

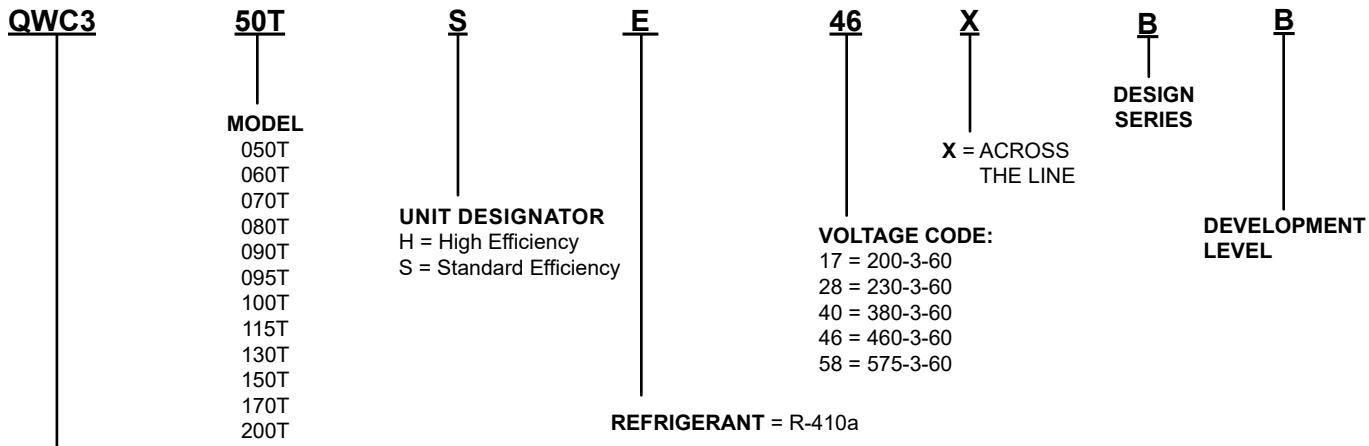
MODEL QWC3 WATER-COOLED SCROLL LIQUID CHILLER

50 tons to 200 tons
60Hz
R-410a



QUANTECH

Nomenclature



QWC3 = QUANTECH CHILLER WATER COOLED SCROLL

Approvals

- ASME Boiler and Pressure Vessel Code –Section VIII Division 1
- AHRI Standard 550/590 and 551/591
- c/U.L. – Underwriters Laboratory
- ASHRAE 15 – Safety Code for Mechanical Refrigeration
- ASHRAE Guideline 3 – Reducing Emission of Halogenated Refrigerants in Refrigeration and Air Conditioning Equipment and Systems
- N.E.C. – National Electrical Code
- OSHA – Occupational Safety and Health Act



Products are produced at a facility whose quality-management systems are ISO9001 certified.

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Equipment Overview

Quantech QWC3 Water-Cooled chillers provide chilled water for all air conditioning applications that use central station air handling or terminal units. They are completely self-contained and are designed for indoor (new or retrofit) installation. Each unit includes hermetic scroll compressors, a liquid evaporator, water cooled condenser, and a user-friendly, Microcomputer Control Center mounted on a rugged steel base. The units are produced at an ISO 9001 registered facility. The QWC3 chillers are rated in accordance with AHRI Standard 550/590.

The chiller is completely assembled with all interconnecting refrigerant piping and internal wiring, ready for field installation.

The unit is pressure-tested, evacuated, and charged with Refrigerant-410A, and synthetic oil (POE). There is an operational test, with water flowing through the evaporator, to check that each control device operates correctly.

The unit can be covered with an optional overspray coat of Caribbean Blue enamel. Units are designed in accordance with NFPA 70 (National Electric Code), ASHRAE/ANSI 15 Safety Code for Mechanical Refrigeration. All units are produced at an ISO 9001 registered facility. All QWC3 chillers are rated in accordance with AHRI Standard 550/590 at AHRI conditions.

COMPRESSORS

The chiller has suction-gas cooled, hermetic, scroll compressors. The QWC3 compressors incorporate a compliant scroll design in both the axial and radial direction. All rotating parts are statically and dynamically balanced. A large internal volume provides greater liquid tolerance. Compressor crankcase heaters are also included for extra protection against liquid migration. All compressors are mounted on isolator pads to reduce transmission of vibration to the rest of the unit.

EVAPORATOR

The dual-circuit evaporator is the direct-expansion type, with refrigerant in the tubes and chilled liquid flowing through the baffled shell. The design working pressure of the shell (liquid) side is 150 psig (10.3 bar), and 400 psig (27.6 bar) for the tube (refrigerant) side.

The evaporator will be constructed and tested in accordance with the applicable sections of the ASME Pressure Vessel Code, Section VIII, Division (1). The water side is exempt per paragraph U-1, (C), (6).

The removable heads will allow access to the internally enhanced, seamless, copper tubes. Vent and drain connections are included. Nozzle connections are grooved to accept ANSI/AWWA C-606 couplings.

The evaporator is covered with 3/4in (19.1 mm) flexible, closed-cell, foam insulation ($K = 0.25$).

Equipment Overview (Cont'd)

CONDENSER

The condenser is a cleanable thru-tube type with steel shell, copper tubes, removable water heads, and includes integral subcooling. The design working pressure of the shell (refrigerant) side will be 560 PSIG (38.6 bar) and 150 PSIG (10.3 bar) for the tube (liquid) side. The shell will be constructed and tested in accordance with section VII, division 1 of the ASME pressure-vessel code. The water side is exempt per paragraph U-1, (C), (6) of section VIII, division 1 of the ASME pressure-vessel code. The condenser is equipped with relief valves and will hold the full refrigerant charge for pumpdown. Water connections are grooved to accept ANSI/AWWA C-606 couplings. Vent and drain connections are included.

REFRIGERANT CIRCUIT

Two independent refrigerant circuits will be furnished on each unit. All piping will be copper with brazed joints. The liquid line will include: a shutoff valve with charging port; sight-glass with moisture indicator; thermal expansion valve; solenoid valve; and high-absorption removable-core filter drier. The entire suction line and the liquid line between the expansion valve and the cooler will be insulated with flexible, closed-cell, foam insulation.

AHRI CERTIFICATION PROGRAM

QWC3 chillers have been tested and certified by Air-Conditioning, Heating and Refrigeration Institute (AHRI) in accordance with the latest edition of AHRI Standard 550/590 (I-P). Under this Certification Program, chillers are regularly tested in strict compliance with this Standard. This provides an independent, third-party verification of chiller performance. Refer to the AHRI site at www.ahrinet.org/ for complete Program Scope, Inclusions, and Exclusions as some options listed herein fall outside the scope of the AHRI certification program. For verification of certification, go to the AHRI Directory at www.ahridirectory.org.



Water-Cooled Water Chilling and
Heat Pump Water-Heating Packages
AHRI Standards 550/590 and 551/591

Rated in accordance with the latest
issuance of AHRI Standard 550/590
and 551/591.

Equipment Overview (Cont'd)

POWER AND CONTROL PANELS

All controls and motor starting equipment necessary for unit operation shall be factory wired and function tested. The panel enclosures shall be designed to NEMA 1 (IP 32) and manufactured from powder-painted galvanized steel.

The Power and Control Panel shall be divided into a power section for each electrical system, a common input section and a control section.

Each power panel contains the following components:

- Compressor starting contactors
- Control-circuit serving compressor capacity control
- Compressor
- Contactor coils
- Compressor motor overloads

The compressor motor overloads contain current transformers which sense each phase, as an input to the microprocessor, to protect the compressor motors from damage due to:

- Low input current
- High input current
- Unbalanced current
- Single phasing
- Phase reversal
- Compressor locked rotor

The common input section contains:

- Control supply transformer providing 115V
- Customer relay board
- Control circuit switch disconnect/emergency stop device

Microprocessor Controls

MICROPROCESSOR CONTROLS

The control section contains:

- On/Off rocker switch
- Microcomputer keypad and display
- Microprocessor board
- I/O expansion board
- Relay boards
- 24V fused power-supply board

The control display includes:

- Liquid Crystal Display with Light Emitting Diode backlighting for outdoor viewing
- Two display lines
- Twenty characters per line

Color coded 12-button non-tactile keypad with sections for display/print for the following information:

- Chilled liquid temperatures
- System pressures for each circuit
- Operating hours and starts for each compressor
- Print calls up to the liquid crystal display
- Operating data for the systems
- History of fault shutdown data for up to the last six fault shutdown conditions
- An RS-232 port, in conjunction with this press-to-print button, is provided to permit the capability of hard copy print-outs via a separate printer (by others)

Entry section to:

- ENTER setpoints or modify system values

Setpoints updating can be performed to:

- Chilled liquid temperature setpoint and range
- Remote reset temperature range
- Set daily schedule/holiday for start/stop
- Manual override for servicing
- Number of compressors

Microprocessor Controls (Cont'd)

- Low liquid temperature cutout
- Low suction pressure cutout
- High discharge pressure cutout
- Anti-recycle timer (compressor start cycle time)
- Anti-coincident timer (delay compressor starts)

Unit section to:

- Set time
- Set unit options

The microprocessor control center is capable of displaying the following:

- Return and leaving chilled liquid temperature
- Low leaving liquid temperature cutout setting
- English or Metric data
- Suction pressure cutout setting
- Each system suction pressure
- Discharge pressure
- Liquid Temperature Reset via a Building Automation System via one of the following:
 - 0-20 VDC input, 0-10 VDC input or a 4 mA to 20 mA input
 - Anti-recycle timer status for each system
 - Anti-coincident system start timer condition
 - Compressor run status
 - No cooling load condition
 - Day, date and time
 - Daily start/stop times
 - Holiday status
 - Automatic or manual system lead/lag control
 - Lead system definition
 - Compressor starts and operating hours (each compressor)
 - Status of hot gas valves (if supplied)
 - Run permissive status
 - Number of compressors running
 - Liquid solenoid valve status
 - Load & unload timer status

Microprocessor Controls (Cont'd)

The standard controls includes: brine chilling, automatic pumpdown, run signal contacts, demand load limit form external building automation system input, remote reset liquid temperature reset input, unit alarm contacts, chilled liquid pump control, automatic reset after power failure, and automatic system optimization to match operating conditions. A non-reversing heat pump function (leaving condenser temperature control) is also standard.

The operating program software is stored in nonvolatile memory (EPROM) to eliminate chiller failure due to AC power failure. Programmed setpoints are retained in lithium battery-backed regulated time clock (RTC) memory for 5 years minimum.

COMMUNICATIONS

- Native communication capability for BACnet (MS/TP) and Modbus
- Optional communication available for N2 and LON via eLink option

Accessories and Options

All accessories and options are factory installed unless otherwise noted.

POWER OPTIONS

Single Point Supply Terminal Block – The standard power wiring connection on all models is a single point power connection to a factory provided terminal block. Components included are the enclosure, terminal block and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring. (Do not include this option if either the Single-Point Non-Fused Disconnect Switch or Single-Point Circuit Breaker options have been included.)

Single Point Non-Fused Disconnect Switch – An optional unit-mounted disconnect switch with external, lockable handle (in compliance with Article 440-14 of N.E.C.), can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied, by others in the power wiring, which must comply with the National Electrical Code and/or local codes.

Single Point Circuit Breaker – An optional unit mounted circuit breaker with external, lockable handle (in compliance with N.E.C. Article 440-14), can be supplied to isolate the power voltage for servicing.

Multiple Point Circuit Breaker – Optional multiple point supply with independent system circuit breakers and locking external handles (in compliance with Article 440-14 of N.E.C) can be factory supplied. Selecting this option also selects optional compressor external overloads, for reduced MCA.

Control Transformer – Converts unit power voltage to 115-1-60 (0.5 or 1.0 KVA capacity). Factory mounting includes primary and secondary wiring between the transformer and the control panel.

Compressor External Overloads – Optional compressor motor overloads can be factory mounted in the unit control/power panel. This option will reduce the chiller MCA (minimum circuit ampacity) and allow for reduced wire sizing to the unit. This option is not available for applications with Leaving Condenser Water Temperature (**LCWT**) greater than 110°F (43°C).

CONTROLS OPTIONS

Language LCD And Keypad – Standard display language and keypad is in English. Spanish and French are available as an option.

HEAT EXCHANGER OPTIONS

Flow Switch – An optional flow switch can be factory supplied for the evaporator. Vapor-proof SPDT, NEMA 3R switch, 150 psig (10.3 bar) DWP, 20°F to 250°F (-7°C to 121°C) with 1in NPT (IPS) connection for upright mounting in horizontal pipe. The flow switch or its equivalent must be furnished with each unit. (**Field mounted**)

Accessories and Options (Cont'd)

Differential Pressure Switch – An alternative option to the paddle-type flow switch. 3 to 45 psig (0.2-3 bar) range with 1/4in NPTE pressure connections. (**Field Mounted**)

Pressure Vessel Codes – Evaporators and condensers are be supplied (Standard) in conformance with the A.S.M.E. pressure codes.

Flanges (ANSI/AWWA C-606 Couplings Type) – consists of flange adapters for grooved end pipe on evaporator and condenser (NOTE: the 060THE and 090TSE units do not include evaporator flanges, and the 050TSE, 060TSE, and 070TSE units do not include condenser flanges). Standard 150 psig (10.3 bar). (**Field-mounted, matching pipe flange by contractor**).

Double Thick Insulation – Double Thick (1-1/2") insulation provided on the evaporator.

CHILLER OPTIONS

Final Paint Overspray – Overspray painting of unit after assembly. (**Factory Paint**)

Service Isolation Valve – Service suction isolation valve added to unit per system in addition to the standard discharge service valve.

Hot Gas By-Pass – Permits continuous, stable operation at capacities below the minimum step of compressor unloading to as low as 5% capacity (depending on both the unit and operating conditions) by introducing an artificial load on the evaporator. Hot gas bypass is installed on only refrigerant system #2 on two-circuited units.

