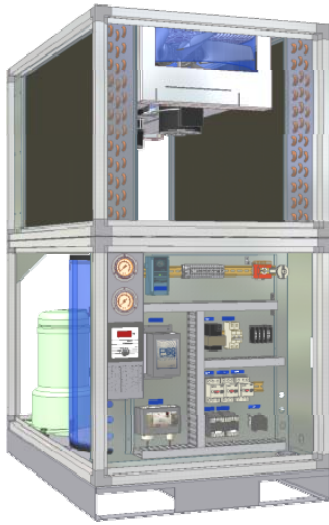


# GENERAL SPECIFICATION

## CF Series

*Portable Packaged Liquid Chillers*





- ❧ 1/2 ton to 40 ton standard portable designs
- ❧ Range from 20° F to 70° F coolant temp
- ❧ Large pressurized stainless steel reservoir tank
- ❧ System pump with integrated bypass circuit
- ❧ Standard operating and safety controls
- ❧ Packaged air, water, or remote air cooled
- ❧ Breakers and motor protectors– (No Fuses)
- ❧ Removable panels for easy service access
- ❧ Extreme duty stainless steel fan shroud
- ❧ Modulating condenser fan and composite prop
- ❧ Ventilated control cabinet with hinged access
- ❧ Indoor/ outdoor operation

*The CF series is designed to provide portable process chilled water where you need it. The compact cabinet dimensions allow you to move the unit through standard door openings and set the chiller close to the process. This fully packaged system includes a robust and high efficiency refrigeration circuit which includes industrial style scroll compressors. The integrated tank, pump, and controls make set up and operation of the chiller easy and reliable.*

**Standard Features**

- |  |  |
|--|--|
| ❧ Industrial scroll compressor with accumulator      | ❧ Electro-mechanical simple controls       |
| ❧ Filter drier, sight glass, TXV, and evaporator     | ❧ Modulating condenser fan/ composite prop |
| ❧ Insulated pressurized stainless steel storage tank | ❧ Full refrigerant charge                  |
| ❧ Tank sight glass, relief valve, air vent, and fill | ❧ Super corrosion resistant design         |
| ❧ System pump with integrated bypass circuit         | ❧ Laser engraved placards and diagrams     |

**Available Options**

- |   |  |
|---|--|
| ❧ System pump pressure bypass valve           | ❧ Semi-hermetic reciprocating compressor |
| ❧ Bypass pump                                 | ❧ Locking casters                        |
| ❧ Variable speed system pump                  | ❧ Voltage/ phase protector               |
| ❧ Remote air-cooled condenser                 | ❧ Door mounted disconnect switch         |
| ❧ Water cooled condenser with mod. valve      | ❧ Remote operating/monitoring panel      |
| ❧ Tank level alarm/switch                     | ❧ 6-point digital temperature display    |
| ❧ Auto-tank fill with pressure reducing valve | ❧ Oil filled refrigerant pressure gauges |
| ❧ Flow switch                                 | ❧ R-134a, R407c, R-410a, R-507a          |

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**Model Number Nomenclature**

**C A - 1 0 - A - 2 L B 3 *Model Number***  
**1 2 - 3 4 - 5 - 6 7 8 9 *Number Sequence Below***

**Digit 1, 2- Designates Chiller Type**

- CA - Air Conditioning Packaged Chiller Series
- CE - Industrial Packaged Chiller Series with Stainless Steel Tank & System Pump
- CF - Portable Packaged Chiller Series with Stainless Steel Tank & System Pump
- CM - Modular Chiller Series with optional tanks condensers and pumps

**Digit 3, 4- Denotes Chiller Capacity (Nominal Tons)**

- |             |             |
|-------------|-------------|
| 02- 2 Tons  | 15- 15 Tons |
| 03- 3 Tons  | 18- 18 Tons |
| 04- 4 Tons  | 20- 20 Tons |
| 05- 5 Tons  | 25- 25 Tons |
| 06- 6 Tons  | 30- 30 Tons |
| 07- 7 Tons  | 35- 35 Tons |
| 10- 10 Tons | 40- 40 Tons |
| 12- 12 Tons |             |

**Digit 5- Designates Condenser Type**

- A - Air Cooled with Variable Speed Head Pressure Control
- R - Remote Air Cooled with Variable Speed Head Pressure Control
- W - Water Cooled with Modulating Water Valve Head Pressure Control

**Digit 6- Designates Number of Compressors**

- 1 - Single Compressor
- 2 - Dual Compressors
- 3- Three Compressors
- 4- Four Compressors

