



TSW180 Water-Cooled Chiller

### General

The TC Series central chillers are designed for indoor use in industrial manufacturing locations. The chillers are produced in our ISO 9001:2008 certified facility. Water-cooled units ship with a full refrigerant charge. Units with a remote air-cooled condenser ship with a nitrogen charge. All units are built on a rugged industrial duty frame and are finished with air-dry enamel paint.

### Energy Efficiency

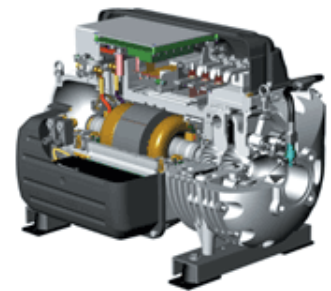
The core of our design revolves around the revolutionary Danfoss Turbocor family of compressors, the world's first totally oil-free variable-speed centrifugal compressors. The convergence of aerospace and industrially proven magnetic bearings, direct-drive variable-speed centrifugal compression, and sophisticated digital electronic control technologies enable our chillers to deliver outstanding operating efficiencies, especially in part-load situations – **up to 50% energy savings when compared to a conventional rotary-screw compressor chiller.**

### Easy Installation

- Compact size designed to minimize the amount of valuable production floor space required while providing easy access to the unit controls and components
- Starters, control transformer, and flow switch all mounted and wired to the control panel at the factory thereby reducing installation labor, time, and material costs
- Modular design allows the control systems of multiple chillers to be linked together to allow for easy system expansion while maintain one master system control set point

### Variable-Speed R-134A Centrifugal Compressor

- Integral variable-speed drive motor control allows the compressor to continuously make adjustments to the compressor speed to operate at peak energy efficiency throughout varying loads while maintaining tight temperature control
- Soft-start limits initial inrush current to 2 amps and reduces peak energy demand and extends the life of the drive motor windings
- Magnetic 'friction-free' bearings eliminate the inefficiencies caused by the frictional heat of mechanical bearings and eliminate the need for oil in the refrigerant
- Oil-free operation eliminates the inefficiencies caused by having an oil charge in the refrigerant and eliminates the need for an oil management system
- Low operating noise of 71 dBA per compressor with virtually no structural vibration provides a much more desirable level of noise than conventional compressor technologies
- Integrated computer control provides 79 points of diagnostic information for extensive operational monitoring and control



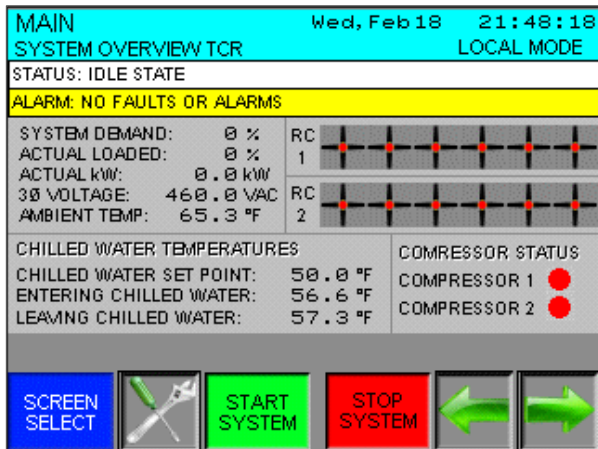
## Stainless Steel Brazed Plate Evaporator

- Stainless steel brazed plate evaporators provide a level of corrosion protection not available in conventional steel shell and copper tube evaporators.
- Our compact brazed plate heat exchangers greatly reduce the overall refrigerant charge of our system compared to a typical shell and tube evaporator design.
- The reduced size of the evaporator allows the overall weight and size of the unit to be kept to a minimum.
- Due to the increased velocities of the passages inside the evaporator, our brazed plate evaporators can tolerate higher flows than typical shell and tube evaporators.

## Control Panel

- Rotary circuit breaker, one for each compressor, provides compressor protection and isolation for easy maintenance of a compressor without the need to shut down the entire chiller system.
- 24 VDC control circuit.
- C-UL 508A panel construction.
- Control panel cooled with a ventilation fan to extend component life and provide consistent and reliable operation.