Chicago Code Relief Valves – Unit is provided with relief valves to meet Chicago code requirements.

Compressor Acoustic Sound Blanket – Each compressor is individually enclosed by an acoustic sound blanket. The sound blankets are made with one layer of acoustical absorbent textile fiber of 5/8" (15mm) thickness; one layer of anti-vibrating heavy material thickness of 1/8" (3mm). Both are closed by two sheets of welded PVC, reinforced for temperature and UV resistance.

Non Reversing Heat Pump – Unit configured for optional operating mode controlled by leaving condenser water temperature. Temperature setpoint user adjustable from 86°F to 122°F (30°C to 50°C), default 122°F (50°C). While operating in this mode, chiller will stage compressors to maintain heating setpoint provided there is sufficient cooling demand. Unit can be changed from heat pump to chiller mode locally or through BAS. Unit leaving evaporator water temperature will float based on heating output while in this mode, making this option ideal for applications that do not require a constant evaporator leaving temperature or for multiple (series) chiller installations. Option requires factory startup and adds one day startup labor for field configuration. Requires evaporator leaving temperature above 40°F (4.4°C) while heat pump is in operation.

Accessories and Options (Cont'd)

VIBRATION ISOLATION

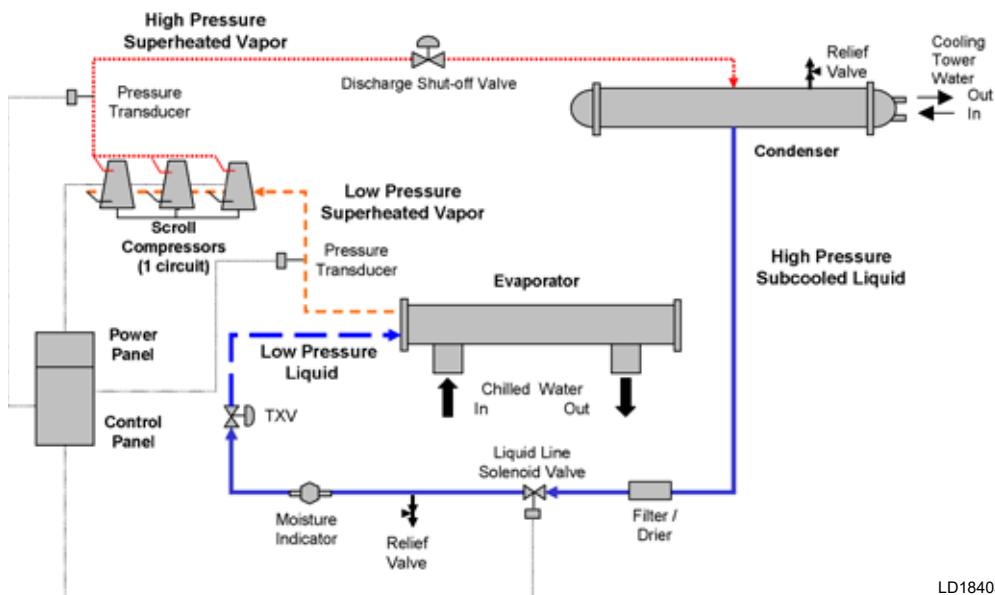
Elastomeric Isolation – Recommended for normal installations. Provides very good performance in most applications for the least cost. (**Field-Mounted**)

1 Inch Spring Isolators – Level adjustable, spring and cage type isolators for mounting under the unit base rails. 1" nominal deflection may vary slightly by application. (**Field -Mounted**)

2 Inch Spring Isolators – Restrained spring-flex mountings incorporate a rugged welded steel housing with vertical and horizontal limit stops. Housings designed to withstand a minimum 1.0g accelerated force in all directions to 2". Level adjustable, deflection may vary slightly by application. (**Field-Mounted**)

Refrigerant Flow Diagram

Low-pressure liquid refrigerant enters the evaporator tubes and is evaporated and superheated by the heat energy absorbed from the chilled liquid passing through the evaporator shell. Low-pressure vapor enters the compressor where pressure and superheat are increased. High-pressure vapor is passed through the condenser where heat is rejected to the condenser water passing through the tubes. The fully condensed and subcooled liquid leaves the condenser and enters the expansion valve, where pressure reduction and further cooling take place. The low pressure liquid refrigerant then returns to the evaporator.



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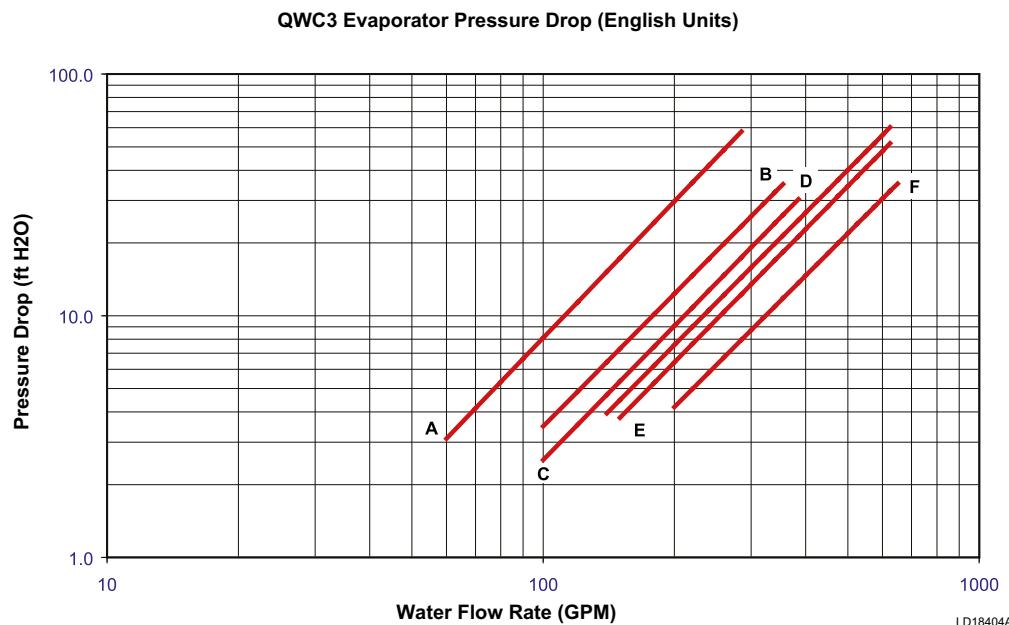
Design Parameters

| DESIGN PARAMETERS - STANDARD EFFICIENCY (SE) | | | | | | | | | | | | |
|--|------------------------------|---------------|-----------------------------|---------------|---|------------|--------------------------------------|--|--------------------------------------|-------------|-----------------------------------|--|
| QWC3 MODEL | EVAPORATOR FLOW GPM (L/S) | | CONDENSER FLOW GPM (L/S) | | LEAVING EVAP. WATER TEMP. °F (°C) | | ENT. COND. WATER TEMP. °F (°C) | | LVG. COND. WATER TEMP. °F (°C) | | EQUIPMENT ROOM TEMP °F (°C) | |
| | MIN | MAX | MIN | MAX | MIN1 | MAX2 | MIN | | MAX | MIN | MAX | |
| 050TSE | 60 (3.8) | 285 (18) | 90 (5.7) | 360 (22.7) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 060TSE | 60 (3.8) | 285 (18) | 90 (5.7) | 360 (22.7) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 070TSE | 60 (3.8) | 285 (18) | 90 (5.7) | 360 (22.7) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 080TSE | 60 (3.8) | 285 (18) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 090TSE | 100 (6.3) | 355 (22.4) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 100TSE | 100 (6.3) | 385 (24.3) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 115TSE | 100 (6.3) | 385 (24.3) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 130TSE | 140 (8.8) | 625 (39.4) | 180 (11.4) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 150TSE | 150 (9.5) | 625 (39.4) | 225 (14.2) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 170TSE | 200 (12.6) | 650 (41) | 260 (16.4) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 200TSE | 200 (12.6) | 650 (41) | 260 (16.4) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| DESIGN PARAMETERS - HIGH EFFICIENCY (HE) | | | | | | | | | | | | |
| QWC3 MODEL | EVAPORATOR FLOW GPM (L/S) | | CONDENSER FLOW GPM (L/S) | | LEAVING EVAP. WATER TEMP. °F (°C) | | ENT. COND. WATER TEMP. °F (°C) | | LVG. COND. WATER TEMP. °F (°C) | | EQUIPMENT ROOM TEMP °F (°C) | |
| | MIN | MAX | MIN | MAX | MIN1 | MAX2 | MIN | | MAX | MIN | MAX | |
| 060THE | 100 (6.3) | 355 (22.4) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 070THE | 140 (8.8) | 625 (39.4) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 080THE | 140 (8.8) | 625 (39.4) | 145 (9.1) | 450 (28.4) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 090THE | 140 (8.8) | 625 (39.4) | 225 (14.2) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 095THE | 150 (9.5) | 625 (39.4) | 225 (14.2) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 115THE | 140 (8.8) | 625 (39.4) | 225 (14.2) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 130THE | 200 (12.6) | 650 (41) | 225 (14.2) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |
| 150THE | 200 (12.6) | 650 (41) | 260 (16.4) | 700 (44.2) | 40 (4.4) | 50 (10) | 65 (18) | | 130 (54) | 40 (4.4) | 115 (46) | |

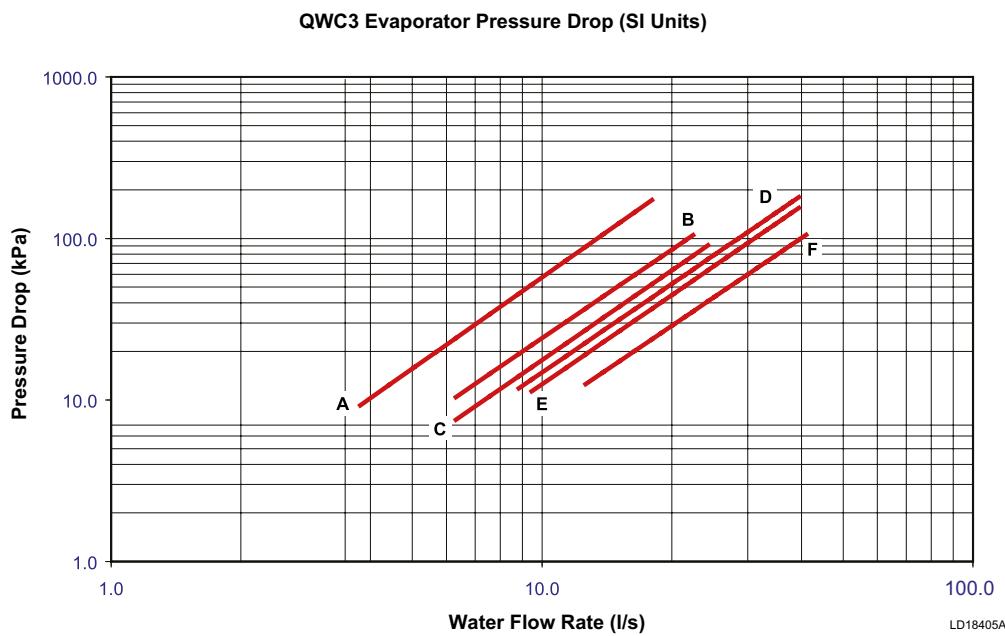
NOTES:

- For leaving temperature below 40°F (4.4°C), optional brine chilling kit required. Minimum with kit is 15°F (-9.4°C).
- For leaving water temperature higher than 50°F (10°C), contact the nearest QuanTech Sales Representative for application guidelines.