**Digit 7- Designates Style of Compressors**

- |                               |                             |
|-------------------------------|-----------------------------|
| C- Compound Reciprocating     | Z- Scroll                   |
| R- Single Stage Reciprocating | S- Screw                    |
| H- Hermetic Inertia           | D- Digital Two Stage Scroll |

**Digit 8- Designates Bypass Type**

- P - Pressure Bypass Automatic Integrated Water Valve
- B - Bypass Pump
- U - Bypass Ball Valve

**Digit 9- Designates Voltage/ Hertz/ Phase**

- |                  |              |
|------------------|--------------|
| 0 - 208-230/60/1 | 5 - 380/60/3 |
| 1 - 200/60/3     | 6 - 220/50/3 |
| 2 - 208-230/60/3 | 7 - 575/60/3 |
| 3 - 460/60/3     | 8 - 230/50/1 |

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### General Description

The CF series chiller is a portable packaged chiller designed to provide a “move in place” solution to a process cooling requirement. The CF series comes equipped with a robust refrigerant circuit designed to operate from 20° F LCT to 70° F LCT (options for hot water return are available). The CF series comes standard with a large pressurized storage tank, a process system pump, operating and safety controls.

### Refrigerant Circuit

The standard R-22 refrigerant circuit components are a compressor, evaporator, condenser, thermostatic expansion valve, sight glass, liquid line filter drier, and service valves. The optimized refrigerant circuit provides a more stable and efficient refrigerant system than systems with large volume receivers and other devices. Refrigerant circuit sizing under the scroll compressor refrigerant charge limit (RCL) prevents refrigerant migration/ oil dilution issues. Options for refrigerants R-407c, R410a, R134a, and R-507a are available.

### Operating Controls

The standard operating controls provide simple control and operation of the chiller system mounted inside the main electrical enclosure. Operating controls include an electronic temperature controller capable of +/-1° F operation, staging modules (when more than one stage is available), auto-ramping condenser fan system that provides inherent low-ambient control, and a six point digital temperature display to provide operating and service information. Options for remote operating and monitoring controls are available.

### Safety Controls

The safety controls provide a method of simple and safe management of the chiller. Safety controls include a manual reset high/low pressure control and motor overload/ thermal protection. An integral starter on the chiller pump will interrupt compressor operation in case of pump failure. All branch circuits for the chiller are protected by circuit breakers or motor protectors, eliminating the use of replaceable fuses. Optional safety controls include a voltage phase monitor, flow switch, fused disconnect, low tank-level alarm, high temperature alarm, and many other custom options.

### Scroll Compressor

The industrial scroll compressor is a nominal 3500 rpm on 60 Hz and 2900 rpm on 50 Hz hermetic compressor with a solidly mounted compressor assembly. The compressor is unidirectional and will only pump refrigerant when the compressor motor is wired in the proper electrical phase sequence. In single compressor units over 10 tons the compressor has as standard features an oil sight glass and an oil charging valve. Each compressor comes equipped with standard sump heater, vibration mounting assembly, and integrated motor thermal and over-load protection devices.

### Dual Scroll Compressor

Units from 8 tons nominal are offered with dual compressor independent refrigerant/ control circuits. Units over 15 tons nominal are standard with dual compressor independent refrigeration/ control circuits. Dual independent refrigerant circuits allow the chiller to operate each compressor independently for redundancy and automatic staging.

### **Semi-hermetic Reciprocating Compressor (Optional)**

The industrial reciprocating compressor is a nominal 1725 rpm on 60 Hz and 1450 rpm on 50 Hz semi-hermetic compressor with a solidly mounted compressor and suction gas cooled motor. Each compressor includes an oil sight glass, oil pump (over 5 HP), crankcase heater, INT69 compressor protection module, and suction/discharge king valves. A single compressor will be used from 2 tons up to 40 tons with unloading capabilities in 10 ton to 40 ton models. Each compressor with an oil pump is equipped with a standard manual reset oil differential safety control which will interrupt compressor operation if the oil pressure does not meet set-point for over two minutes.

### **Evaporator**

The fluid cooler (evaporator) is an AISI 316 stainless steel brazed plate heat exchanger consisting of a series of channel plates, a front cover and a back cover plate, as well as a seal plate and connections. The channel plates are made of AISI 316 stainless steel stamped with a herringbone pattern. The channel plates are arranged so that the herringbone pattern of adjacent plates points in opposite directions. This creates a criss-cross pattern of support points where the ridges of each plate meet. The plates are brazed together with 99.9% pure copper, thereby sealing the contact points and forming continuous media flow channels. Brazing around the outer edge of the plates and connections creates a completely sealed unit. The thin plate material, corrugated plate pattern and fluid turbulence all contribute to high heat transfer coefficients.