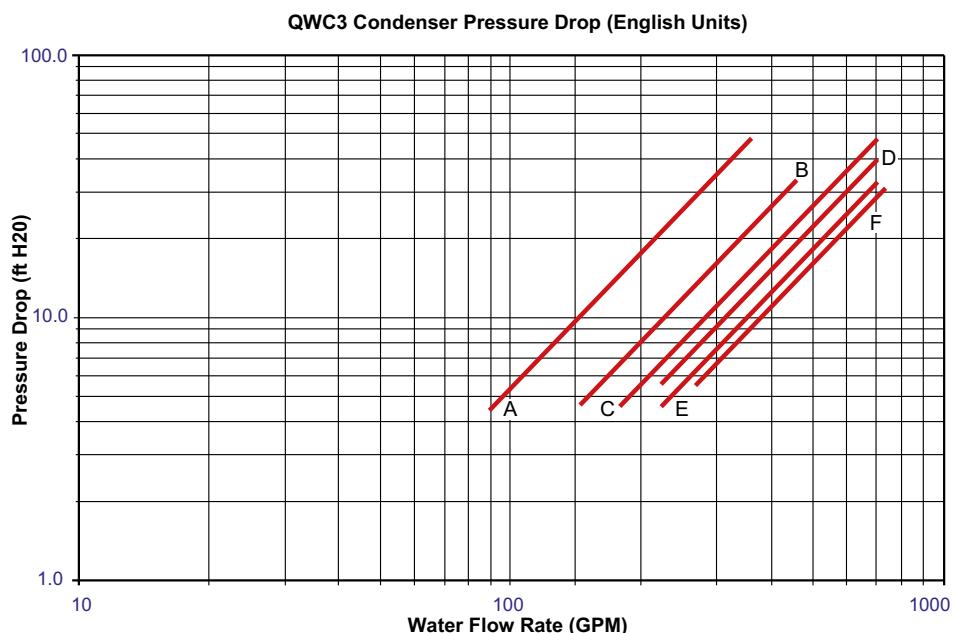
Pressure Drop Curves



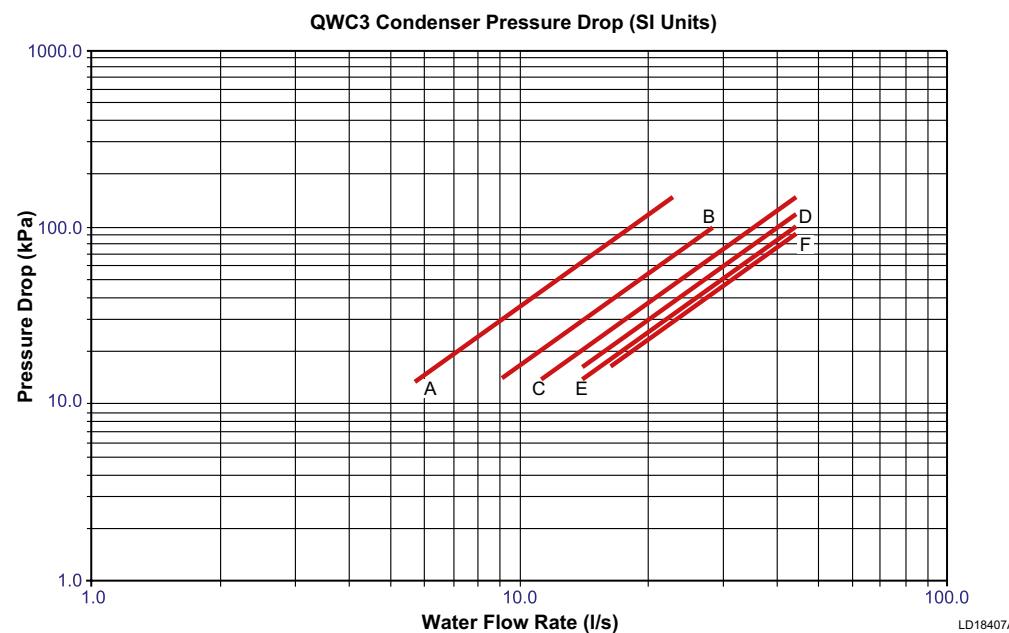
| EVAPORATOR | QWC3 MODEL NUMBER |
|------------|--|
| A | 050TSE, 060TSE, 070TSE, 080TSE |
| B | 060THE, 090TSE |
| C | 100TSE, 115TSE |
| D | 070THE, 080THE, 090THE, 115THE, 130TSE |
| E | 095THE, 150TSE |
| F | 130THE, 150THE, 200TSE |



Pressure Drop Curves (Cont'd)



| EVAPORATOR | QWC3 MODEL NUMBER |
|------------|--|
| A | 050TSE, 060TSE, 070TSE, 080TSE |
| B | 060THE, 090TSE |
| C | 100TSE, 115TSE |
| D | 070THE, 080THE, 090THE, 115THE, 130TSE |
| E | 095THE, 150TSE |
| F | 130THE, 150THE, 200TSE |



Selection Data

GUIDE TO SELECTION

Complete water chilling capacity ratings for QWC3 chillers are shown on the following pages to cover the majority of job requirements. For any application beyond the scope of this Engineering Guide, consult your nearest Quantech Sales Representative.

Selection Rules

- Ratings** – All QWC3 ratings are in accordance with AHRI Standard 550/590, at the AHRI standard conditions. Ratings not at standard AHRI conditions are rated in accordance with AHRI rating procedures. These ratings may be interpolated but should not be extrapolated.

$$\text{Cond. GPM} = \frac{\text{MBH} \times 2}{\text{Cond. Water Range } (^{\circ}\text{F})}$$

| EVAPORATOR CORRECTION FACTORS | | | | |
|-------------------------------|---------|----------|---------|----------|
| FF=TEMP SPLIT | 0.00010 | | 0.00025 | |
| | TONS | COMPR KW | TONS | COMPR KW |
| 6 | 0.976 | 0.996 | 0.969 | 0.997 |
| 8 | 0.990 | 0.999 | 0.960 | 0.996 |
| 10 | 1.000 | 1.000 | 0.991 | 0.999 |
| 12 | 1.009 | 1.001 | 0.999 | 1.000 |
| 14 | 1.017 | 1.002 | 1.007 | 1.001 |

- Cooling Water Quantity** – Ratings are based on 10°F chilled water range with the evaporator at sea level. Use the chilled water correction factors (below) for other ranges except as limited by water pressure drop, minimum or maximum water flows for the evaporator.

| CONDENSER CORRECTION FACTORS | | | | |
|------------------------------|---------|----------|---------|----------|
| FF=TEMP SPLIT | 0.00025 | | 0.00050 | |
| | TONS | COMPR KW | TONS | COMPR KW |
| 6 | 1.020 | 0.963 | 1.014 | 0.974 |
| 8 | 1.010 | 0.982 | 1.019 | 0.990 |
| 10 | 1.000 | 1.000 | 0.995 | 1.010 |
| 12 | 0.990 | 1.019 | 0.985 | 1.029 |
| 14 | 0.980 | 1.040 | 0.975 | 1.048 |

Note: Temperature split factors @ 85°F Entering Condenser Water Temp (ECWT)

- Condenser Water Quantity** – Ratings are applicable from 2 to 4 GPM/Ton. Use the condenser water correction factors (below) for different ranges except as limited by water pressure drop or minimum or maximum water flows for the condenser. Using the heat rejection (MBH), the Condenser GPM is calculated as follows:
- Fouling Factors** – Ratings are based on 0.0001 evaporator and 0.00025 condenser fouling factor. For other fouling factors, consult the table below or contact your Quantech Sales Representative.

Selection Data (Cont'd)

5. **Ethylene Glycol Correction Factors** – The following factors are to be applied to the standard ratings for units cooling ethylene glycol.

| ETHYLENE GLYCOL | | | | | |
|-----------------|-------|----------|-------|------------|--------------|
| %WEIGHT | TONS | COMPR KW | GPM | PRESS DROP | FREEZE POINT |
| 10 | 0.993 | 1.002 | 1.029 | 1.095 | 26 |
| 20 | 0.980 | 1.004 | 1.040 | 1.191 | 18 |
| 30 | 0.964 | 1.007 | 1.055 | 1.302 | 7 |
| 40 | 0.945 | 1.009 | 1.071 | 1.435 | -8 |
| 50 | 0.922 | 1.013 | 1.091 | 1.599 | -29 |

6. **Propylene Glycol Correction Factors** – The following factors are to be applied to the standard ratings for units cooling propylene glycol.

| PROPYLENE GLYCOL | | | | | |
|------------------|-------|----------|-------|------------|--------------|
| %WEIGHT | TONS | COMPR KW | GPM | PRESS DROP | FREEZE POINT |
| 10 | 0.985 | 1.002 | 1.003 | 1.078 | 28 |
| 20 | 0.968 | 1.005 | 1.000 | 1.157 | 19 |
| 30 | 0.937 | 1.008 | 0.992 | 1.288 | 9 |
| 40 | 0.898 | 1.012 | 0.982 | 1.414 | <1 |
| 50 | 0.862 | 1.019 | 0.985 | 1.605 | -28 |

METHOD OF SELECTION

If the duty requires a 10°F range on both the evaporator and condenser, see "Ratings". For water ranges other than 10°F, use the following procedure.

1. Determine capacity required from the following formula.

$$\text{Capacity (Tons)} = \frac{\text{GPM} \times \text{Chilled Water Range } (\text{°F})}{24}$$

2. After applying any fouling factor corrections, the actual condenser heat rejection may be determined as follows:

$$\text{Heat Rejection (MBH)} = \frac{\text{Heat Rejection (Btuh)}}{1000}$$

$$= (\text{Tons} \times 12) = (\text{kW} \times 3.415)$$

3. Determine condensing water requirements for water cooled models as follows:

$$\text{Condenser Tons} = \frac{\text{Heat Rejection (MBH)} \times 1000}{15,000}$$

Selection Data (Cont'd)

Or combine the two formulas:

$$\text{Cond. Water GPM} = \frac{\text{Condenser Tons} \times 30}{\text{Condenser Water Range } (^{\circ}\text{F})}$$

SAMPLE SELECTION

Water Cooled Chiller (QWC3)

GIVEN – Chill 200 GPM of water from 56°F to 44°F and 0.0001 evaporator fouling factor with 85°F to 95°F condensing water available. The fouling factor is 0.0005 for the condenser.

FIND – The required unit size capacity, kW, EER, and water pressure drop.

SOLUTION:

- Chilled water range = 56°F - 44°F = 12°F and correction factors are 1.009 for Tons and 1.001 for kW for the evaporator.

$$\begin{aligned} \text{Capacity (Tons)} &= \frac{\text{GPM} \times \text{Chilled Water Range}}{24} \\ &= \frac{200 \times 12}{24} = 100\text{TR} \end{aligned}$$

- From the rating, a model QWC3115TSE has a capacity range required. For the evaporator leaving water temperature of 44°F and a condenser leaving water temperature of 95°F, the unit capacity rating table indicates:

$$\begin{aligned} \text{Tons} &= 108.4 \\ \text{KW} &= 83.5 \\ \text{EER} &= 15.6 \end{aligned}$$

Correcting for the 12°F chilled water range and the 0.0005 condenser-fouling factor (Correction factors for the condenser are 0.995 for Tons and 1.010 for kW):

$$\text{Tons} = 108.4 \times 1.009 \times 0.995 = 108.8\text{TR}$$

$$\text{KW} = 83.5 \times 1.001 \times 1.010 = 84.4 \text{ kW}$$

Selection Data (Cont'd)

3. Determine the average full load kW and EER at 100 Tons.

$$\frac{100}{108.8} \times (84.4) = 77.6 \text{ kW}$$

$$\text{EER} = \frac{\text{Tons} \times 12}{\text{kW}} = \frac{100 \times 12}{77.6} = 15.5$$

4. Determine the cond. Heat rejection as follows:

$$\begin{aligned}\text{Heat Rejection (MBH)} &= (\text{Tons} \times 12) + (\text{kW} \times 3.415) \\ &= (108.8 \times 12) + (84.4 \times 3.415) \\ &= 1306 + 288 \\ &= 1594\end{aligned}$$

5. Determine the GPM of condensing water as follows:

$$\begin{aligned}\text{GPM Condenser Water} &= \frac{\text{MBH} \times 2}{\text{Cond. Water Range}} \\ &= \frac{1594 \times 2}{10} \\ &= 319 \text{ GPM}\end{aligned}$$

6. From curves on pages 14 and 15, the pressure drops with 200 GPM through the evaporator and 319 GPM through the condenser of the Model QWC3115TSE:

Evaporator Pressure Drop at 200 GPM = 9 ft

Condenser Pressure Drop at 319 GPM = 18 ft

The unit is suitable.

Application Data

UNIT LOCATION

Chillers are designed for indoor installation. Units should be located away from noise-critical areas. Service clearance must be allowed and include space for removing condenser tubes. A doorway or window can sometimes provide space for tube removal. Units should be installed indoors where they are not exposed to rain or water splash. Chillers should be located near a drain. The use of chillers in corrosive, dusty or explosive atmospheres should be avoided unless the unit is properly protected. A unit located in a clean room will run best, require least maintenance, and last longest. Heat or ventilation may be required to maintain the ambient between 40°F and 115°F (4.4°C and 46.1°C).

UNIT ISOLATION

The chiller foundation must be rigid to reduce vibration transmission to a minimum. All upper story installations should use vibration isolators under the unit base. To maintain isolator efficiency, no mechanical ties should be made to the building. Properly selected flexible connectors and piping isolators are recommended. All the above recommendations will help to reduce vibration transmission and result in a quieter operation.

FIELD CONNECTED WATER PIPING

Piping must comply in all respects with applicable local plumbing codes and ordinances. In no case should the unit support the weight of connecting piping. Since elbows, tees, and valves increase pressure drop, all piping should be kept as simple as possible. Hand stop valves should be installed where required to facilitate servicing. Piping to the inlet and outlet connections of the evaporator and condenser may include high-pressure rubber hose or piping loops to ensure against water pump transmission of vibration.

Facilities should be provided for measuring temperature and pressure in the evaporator and condenser field water piping. Drain connections should be provided at all low points to permit complete drainage of the evaporator(s), condenser(s), and system piping. This is especially important if the unit is located in an unheated room where freezing could prevail. Water lines subjected to ambient temperatures below freezing may require heater cables or antifreeze (by others).

Water loops should contain provisions for venting. A strainer, preferably 40 mesh, should be installed in the evaporator and condenser inlet lines, and located where it will protect the circulating pump and the heat exchanger tube bundles. It should be determined that the maximum water pressure at the evaporator or condenser does not exceed the maximum design working pressure of the evaporator or condenser.

The water circulating pumps should be located on the inlet side of the heat exchangers. If, however, space does not permit this, the pumps are located in the outlet water piping. The net positive suction head must be considered when applying pumps.

Application Data (Cont'd)

FIELD WIRING

All field wiring must comply with the National Electric Code and all applicable local codes. Quantech liquid chiller units are factory wired for optimum reliability. Therefore the unit controls must not be modified without expressed written consent by Quantech. The use of a simple switch or timer from a remote point is permitted; but it must be connected to the unit panel at points expressly indicated for that purpose.

CONDENSER WATER

The chiller is engineered for maximum efficiency at both design and part-load operation by taking advantage of the colder cooling tower water temperatures which naturally occur during the winter months. Appreciable power savings are realized from these reduced heads. For stable unit performance, continuous operation with entering condenser water temperature below 65°F (18°C) is not recommended. For operation with entering condenser water temperature below this, it is recommended that some type of condenser water temperature control be used.

REFRIGERANT RELIEF PIPING

Each chiller is equipped with pressure relief valves. The purpose of the relief valves is to quickly relieve excess pressure of the refrigerant charge as a safety precaution in the event of an emergency such as a fire. Sized to the requirements of applicable local codes, a vent line must be run from the relief valve to the outside of the building. Vent piping must be arranged to avoid imposing a strain on the relief valves and should include flexible connections.