### **Air Cooled Condenser (-A Standard)**

The air-cooled condenser coil consists of seamless internally rifled copper tubes expanded into enhanced aluminum fins. Condenser coil fin spacing is limited to 12 fins per inch to prevent premature clogging and restriction. Each coil is designed with refrigerant flow counter to the airflow. Tube sheets are heavy gauge galvanized steel or aluminum with tapered tube collars. Each coil is designed to provide 15 to 20 degrees of refrigerant sub-cooling which eliminates liquid flashing and increases total unit capacity and efficiency.

The condenser fan motors and props are designed for high temperature low noise operation. The entire top fan shroud is constructed of heavy gauge welded 304 stainless steel with a formed venturi that holds a close tolerance to the fan blade. The fan blade is a PAGI composite material formed to provide a sickle style prop for high efficiency operation and low noise. The hub is constructed of heavy-duty cast aluminum which makes the entire prop assembly corrosion free. Each fan motor is rated for: TEAO, 60° C ambient, vertical shaft, direct drive, rain shield, permanently lubricated ball bearings, and VFD operation. Each fan motor is isolated by means of a UL 508 rated motor protector.

Each air cooled condenser section is isolated from the mechanical section. The bottom pan is 304 stainless steel sealed with fasteners and caulked with butyl sealant to prevent water from entering the mechanical or electrical sections. Each condenser section is complete with a drain piped through the base frame, and a 2 inch vent to provide component cooling for the mechanical and electrical sections.

### **Remote Air Cooled Condenser (-R Option)**

The remote air cooled condenser simply removes the condenser from the top of the unit and mounts it to a heavy duty two part epoxy coated base frame with several rigging connections. A Nema 3r rated enclosure is provide with integral motor protectors which connect to the condenser fan motor(s). Wiring terminations are provided in the compressor unit electrical box to control the remote condenser in a similar fashion to the packaged system. The remote condenser system will be fully pressure tested to 500 psig. The unit ships with refrigerant ball valves and a 10 PSIG nitrogen charge. Optional explosion proof designs available.

### **Water Cooled Condenser (-W Option)**

The water cooled condenser simply removes the air cooled condenser and adds an appropriately sized coaxial tube in tube heat exchanger. These condensers consist of a continuous length of longitudinally finned (solder-bonded) inner tube with an outer tube serving as a shell. The longitudinally crimped fin is spirally wrapped about – and metallically bonded to – the inner tube. The pitch of the spiral is such that a gap exists between each successive spiral. The gap is important both for the bending and forming of the heat exchanger coil and for insuring proper drainage of the fluid to the bottom of the annular space. The interior of the inner tube is smooth thereby preventing scaling prevalent with shell in tube applications. Optional condensers may be requested with cupro-nickel or titanium.

Water cooled units also come standard with a direct acting modulating water valve which controls condenser water flow based on compressor discharge pressure.

### **Insulated Storage Tank**

The welded fluid storage tank consisting of a 14 gauge type 304 stainless steel shell with 7 gauge 304 stainless steel heads. The non-coded tank is complete with a pressure relief valve, tank level sight glass, drain/fill valve, and air vent. A location for the optional addition of auto-tank fill or low tank level alarm is also provided. The tank includes stainless steel welded nozzles for supply and return. The tanks utilize a series of stainless steel structural stay pipes which serve to reinforce the top and bottom of the tank. The evaporator is immersed in the tank and piped to the exterior of the tank utilizing welded sleeves and bronze brazing techniques. The evaporator is welded to the tank center stay pipe. The entire assembly is factory pressure tested (refrigeration 500 psig, tank at 45 psig) prior to final assembly. The tank is fully insulated with ¾ inch closed cell elastomeric insulation.

### **System Pump**

The system pump is a vertical, in-line, centrifugal pump sized to deliver the flow and head required for the entire system. The pump head and base are cast iron, while the impellers, rated to operate at 3450 RPM, and intermediate chambers are made of stainless steel. The base of the pump is insulated with ¾ inch closed cell elastomeric insulation. A ball valve is included between the pump and the tank to isolate the pump in case of service. Each pump is normally operated with a contactor/ motor starter to meet UL 508. A nominally sized pump is listed with the specification. Optional pumps with greater flow, pressure, and stainless steel housings are available upon request.