The low side relief valve is located on the suction line. It has a pressure setting of 400 psig (27.6 bar) and a capacity of 26.8 lbs. air/min (166.3 l/s). The high side relief valve is located on the condenser shell. It has a pressure setting of 560 psig (38.6 bar) and a capacity of 49.8 lbs air/min (309.1 l/s).

The 060, 070, and 095 units have additional relief valves on the discharge line(s) in lieu of compressor internal relief. The valve has a pressure setting of 650 psig (44.8 bar), a capacity of 44.6 lbs air/min (277.0 l/s) and a 1/2" flare connection.

Physical Data

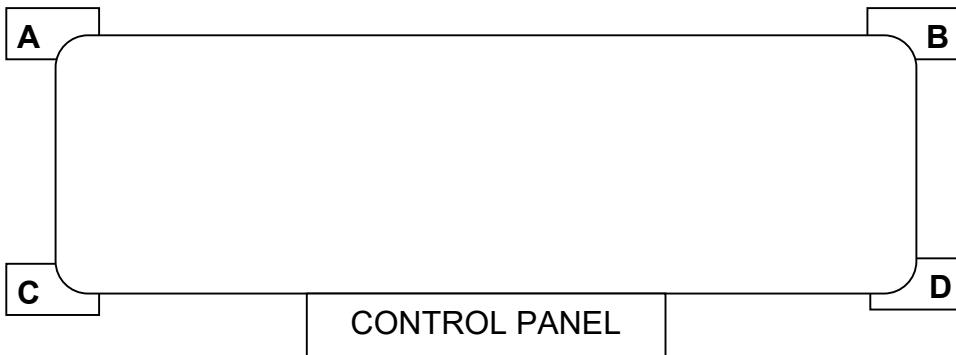
STANDARD EFFICIENCY (SE)

| QWC3 | 050TSE | 060TSE | 070TSE | 080TSE | 090TSE | 100TSE | 115TSE | 130TSE | 150TSE | 170TSE | 200TSE |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|-----------------------|
| GENERAL UNIT DATA | | | | | | | | | | | |
| Nominal Unit Capacity (Tons) | 51.6 | 59.9 | 67.8 | 76.6 | 85.8 | 92.7 | 110.4 | 127.4 | 144.0 | 167.7 | 199.6 |
| Number of Independent Refrigerant Circuits | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Refrigerant Charge, R-410A, Ckt 1/Ckt. 2 (lbs.) | 60/ 60 | 60/ 60 | 60/ 60 | 70/ 70 | 65/ 65 | 80/ 80 | 80/ 80 | 130/ 130 | 170/ 170 | 195/ 195 | 195/ 195 |
| Oil Charge, Ckt. 1/ Ckt. 2, (gal.) | 1.7/ 1.7 | 2.2/ 2.2 | 2.5/ 2.2 | 2.5/ 2.5 | 3.1/ 3.1 | 3.1/ 3.1 | 3.3/ 3.1 | 3.3/ 3.3 | 4.7/ 4.7 | 4.7/ 4.7 | 4.7/ 4.7 |
| Shipping Weight (lbs.) | 4067 | 4067 | 4337 | 4860 | 5317 | 5333 | 5363 | 6006 | 6626 | 7777 | 8132 |
| Operating Weight (lbs.) | 4200 | 4200 | 4470 | 5055 | 5632 | 5648 | 5678 | 6570 | 7354 | 8721 | 9076 |
| COMPRESSORS, SCROLL | | | | | | | | | | | |
| Quantity per Chiller | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 6 |
| Nominal Size Ckt. 1 / Ckt. 2 | 13-13/ 13-13 | 15-15/ 15-15 | 20-20/ 15-15 | 20-20/ 20-20 | 25-25/ 20-20 | 25-25/ 25-25 | 32-32/ 25-25 | 32-32/ 32-32 | 35-35/ 35-35 | 32-32-32/ 32-32 | 32-32-32/ 32-32-32 |
| CONDENSER | | | | | | | | | | | |
| Water Volume (gal.) | 19.4 | 19.4 | 19.4 | 26.9 | 26.9 | 26.9 | 26.9 | 35.2 | 52.4 | 59.1 | 59.1 |
| Maximum Water Side Pressure (psig) | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Maximum Refrigerant Side Pressure (psig) | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 |
| Dia. X Length (inches X feet) | 13" x 8' | 13" x 8' | 13" x 8' | 14" x 8' | 14" x 8' | 14" x 8' | 14" x 8' | 16" x 8' | 18" x 10' | 18"x10' | 18"x10' |
| Water Nozzle Connection Size, (inches) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| EVAPORATOR | | | | | | | | | | | |
| Water Volume (gals.) | 22.4 | 22.4 | 22.4 | 22.4 | 37.3 | 37.3 | 37.3 | 59.8 | 57.6 | 77.0 | 77.0 |
| Maximum Water Side Pressure (psig) | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Maximum Refrigerant Side Pressure (psig) | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 |
| Dia. X Length (inches X feet) | 11" x 8' | 11" x 8' | 11" x 8' | 11" x 8' | 13" x 8' | 14" x 8' | 14" x 8' | 16" x 8' | 15" x 10' | 17" x 10' | 17" x 10' |
| Water Nozzle Connection Size, (inches) | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 8 | 8 | 8 | 8 |

Physical Data

HIGH EFFICIENCY (HE)

| QWC3 | 060THE | 070THE | 080THE | 090THE | 095THE | 115THE | 130THE | 150THE |
|---|-----------------|-----------------|-----------------|-----------------|-----------------------|-----------------|--------------------|-----------------|
| GENERAL UNIT DATA | | | | | | | | |
| Nominal Unit Capacity (Tons) | 63.2 | 73 | 82.4 | 92.6 | 95.8 | 117.2 | 132.1 | 148.5 |
| Number of Independent Refrigerant Circuits | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Refrigerant Charge, R-410A, Ckt 1/Ckt. 2 (lbs.) | 65/65 | 90/90 | 90/90 | 155/155 | 170/170 | 155/155 | 180/180 | 195/195 |
| Oil Charge, Ckt. 1/Ckt. 2, (gal.) | 2.2/2.2 | 2.5/2.2 | 2.5/2.5 | 3.1/2.5 | 3.3/3.3 | 3.3/3.1 | 3.7/3.7 | 4.7/4.7 |
| Shipping Weight (lbs.) | 4757 | 5389 | 5659 | 6264 | 6476 | 6314 | 7172 | 7322 |
| Operating Weight (lbs.) | 5072 | 5884 | 6154 | 6903 | 7204 | 6953 | 8060 | 8266 |
| COMPRESSORS, SCROLL | | | | | | | | |
| Quantity per Chiller | 4 | 4 | 4 | 4 | 6 | 4 | 5 | 4 |
| Nominal Size Ckt. 1 / Ckt. 2 | 15-15/ 15-15 | 20-20/ 15-15 | 20-20/ 20-20 | 25-25/ 20-20 | 15-15-15/ 15-15-15 | 32-32/ 25-25 | 20-20-20/ 32-32 | 35-35/ 35-35 |
| CONDENSER | | | | | | | | |
| Water Volume (gal.) | 26.9 | 26.9 | 26.9 | 44.1 | 52.4 | 44.1 | 52.4 | 59.1 |
| Maximum Water Side Pressure (psig) | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Maximum Refrigerant Side Pressure (psig) | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 |
| Dia. X Length (inches X feet) | 14" x 8' | 14" x 8' | 14" x 8' | 18" x 8' | 18" x 10' | 18" x 8' | 18" x 10' | 18" x 10' |
| Water Nozzle Connection Size, (inches) | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 |
| EVAPORATOR | | | | | | | | |
| Water Volume (gals.) | 37.3 | 59.8 | 59.8 | 59.8 | 57.6 | 59.8 | 77 | 77 |
| Maximum Water Side Pressure (psig) | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Maximum Refrigerant Side Pressure (psig) | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 |
| Dia. X Length (inches X feet) | 13" x 8' | 16" x 8' | 16" x 8' | 16" x 8' | 15" x 10' | 16" x 8' | 17" x 10' | 17" x 10' |
| Water Nozzle Connection Size, (inches) | 6 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

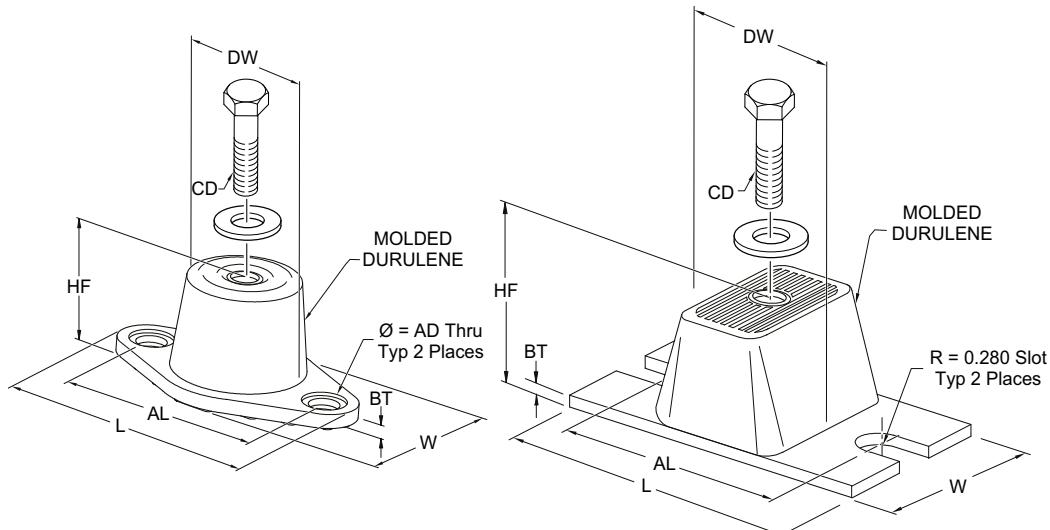
Isolator Selection Data

| MODEL QWC3 | EFFICIENCY | ELASTOMERIC ISOLATOR | 1" SPRING ISOLATOR | 2" SPRING ISOLATOR |
|------------|------------|----------------------|-----------------------|--------------------|
| 050T | SE | RD-4 Brick Red | CP-1D-1360 White | Red/Black |
| 060T | SE | RD-4 Brick Red | CP-1D-1360 White | Pink |
| 070T | SE | RD-4 Brick Red | CP-1D-1785N Gray/Red | Pink |
| 080T | SE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink |
| 090T | SE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink |
| 100T | SE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink |
| 115T | SE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink |
| 130T | SE | RD-4 Brick Red | C2P-1D-2400 Gray | Pink/Gray |
| 150T | SE | RD-4 Charcoal | C2P-1D-2720 White | Pink/Gray/Orange |
| 170T | SE | RD-4 Charcoal | C2P-1D-2720 White | Pink/Gray |
| 200T | SE | RD-4 Charcoal | C2P-1D-3570 Gray/Red | Pink/Gray/Orange |
| 060T | HE | RD-4 Brick Red | CP-1D-1785N Gray/Red | Pink |
| 070T | HE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink |
| 080T | HE | RD-4 Brick Red | CP-2D-1800 Dark Green | Pink/Gray |
| 090T | HE | RD-4 Charcoal | C2P-1D-2400 Gray | Pink/Gray |
| 095T | HE | RD-4 Charcoal | C2P-1D-2400 Gray | Pink/Gray |
| 115T | HE | RD-4 Charcoal | C2P-1D-2400 Gray | Pink/Gray |
| 130T | HE | RD-4 Charcoal | C2P-1D-2720 White | Pink/Gray |
| 150T | HE | RD-4 Charcoal | C2P-1D-3570 Gray/Red | Pink/Gray/Orange |

NOTE: All four corners use the same isolator

Isolator Information

ELASTOMERIC ISOLATOR



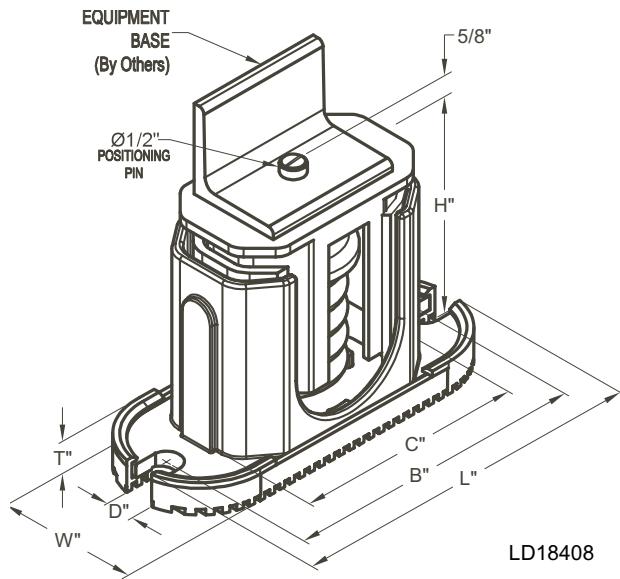
LD17304

| MOUNT TYPE | DIMENSION DATA (INCHES) | | | | | | | |
|------------|-------------------------|------|------|------|------|------|-------------------|------|
| | L | W | HF | AL | AD | BT | CD | DW |
| RD1-WR | 3.13 | 1.75 | 1.25 | 2.38 | 0.34 | 0.19 | 5/16-18 UNC X 3/4 | 1.25 |
| RD2-WR | 3.88 | 2.38 | 1.75 | 3.00 | 0.34 | 0.22 | 3/8-16 UNC X 1 | 1.75 |
| RD3-WR | 5.50 | 3.38 | 2.88 | 4.13 | 0.56 | 0.25 | 1/2-13 UNC X 1 | 2.50 |
| RD4-WR | 6.25 | 4.63 | 2.75 | 5.00 | 0.56 | 0.38 | 1/2-13 UNC X 1 | 3.00 |

| MODEL NUMBER | SOLATOR COLOR | WEIGHT RANGE (LBS) | WEIGHT RANGE (KGS) |
|-------------------|---------------|--------------------|--------------------|
| RD-3-CHARCOAL-WR | CHARCOAL | Up thru 825 | UP TO 374 |
| RD-4-BRICK RED-WR | BRICK RED | 826 thru 1688 | 375 - 766 |
| RD-4-CHARCOAL-WR | CHARCOAL | 1689 thru 4000 | 767 - 1814 |