### **Bypass Valve (-U Standard)**

The bypass ball valve is sized and installed to allow some of the fluid flow to bypass the process and return back to the evaporator in low or no flow applications. This manually set valve is designed as the standard bypass system for the CF Series chillers. This valve is installed between the discharge line of the system pump and the return line from the process internal to the mechanical section.

### **Bypass Pump (-B Option)**

The bypass pump is installed for applications where system pump operation is desired to be independent of chiller operation. The bypass pump is an inline wet-rotor circulator in units up to 10 tons. In units over 10 tons a vertical, in-line, centrifugal pump similar in construction to the system pump is used. The bypass pump allows the chiller to maintain the chiller storage tank temperature at all times. The system pump then can be remotely operated or “dead-headed” when the process is not called upon. The bypass pump also allows for use of a variable pressure and flow system pump in applications where this is desirable.

### **Bypass Pressure Controlled Modulating Valve (-P Option)**

The pressure controlled modulating water valve utilizes a 4-20 ma pressure transducer connected to a proportioning pressure controller which senses the return fluid pressure to the chiller. As the return fluid pressure reduces past set-point the proportional pressure controller opens a 0-10V motorized valve to allow fluid to short circuit around the process. This allows the process to be operated without regard to chiller fluid flow.

### **Piping**

The entire fluid system is piped using non-ferrous materials like copper and stainless steel. All refrigerant lines shall be Type L- AC&R copper, nitrogen sealed. When connected by brazing, all lines are purged with 1 to 3 CFM of dry nitrogen to prevent the formation of copper oxides and 5% to 15% silver-alloy is used. When threaded joints are made, Loctite brand 592 PST sealant is used. Other sealants are available upon request. All fluid side piping is pressure tested to 300 psig, refrigerant side piping is tested to 500 psig.

### **Insulation**

All components subject to operation below dew-point shall be insulated with ¾ inch closed cell elastomeric insulation. The expanded closed-cell structure of the pipe insulation makes it an efficient heat and vapor barrier. It is manufactured without the use of CFC's, HFC's or HCFC's. It is also formaldehyde free, low VOCs, fiber free, dust free and resists mold and mildew. The insulation has a flame-spread index of less than 25 and a smoke-developed index of less than 50 as tested by ASTM E 84-03 and CAN/ULC S-102. Insulation shall be further vapor sealed using a silicone or butyl based sealant.

### **Electrical**

The electrical components are mounted in a weatherproof and gasket sealed electrical enclosure. The enclosure contains all motor protectors, contactors, transformers, controls, and relays. All components and wiring are U.L. listed and meet or exceed NEC standards. Each motor is branch circuit protected and isolated from the others in the group. The chiller is complete with single point wiring to the main tie in block with access through a hole provided on the right side of the chiller, control circuit power is provided by a transformer.

All components are easily accessible and identified through a hinged access door on the front of the chiller. Laser engraved placards identify each of the components and are coordinated with the electrical and process diagrams which are also laser engraved and permanently mounted to the interior of the unit.

### **Access Panels**

Each access panel is constructed of high grade 18 gauge galvanized steel. Each panel is manufactured with a 1 inch u-bend on each edge which provides added strength along with a 1 inch surface for the panel to set against the gasket sealed opening. Each access panel is attached to the extruded aluminum structure profile using special reinforced panel clips mounted to the aluminum with stainless steel fine pitch 5/16 inch hex head screws. The panel clips are internally threaded providing a strip/gall resistant attachment method. Two primary double wall panels are provided with hinges and handles for easy access to the electrical compartment and rear compressor compartment respectively. Optional 304 stainless steel panels are available.

### **Base Frame**

The primary base frame for the CF series shall be heavy gauge 304 stainless steel folded to form the primary structure with welded supports in units up to 10 tons. In units over 10 tons, 5 inch heavy duty carbon steel "C" channels shall be placed on end and welded together along with several intermediate supports. The 3/16 inch carbon steel plate is then welded to the top of this 5 inch "C" channel structure to provide the rugged base for the unit. All parts of the base frame that are not stainless steel shall be two part epoxy coated for additional corrosion resistance.

### **Assembly and Testing Standards**

Each sub-assembly is subjected to a rigorous assembly test to ensure product reliability. These standards are a combination of internationally recognized standards adapted to the assembly of the CF Series. Assembly and testing standards documentation is available on request, and can be found as part of the general specifications manual. Each CF Series unit is fully run tested at the facility prior to shipment.