Isolator Information (Cont'd)

ONE INCH DEFLECTION SPRING ISOLATOR



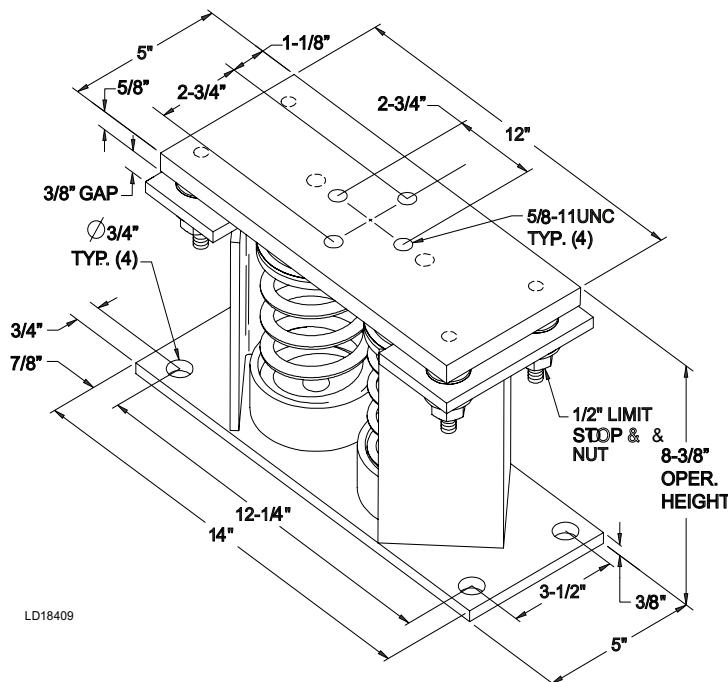
| MOUNT TYPE | DIMENSION DATA (INCHES) | | | | | | |
|---------------|-------------------------|-----|--------|-------|-------|------|-------|
| | W | D | L | B | C | T | H |
| CP | 3 | 5/8 | 7-3/4 | 6-1/2 | 4-3/4 | 1/2 | 5-5/8 |
| C2P | 3 | 5/8 | 10-1/2 | 9-1/4 | 7-3/4 | 9/16 | 6 |

| MODEL NUMBER | COLOR CODE | RATED CAPACITY (FOR UNITS WITH ALL LOAD POINTS LESS THAN 1785 LBS (810 KG)) | |
|--------------|------------|---|--------------|
| | | LBS. | KG |
| CP-1D-510 | BLACK | Up thru 434 | Up thru 197 |
| CP-1D-900 | DARK GREEN | 435 thru 765 | 198 thru 347 |
| CP-1D-1200 | GRAY | 766 thru 1020 | 348 thru 463 |
| CP-1D-1360 | WHITE | 1021 thru 1156 | 464 thru 524 |
| CP-1D-1785N | GRAY/RED | 1157 thru 1785 | 525 thru 810 |

| MODEL NUMBER | COLOR CODE | RATED CAPACITY (FOR UNITS WITH ANY LOAD POINT ABOVE 1518 LBS (689 KG)) | |
|--------------|-------------|--|-------------|
| | | LBS. | KG |
| C2P-1D-1350 | DARK PURPLE | Up thru 1148 | Up to 521 |
| C2P-1D-1350 | DARK PURPLE | Up thru 1148 | Up to 521 |
| C2P-1D-1800 | DARK GREEN | 1149 thru 1530 | 522 - 694 |
| C2P-1D-2400 | GRAY | 1531 thru 2040 | 695 - 925 |
| C2P-1D-2400 | GRAY | 1531 thru 2040 | 695 - 925 |
| C2P-1D-2720 | WHITE | 2041 thru 2312 | 926 - 1049 |
| C2P-1D-3570N | GRAY/RED | 2313 thru 3570 | 1050 - 1619 |

Isolator Information (Cont'd)

TWO INCH DEFLECTION SPRING ISOLATOR

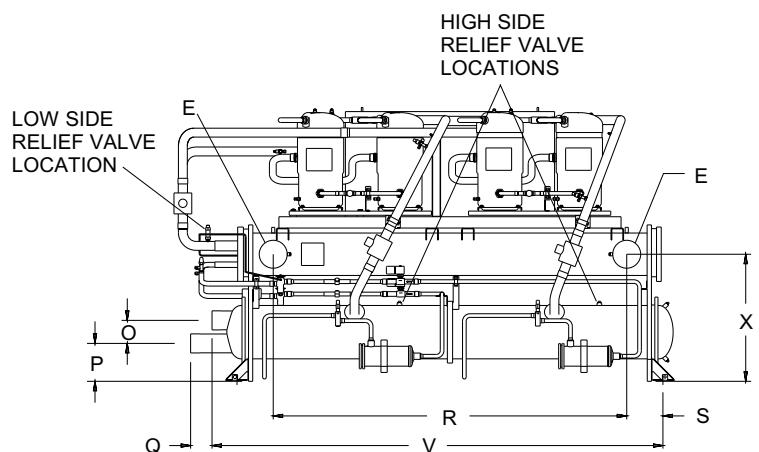
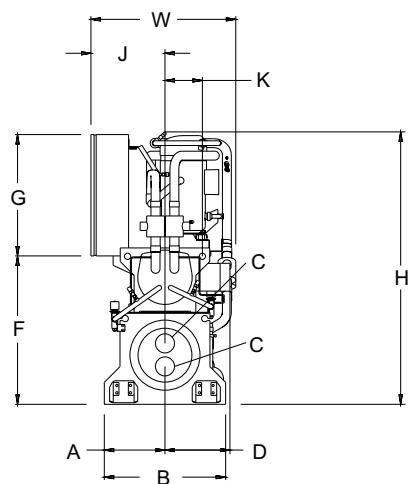
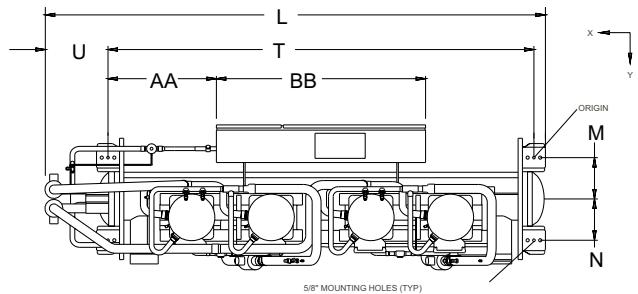


| MODEL NUMBER | ISOLATOR COLOR | WEIGHT RANGE (LBS) | WEIGHT RANGE (KGS) |
|----------------|--------------------|--------------------|--------------------|
| Y2RSI-2D-460 | GREEN | Up thru 391 | UP TO 177 |
| Y2RSI-2D-460 | GREEN | Up thru 391 | UP TO 177 |
| Y2RSI-2D-710 | DARK BROWN | 392 thru 604 | 178 - 274 |
| Y2RSI-2D-870 | RED | 605 thru 740 | 275 - 336 |
| Y2RSI-2D-1200N | RED/BLACK | 741 thru 1020 | 337 - 463 |
| Y2RSI-2D-1690 | PINK | 1021 thru 1437 | 464 - 652 |
| Y2RSI-2D-2640N | PINK/GRAY | 1438 thru 2244 | 653 - 1018 |
| Y2RSI-2D-2870N | PINK/GRAY/ORANGE | 2245 thru 2618 | 1019 - 1188 |
| Y2RSI-2D-3280N | PINK/GRAY/DK.BROWN | 2619 thru 3740 | 1189 - 1696 |

Unit Dimensions - Four Compressor (Cont'd)

NOTES:

1. Recommended service clearances
 - Rear to wall: 20" (508mm)
 - Front to wall: 36" (915mm)
 - Top: 43" (1092mm)
 - Tube cleaning and removal: 132" (3353mm) either end
2. Relief valve connection sizes
 - Low side (suction line): 1/2" flare
 - High side (condenser): 5/8" NPTI



LD18410

Unit Dimensions - Five & Six Compressor

| STANDARD EFFICIENCY (SE) | | |
|---------------------------------|---------------|---------------|
| QWC3 | 170TSE | 200TSE |
| W | 34 13/16 | 34 13/16 |
| H | 77 9/32 | 77 9/32 |
| H* | — | — |
| H** | 76 | 76 |
| L | 143 7/16 | 143 7/16 |
| A | 15 | 15 |
| B | 30 | 30 |
| C | 5 9/16 | 5 9/16 |
| D | 16 1/32 | 16 1/32 |
| E | 8 5/8 | 8 5/8 |
| F | 41 | 41 |
| G | 29 | 29 |
| J | 17 11/16 | 17 11/16 |
| K | 17 25/32 | 17 25/32 |
| M | 10 3/8 | 10 3/8 |
| N | 10 3/8 | 10 3/8 |
| O | 8 5/8 | 8 5/8 |
| P | 8 1/2 | 8 1/2 |
| Q | 5 3/16 | 5 3/16 |
| R | 102 | 102 |
| S | 11 29/32 | 11 29/32 |
| T | 125 13/16 | 125 13/16 |
| U | 14 7/8 | 14 7/8 |
| V | 132 23/32 | 132 23/32 |
| X | 36 1/4 | 36 1/4 |
| AA | 37 21/32 | 37 21/32 |
| BB | 50 | 50 |

| HIGH EFFICIENCY (HE) | |
|-----------------------------|---------------|
| 095THE | 130THE |
| 35 1/16 | 34 13/16 |
| 72 5/32 | 77 19/32 |
| — | — |
| 76 | 76 |
| 143 3/8 | 145 7/32 |
| 15 | 15 |
| 30 | 30 |
| 5 9/16 | 5 9/16 |
| 16 1/32 | 16 1/32 |
| 8 5/8 | 8 5/8 |
| 41 | 41 |
| 29 | 29 |
| 17 11/16 | 17 11/16 |
| 17 25/32 | 17 25/32 |
| 10 3/8 | 10 3/8 |
| 10 3/8 | 10 3/8 |
| 8 5/8 | 8 5/8 |
| 8 1/2 | 8 1/2 |
| 5 3/16 | 5 3/16 |
| 102 | 102 |
| 11 29/32 | 11 29/32 |
| 125 13/16 | 125 13/16 |
| 14 13/16 | 16 21/32 |
| 132 23/32 | 132 23/32 |
| 36 1/4 | 36 1/4 |
| 37 21/32 | 34 31/32 |
| 50 | 50 |

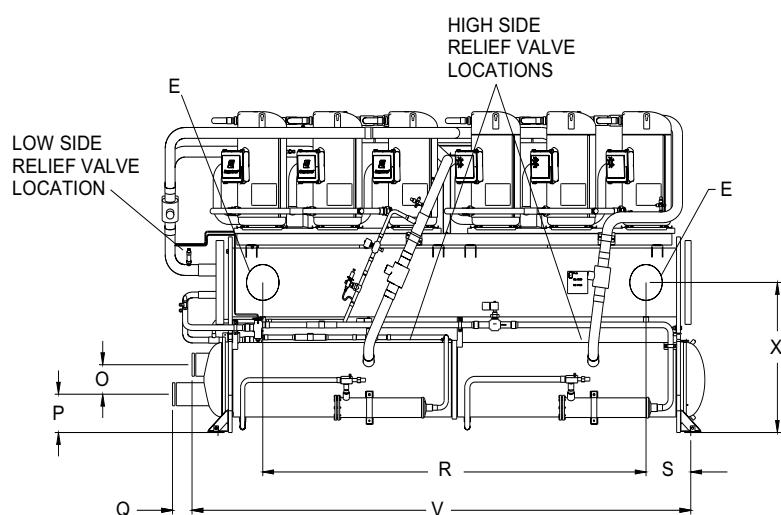
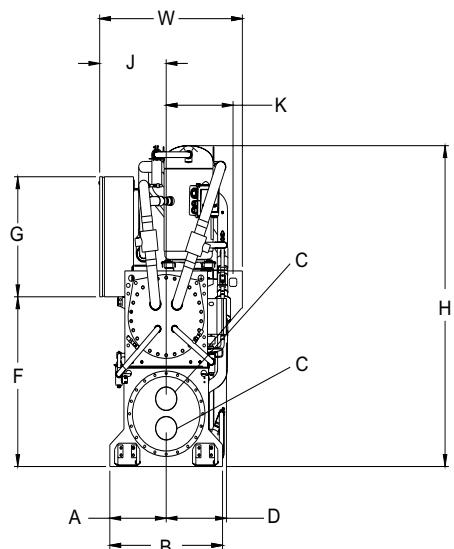
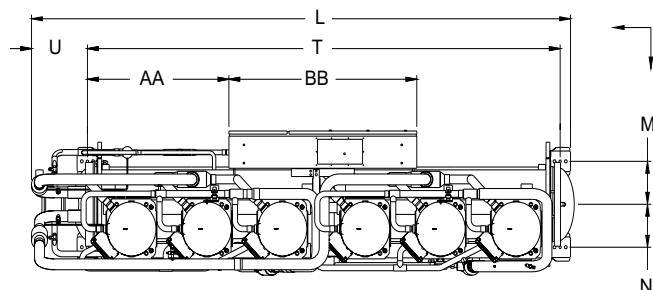
H* - for 200/230 volt units, which require a larger electrical enclosure

H** - for multiple point circuit breaker units, 200/230 volt, which require a larger electrical enclosure

Unit Dimensions - Five & Six Compressor (Cont'd)

NOTES:

1. Recommended service clearances
Rear to wall: 20" (508mm)
Front to wall: 36" (915mm)
Top: 43" (1092mm)
Tube cleaning and removal: 132" (3353mm)
either end
2. Relief valve connection sizes
Low side (suction line): 1/2" flare
High side (condenser): 5/8" NPTI



LD18411

Electrical Notes

1. Minimum Circuit Ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 43024. If the optional Factory Mounted Control Transformer is provided, add the following MCA values to the electrical tables for the system providing power to the transformer: 17, add 2.5 amps; 28, add 2.3 amps; 40, add 1.5 amps, 46, add 1.3 amps; 58, add 1 amps.
2. MCA for units with optional external compressor overloads is calculated at 54/44 evaporator (water), 85/95 condenser (water) condition per UL1995. If unit is to be operated at higher temperatures, increase Service Wiring and Equipment accordingly.
3. For Leaving Condenser Temperatures above 95°F (with maximum limit of 110°F) use the following formula:

$$\text{RMCA} = \text{MCA} * (1 + (\text{DLCT} - 95)/100)$$

DLCT is "Design Leaving Condenser Temperature"
RMCA is "Recommended Minimum Circuit Ampacity"

4. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C. Article 440.
5. Minimum fuse size is based upon 150% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit to avoid nuisance trips at startup due to lock rotor amps. It is not recommended in applications where brown outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 95°F (35°C) is anticipated.
6. Maximum fuse size is based upon 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 440-22.
7. Circuit breakers must be UL listed and CSA certified and maximum size is based on 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit. Otherwise, an HACR type circuit breakers must be used. Maximum HACR circuit breaker rating is based on 225% of the rated The "INCOMING WIRE RANGE" is the minimum and maximum wire size that can be accommodated by the unit wiring lugs. The (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on the National Electrical Code, using copper connectors only. Field wiring must also comply with local codes.
8. An equipment ground lug(s) is provided for the incoming power. Ground line sizing shall be in accordance with the current NEC Table 250-122.
9. The supplied disconnect is a "Disconnecting Means" as defined in the N.E.C. 100, and is intended for isolating the unit for the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.
10. Field Wiring by others which complies to the National Electrical Code & Local Codes.

11. Voltage Utilization Range

LEGEND

| | |
|------------------|--|
| ACR | ACROSS THE LINE START |
| C.B. | CIRCUIT BREAKER |
| D.E. | DUAL ELEMENT FUSE |
| DISC SW | DISCONNECT SWITCH |
| FACT MOUNT CB | FACTORY MOUNTED CIRCUIT BREAKER |
| FLA | FULL LOAD AMPS |
| Hz | HERTZ |
| MAX | MAXIMUM |
| MCA | MINIMUM CIRCUIT AMPACITY |
| MIN | MINIMUM |
| MIN NF | MINIMUM NON FUSED |
| RLA | RATED LOAD AMPS |
| S.P. WIRE | SINGLE POINT WIRING |
| UNIT MTD SERV SW | UNIT MOUNTED SERVICE (NON-FUSED DISCONNECT SWITCH) |
| LRA | LOCKED ROTOR AMPS |
| ECWT | ENTERING CONDENSER WATER TEMPERATURE |

| Rated Voltage | Utilization Range |
|---------------|-------------------|
| 208/60/3 | 187 - 229 |
| 230/60/3 | 200 - 254 |
| 380/60/3 | 342 - 402 |
| 460/60/3 | 414 - 508 |
| 575/60/3 | 520 - 635 |

Ground Wire Sizing

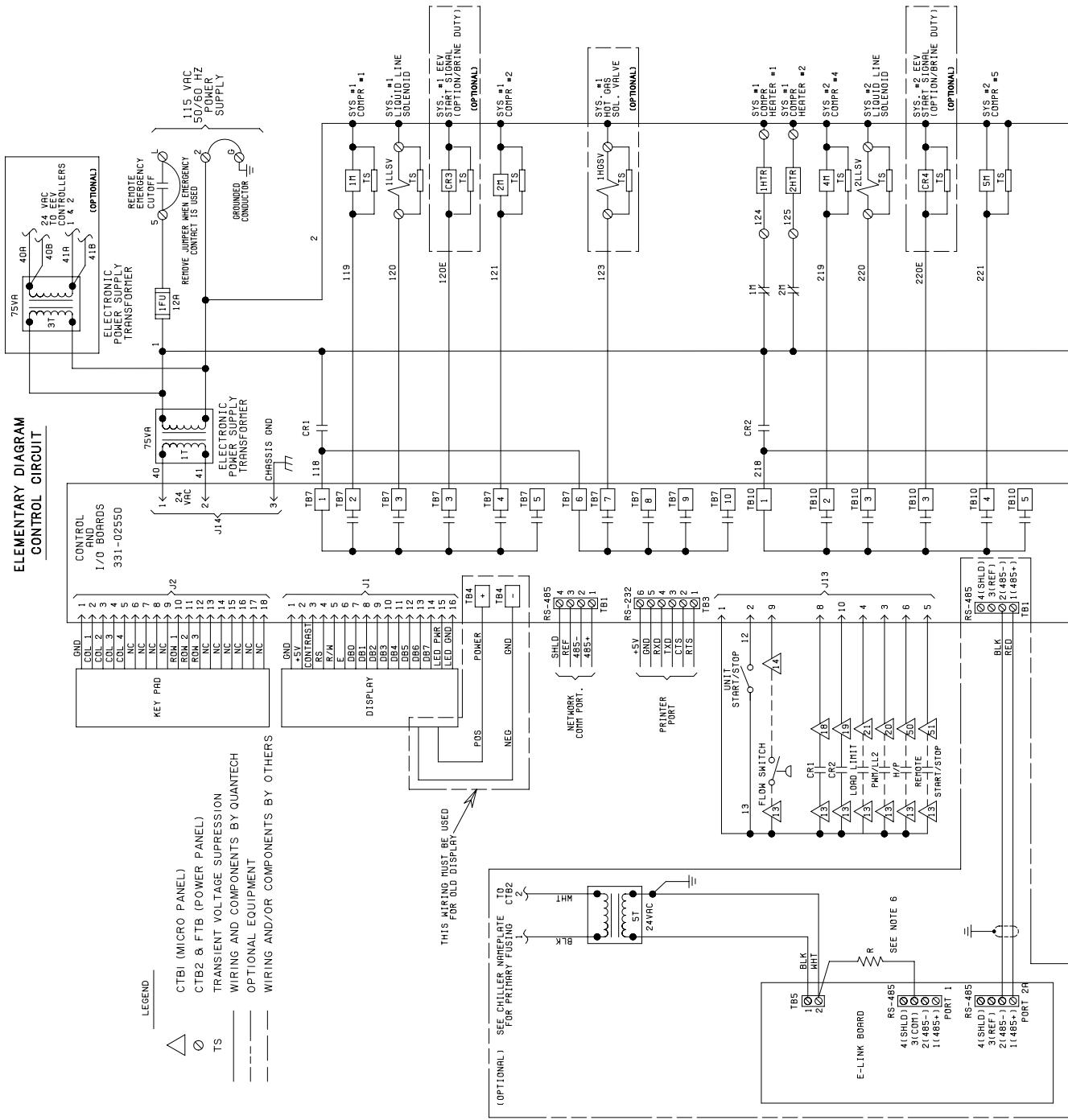
| GROUND LUG SIZING WITH OR WITHOUT OPTIONAL OVERLOADS | | |
|--|---------------------|-------------------|
| NON FUSED DISCONNECT SWITCH OPTION | | |
| RATING | INCOMING WIRE | GROUND WIRE |
| 150A | # 14 - 1/0 AWG | # 8 - 2 AWG |
| 150A | # 2 - 4/0 AWG | # 8 - 2 AWG |
| 150A | # 4 - 300 KCM | # 8 - 2 AWG |
| 225A | # 4 - 300 KCM | # 6 - 1/0 AWG |
| 250A | # 6 - 350 KCM | # 4 - 3/0 AWG |
| 400A | # 250 - 500 KCM | # 2 - 4/0 AWG |
| 400A | (2) # 3/0 - 250 KCM | (2) # 6 - 1/0 AWG |
| 600A | (2) # 250 - 500 KCM | (2) # 2 - 4/0 AWG |
| 800A | (2) # 250 - 500 KCM | (2) # 2 - 4/0 AWG |
| 800A | (3) # 2/0 - 400 KCM | (3) # 4 - 3/0 AWG |
| CIRCUIT BREAKER OPTION | | |
| RATING | INCOMING WIRE | GROUND WIRE |
| 60A | # 14 - 1/0 AWG | # 14 - 6 AWG |
| 70A | # 14 - 1/0 AWG | # 14 - 6 AWG |
| 80A | # 14 - 1/0 AWG | # 14 - 6 AWG |
| 90A | # 14 - 1/0 AWG | # 14 - 6 AWG |
| 100A | # 14 - 1/0 AWG | # 8 - 2 AWG |
| 125A | # 14 - 1/0 AWG | # 8 - 2 AWG |
| 125A | # 2 - 4/0 AWG | # 8 - 2 AWG |
| 150A | # 2 - 4/0 AWG | # 8 - 2 AWG |
| 175A | # 4 - 300 KCM | # 6 - 1/0 AWG |
| 200A | # 4 - 300 KCM | # 6 - 1/0 AWG |
| 225A | # 4 - 300 KCM | # 6 - 1/0 AWG |
| 250A | # 6 - 350 KCM | # 4 - 3/0 AWG |
| 400A | # 250 - 500 KCM | # 2 - 4/0 AWG |
| 400A | (2) # 3/0 - 250 KCM | (2) # 6 - 1/0 AWG |
| 600A | (2) # 250 - 500 KCM | (2) # 2 - 4/0 AWG |
| TERMINAL BLOCK OPTION | | |
| RATING | INCOMING WIRE | GROUND WIRE |
| 130A | # 12 - 1 AWG | # 8 - 2 AWG |
| 165A | # 10 - 3/0 AWG | # 6 - 1/0 AWG |
| 240A | # 10 - 300 KCM | # 4 - 3/0 AWG |
| 320A | # 4 - 500 KCM | # 2 - 4/0 AWG |
| 480A | (2) # 10 - 300 KCM | (2) # 4 - 3/0 AWG |

INSTRUCTIONS:

1. Start in correct power option table (switch, breaker, terminal block)
2. Match engineering guide value for amperage
3. Match engineering guide value for wire range
4. Note corresponding ground wire range

Typical Control Panel Wiring

4 COMPRESSOR UNITS

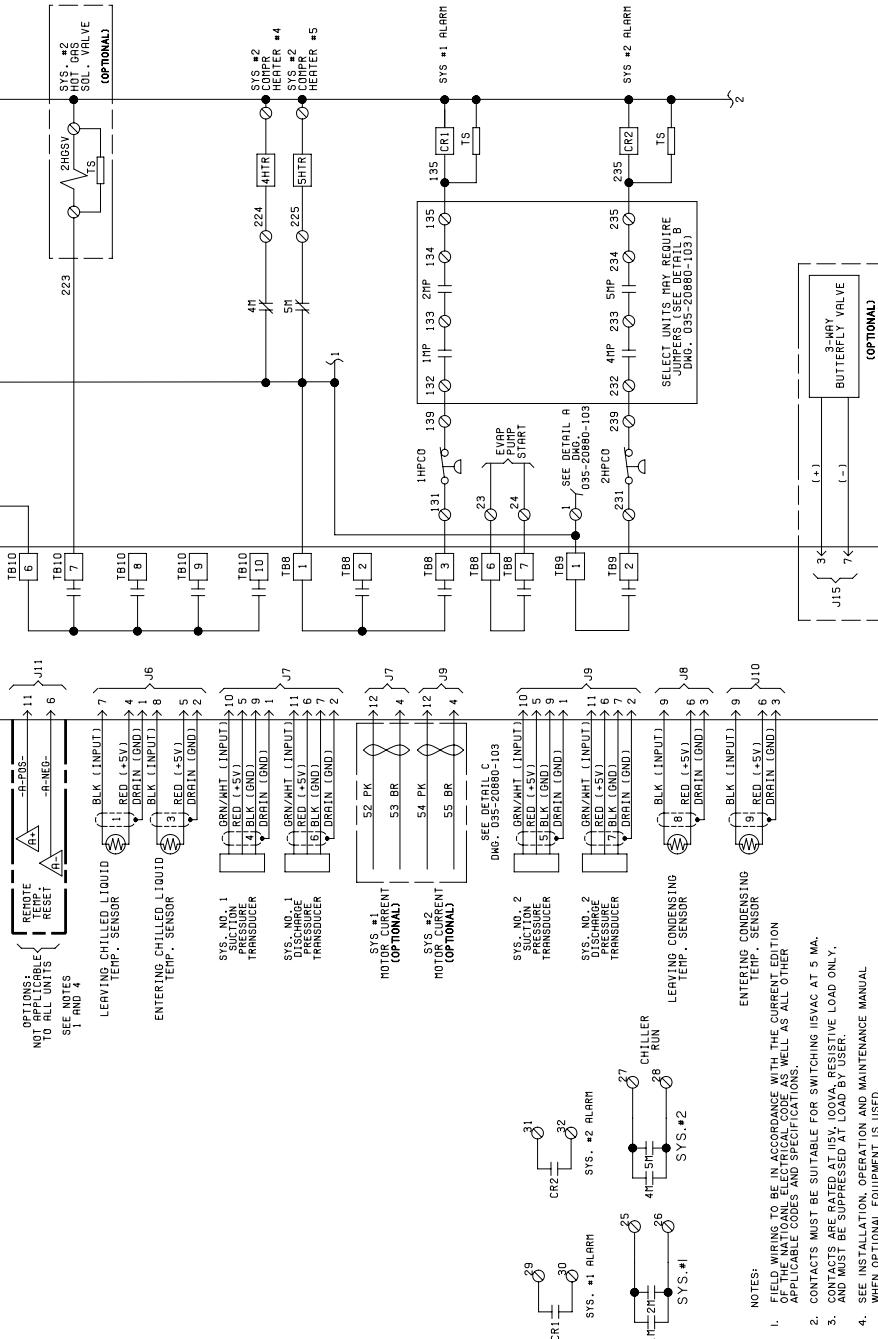


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Typical Control Panel Wiring (Cont'd)

4 COMPRESSOR UNITS

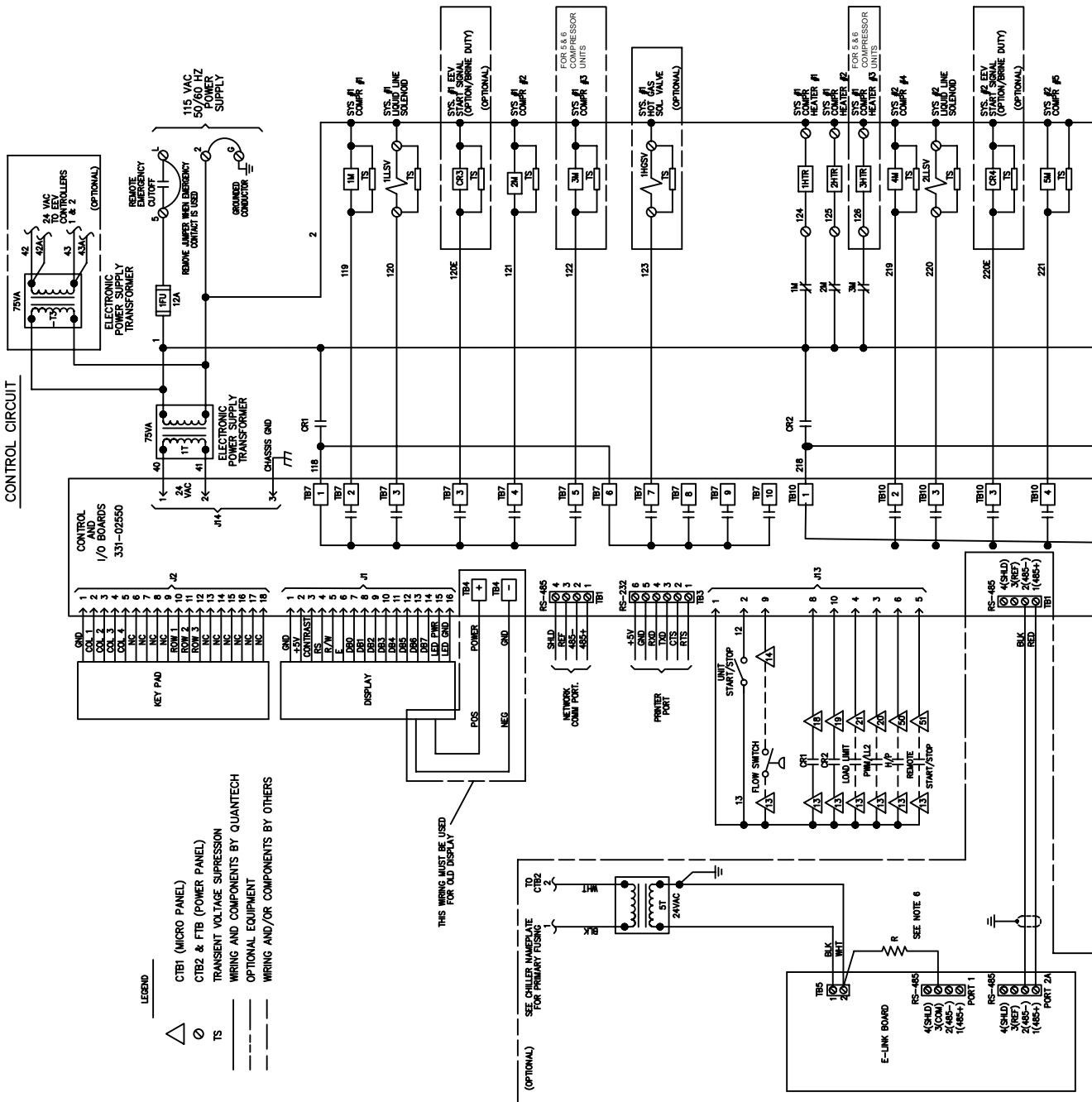
035-21481-101
REV. G



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Typical Control Panel Wiring (Cont'd)

5 & 6 COMPRESSOR UNITS

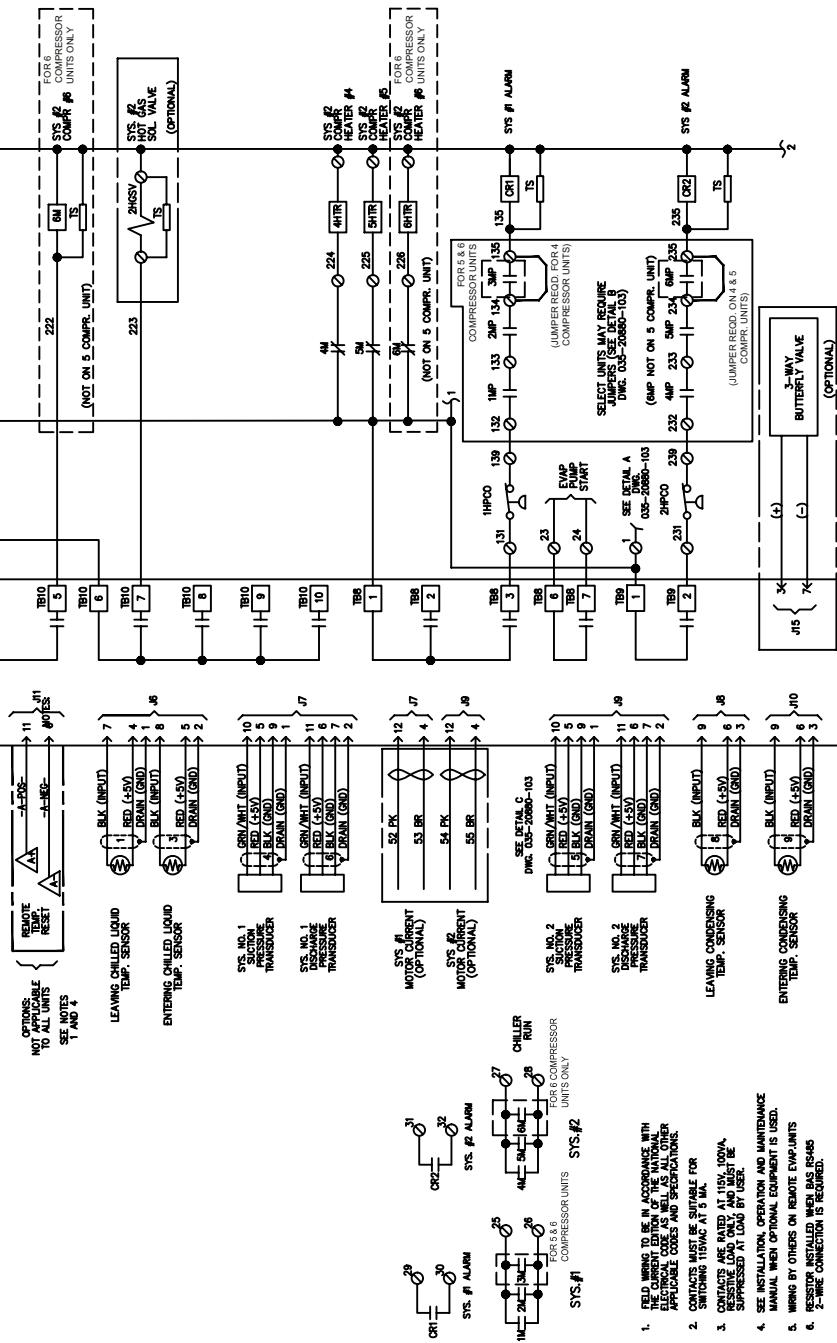
ELEMENTARY DIAGRAM
CONTROL CIRCUIT

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Typical Control Panel Wiring (Cont'd)

5 & 6 COMPRESSOR UNITS

035-21499-101
REV 1



1. FIELD WIRING TO BE IN CONFORMANCE WITH ASME B31.1 AND B31.3 AS WELL AS ALL OTHER APPLICABLE CODES AND SPECIFICATIONS.
2. CONTACTS MUST BE SUITABLE FOR SWITCHING 15VAC AT 5 MA.
3. CONTACTS ARE RATED AT 115V, 10VA, RESISTIVE LOAD ONLY, AND MUST BE SUPPRESSED BY A LOAD CAPACITOR.
4. SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL WHEN OPTIONAL EQUIPMENT IS USED.
5. WIRING BY OTHERS ON REMOTE EQUIPMENTS
6. REGISTERED INSULATED WIRE, RG-5000.
2-WIRE CONNECTION IS REQUIRED.

LD21795b

Customer Wiring Information

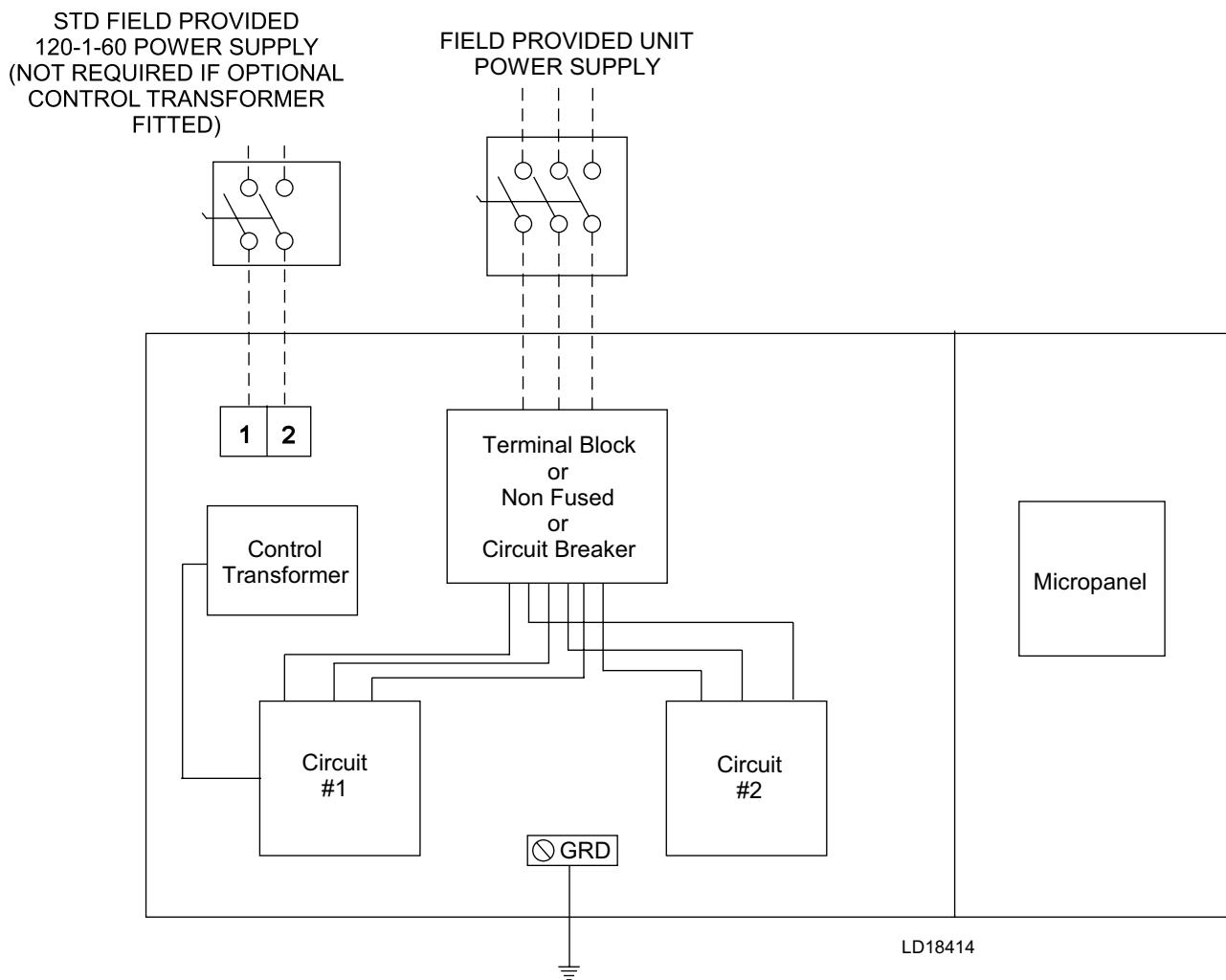


FIGURE 1 - SINGLE POINT POWER SUPPLY CONNECTION – STANDARD UNIT

Customer Wiring Information (Cont'd)

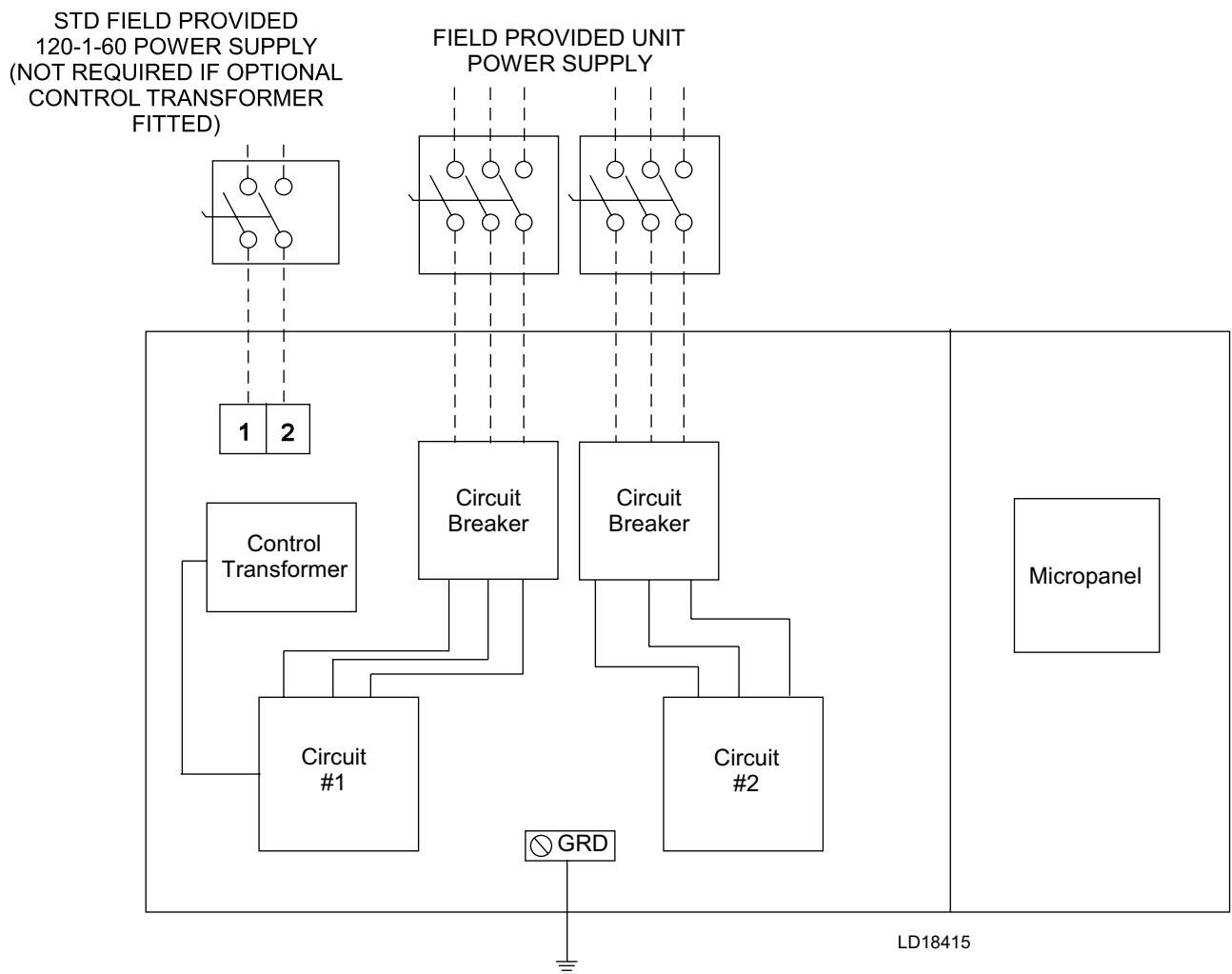


FIGURE 2 - DUAL POINT POWER SUPPLY CONNECTION – OPTIONAL

Guide Specifications

PART 1 – GENERAL

1.01 SCOPE

- A. The requirements of the General Conditions, Supplementary Conditions, Division 1, and Drawings apply to all Work herein.
- B. Provide Microprocessor controlled, multiple-scroll compressor, water-cooled, liquid chillers of the scheduled capacities as shown and indicated on the Drawings, including but not limited to:
 1. Chiller package
 2. Electrical power and control connections
 3. Chilled water connections
 4. Charge of refrigerant and oil
 5. Factory start-up

1.02 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. ANSI/ASHRAE Standard 15 – Safety Code for Mechanical Refrigeration
 2. ASHRAE 90.1 – Energy Efficiency compliance.
 3. ANSI/NFPA Standard 70 – National Electrical Code (N.E.C.)
 4. ASME Boiler & Pressure Vessel Code, Section VIII, Division 1
 5. ASHRAE 34 – Number Designation and Safety Classification of Refrigerants
 6. AHRI Standard 550/590 – Positive Displacement Compressors and Water Cooled Rotary Screw Water-Chilling Packages
 7. Conform to UL code 1995 for construction of chillers and provide ETL/cETL Listing label
 8. Manufactured in facility registered to ISO 9001
 9. OSHA - Occupational Safety and Health Act
- B. Factory Test: Chiller shall be pressure-tested, evacuated and fully charged with refrigerant and oil, and shall be factory operational run tested with water flowing through the vessels.
- C. Chiller manufacturer shall have a factory trained and supported service organization that is within a 50 mile radius of the site.

Guide Specifications (Cont'd)

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

1.03 DELIVERY AND HANDLING

- E. Unit shall be delivered to job site fully assembled, and charged with refrigerant and oil by the Manufacturer.
- F. Unit shall be stored and handled per Manufacturer's instructions.
- G. Unit and its accessories shall be protected from the weather and dirt exposure during shipment.
- H. During shipment, a covering shall be provided over vulnerable components. Nozzles and open ends shall be fitted with plastic enclosures.

PART 2 – PRODUCTS

2.01 CHILLER MATERIALS AND COMPONENTS

- I. General: Install and commission, as shown on the schedules and plans, factory assembled, charged, and tested water-cooled scroll compressor chiller(s) as specified herein. Chiller shall be designed, selected, and constructed using a refrigerant with Flammability rating of "1", as defined by ANSI/ASHRAE STANDARD - 34 Number Designation and Safety Classification of Refrigerants. Chiller shall include, but is not limited to: a complete system with not less than two refrigerant circuits, scroll compressors, direct expansion type evaporator, water-cooled condenser, refrigerant, lubrication system, 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.

2.02 COMPRESSORS

- J. Compressors Shall be hermetic, scroll-type, including:
 - 1. Compliant design for axial and radial sealing
 - 2. Refrigerant flow through the compressor with 100% suction cooled motor.
 - 3. Large suction side free volume and oil sump to provide liquid handling capability.
 - 4. Compressor crankcase heaters to provide extra liquid migration protection.
 - 5. Annular discharge check valve and reverse vent assembly to provide low pressure drop, silent shutdown and reverse rotation protection.
 - 6. Initial Oil charge.
 - 7. Oil Level sightglass.
 - 8. Vibration isolator mounts for compressors.
 - 9. Brazed-type connections for fully hermetic refrigerant circuits.
 - 10. Microprocessor controlled, Factory installed Across-the-Line type compressor motor starters.

Guide Specifications (Cont'd)

2.03 REFRIGERANT CIRCUIT COMPONENTS

Each refrigerant circuit shall include: liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, discharge service valve, system high pressure relief device, sight glass with moisture indicator, expansion valves, and flexible, closed-cell foam insulated suction line.

2.04 HEAT EXCHANGERS

A. Evaporator:

1. Evaporator shall be a direct expansion shell and tube construction, dual circuit heat exchanger capable of refrigerant working pressure of 400 psig (27.6 bar) and liquid side pressure of 150 psig (10.3 bar).
2. Evaporator shall be covered with 3/4" (19mm), flexible, closed-cell insulation, thermal conductivity of 0.26k ([BTU/HR-Ft²-°F]/in.) maximum. Water nozzles shall be insulated by Contractor after pipe installation.
3. Heat exchangers shall be ASME pressure vessel code certified.
4. Installing contractor must include accommodations in the chilled water piping to allow proper drainage and venting of the heat exchanger.
5. The water connections shall be fully accessible and grooved to accept ANSI/AWWA C-606 couplings if used (by others).

B. Condenser:

1. Condenser shall be a cleanable thru-tube construction with removable heads and integral subcooling. Heat exchanger shall be capable of a refrigerant side working pressure of 560 psig (38.6 bar) and liquid side pressure of 150 psig (10.3 bar).
2. The condenser shall be equipped with relief valves and be capable of holding the full refrigerant charge for pumpdown.
3. The water connections shall be fully accessible and grooved to accept ANSI/AWWA C-606 couplings if used (by others).

2.05 CONTROLS

A. General: Automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transients.

B. Microprocessor Enclosure: NEMA 1 (IP32) powder painted steel cabinet with hinged, latched, and gasket sealed door.

C. Microprocessor Control Center:

1. Automatic control of compressor start/stop, anti coincidence and anti-recycle timers, automatic pumpdown on shutdown, evaporator pump, and unit alarm contacts. Automatic reset to normal chiller operation after power failure.
2. Remote water temperature reset via a Pulse Width Modulated (PWM) input signal or up to two steps of demand (load) limiting.
3. Software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed regulated time clock (RTC) memory for minimum 5 years.

Guide Specifications (Cont'd)

4. Forty character liquid crystal display, numeric data in English (or Metric) units. Sealed keypad with sections for Setpoints, Display/Print, Entry, Unit Options & clock, and On/Off Switch. Display descriptions and membrane keypad graphics shown in English language.
5. Programmable Setpoints (within Manufacturer limits): display language; chilled liquid temperature setpoint and range, remote reset temperature range, set daily schedule/holiday for start/ stop, manual override for servicing, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).
6. Display Data: Return and leaving evaporator liquid temperatures, low leaving liquid temperature cutout setting, English or metric data, suction pressure cutout setting, each system suction pressure, discharge pressure, liquid temperature reset via a 0 to 20 VDC input, 2 to 10 VDC input or a 0 to 20 mA input contact closure, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/ stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves (if supplied), run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.
7. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. Includes: high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.
8. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation. Contractor shall provide flow switch installation and wiring per chiller manufacturer requirements.
9. Alarm Contacts: Low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.
10. BAS/EMS Temperature Reset: Chiller to accept 4 to 20mA, 0 to 10 VDC, or discrete contact closure input to reset the leaving chilled liquid temperature.

D. Pressure Transducers and Readout Capability

1. Discharge Pressure Transducers: Permits unit to sense and display discharge pressure.
2. Suction Pressure Transducers: Permits unit to sense and display suction pressure.

E. 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.

Guide Specifications (Cont'd)

2.06 POWER CONNECTION AND DISTRIBUTION

A. Power Panels:

1. NEMA 1 (IP32), powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection(s), control power connections, compressor start contactors, current overloads, and factory wiring.
2. Power supply shall enter unit at a single location, be 3 phase of scheduled voltage, and connect to individual terminal blocks per compressor. Separate disconnecting means and/or external branch circuit protection (by Contractor) required per applicable local or national codes.

B. Exposed compressor and control power wiring shall be routed through liquid tight conduit.

C. Power Supply Connection shall be:

1. Single Point Power Supply: Single point Terminal Block for field connection and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring, which must comply with the National Electric Code and/or local codes.

2.07 ACCESSORIES AND OPTIONS

Some accessories and options supersede standard product features. Your Quantech Sales Representative will be pleased to provide assistance.

A. Power Supply Connections (Factory Mounted):

1. Single Point Disconnect Switch: Single point Non-Fused Disconnect and lockable external handle (in compliance with Article 440-14 of N.E.C.) can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied, by others, in the incoming power wiring, which must comply with the National Electric Code and/or local codes.
2. Single Point Circuit Breaker: Single point Terminal Block with Circuit Breaker and lockable external handle (in compliance with Article 440 14 of N.E.C.) can be supplied to isolate power voltage for servicing. Incoming power wiring must comply with the National Electric Code and/or local codes.
3. Multiple Point Circuit Breaker: Multiple point circuit breakers with lockable external handles (in compliance with Article 440-14 of N.E.C.) can be supplied to isolate power for servicing. Incoming power wiring must comply with the National Electric Code and/or local codes.

B. Control Power Transformer (Factory Mounted): Converts unit power voltage to 120-1-60 (500 VA capacity). Factory mounting includes primary and secondary wiring between the transformer and the control panel.

C. Flow Switch (Field-mounted): Vapor proof SPDT, NEMA 3R switch (150 PSIG), -20°F to 250°F. Available with evaporator.

D. Differential Pressure Switch (Field mounted): Alternative to the paddle-type flow switch. 3-45 PSIG (0.2-3 bar) range with 1/4" NPTE pressure connections. Available with evaporator.

Guide Specifications (Cont'd)

- E. Double Thick Evaporator Insulation (Factory Mounted): Evaporator covered with double thick (1-1/2") flexible, closed-cell insulation in lieu of
- F. Standard (3/4") insulation. Water nozzles shall be insulated by Contractor after pipe installation.
- G. ANSI/AWWA C-606 Flange Kit (Field Mounted): ANSI/AWWA C-606 flange adapters included with the water connections on the evaporator and condenser providing raised face flanges for field piping connection (NOTE: the 050TSE, 060TSE, 060THE, 070TSE, and 090TSE units do not include condenser flanges).
- H. Service Isolation valves (Factory Mounted): Service suction (ball type) isolation valves are added to unit per circuit in addition to the standard discharge service valve. (Factory-mounted.)
- I. Hot Gas By-Pass (Factory Mounted): Permits continuous, stable operation at capacities below the minimum step of unloading to as low as 5% capacity (depending on both the unit & operating conditions) by introducing an artificial load on the evaporator. Hot gas by-pass is installed on only one refrigerant circuit (System #2).
- J. Microprocessor Membrane Keypad Graphics on in lieu of Standard English:
 - 1. Spanish language.
 - 2. French language.
- K. Chicago Code Relief Valves (Factory Mounted): Relief valves provided to meet Chicago Code requirements.
- L. Sound Reduction (Factory-mounted):
 - 1. Each compressors is individually enclosed in anacoustic sound blankets.
- M. Vibration Isolation (Field-mounted):
 - 1. Elastomeric Pad Isolators.
 - 2. 1 Inch Deflection Spring Isolators: Level adjustable, spring and cage type isolators for mounting under the unit base.
 - 3. 2 Inch Deflection Isolators: Level adjustable, restrained isolators, 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 inches.
- N. Final Paint Overspray: Overspray painting of assembled unit with Caribbean Blue enamel.

Guide Specifications (Cont'd)

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Rig and Install in full accordance with Manufacturers 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. If equipment provided exceeds height of scheduled chiller, installing contractor is responsible for additional costs associated with extending the height of parapet or screening walls/enclosures
- 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.

NOTES

Printed on recycled paper
Form QWC3-EG1 (1120) Supersedes: QWC3-EG1 (217)
© 2020 P.O. Box 423, Milwaukee, WI 53201 Printed in USA
Issued on 11/20/2020