## Powerful PLC Control System



- The PLC monitors, controls, and maintains stable and reliable operation of the chiller through use of an extensive array of sensors, actuators, relays, switches, and control algorithms.
- Use of multiple Proportional Integral Derivative (PID) temperature control loops ensures consistent reliability, stability, and efficient operation by instantly registering and reacting to fluctuations in system loads.
- Predictive control loop designed to keep the system operational under low load or batch loading conditions typical of industrial chilling systems. This control logic monitors changes in the process load and attempts to keep the system from shutting off compressors by unloading the compressors as needed to prevent high/low refrigerant pressure or high motor current conditions that would shutdown typical chillers with

simple pressure and current switches. This ensures the system maximizes the ability of the compressors to provide full capacity the moment it is required without having to run through a compressor anti-recycle timer and without causing an alarm condition other chillers would have under similar conditions.

- Durable 6 inch TFT color touch-screen Human Machine Interface (HMI) provides an extensive amount of system diagnostic and operational information as well as a comprehensive list of safeties, alarms, and faults. Faults are time and date-stamped and are viewable at any time with a simple touch of the display.
- Clear language text display for quick and easy viewing of chiller operation.

## Control Panel Display

- Active fault popup screen including history and frequency of faults
- Actual kW usage
- Ambient temperature display (remote air-cooled condenser chillers only)
- Analog output control mode, output percent, output set point, output starting position delay, output starting position percent, PID derivative gain, PID forward or reverse action, PID integral gain, PID proportional gain
- Compressor actual kW, backplane temperature, BMCC PCB temperature, cavity temperature, demand percentage, estimated choke speed, estimated surge speed, inlet guide vane opening in percent, liquid refrigerant temperature, motor actual RPM, motor cooling number of solenoids energized, motor demand power, motor desired RPM, motor earth leakage current, motor inverter temperature, pressure ratio, refrigerant discharge pressure, refrigerant discharge temperature, refrigerant suction pressure, refrigerant suction temperature, refrigerant superheat temperature, saturated discharge temperature, saturated suction temperature, SCR temperature, service hours, soft-start 3Ø current, soft-start 3Ø voltage, soft-start DC Bus voltage, stepper PCB temperature, units (Imperial/Metric)
- Condenser Water inlet temperature (water-cooled condenser chillers only)
- Electronic Expansion Valve auto/manual selection, control loop speed, control mode, control set point °R or °K, position percent open, process value °R or °K, startup position delay, startup position percent opening
- Evaporator water inlet temperature
- Evaporator water outlet temperature
- Process water set point temperature
- Status banner of startup and shutdown sequences
- System demand percentage
- System loading percentage
- Warning banner of compressor variables nearing fault conditions

**Control Functions**

- Active fault, history, and frequency of faults time and date stamped
- Adjustable analog control settings
- Adjustable compressor staging
- Adjustable expansion valve settings
- Adjustable low water temperature system stop set point
- Adjustable PID demand control
- Adjustable remote condenser fan staging
- Compressor anti-recycle timer
- Compressor enable/disable
- Condenser Water Regulating Valve control capability
- Internal calendar and clock
- Password protection of adjustable parameters (two levels – user settable, and factory settable)
- Process water low temperature fault
- Remote alarm contact
- Remote Condenser variable speed fan control capability
- Remote start/stop
- Selectable control mode (leaving/entering water)

**Fault Monitoring**

- Compressor 3Ø over-current, compression ratio out of operating range, high discharge pressure, high discharge temperature, inverter high temperature, leaving water low temperature, locked out, low suction pressure, motor bearing, motor winding high temperature, SCR high temperature, shaft cavity high temperature, superheat out of range, system lockout state, communication failure

**Warranty**

- 12 months parts and labor

**Water Cooled Chiller General Data (60 Hz)**

Model	TCW60	TCW70	TCW80	TCW90	TCW120	TCW140	TCW160	TCW180
Nominal Capacity (ton)	60	70	80	90	120	140	160	180
Number of Refrigerant Circuits	1	1	1	1	2	2	2	2
Refrigerant Type	R134A	R134A	R134A	R134A	R134A	R134A	R134A	R134A
Refrigerant Charge (lb)	60	70	80	90	120	140	160	180
Number of Capacity Steps	Variable Speed Compressor for Continuously Variable Capacity Adjustment							
Minimum Unloaded Capacity (ton)	27	27	27	27	27	27	27	27
Condenser Water Inlet & Outlet Flange Size (in)	4	4	4	4	6	6	6	6
Process Fluid Inlet & Outlet Flange Size (in)	3	3	4	4	4	4	6	6
Length (in)	103	103	109	109	109	109	115	115
Width (in)	27	27	27	27	54	54	54	54
Height (in)	69	69	69	69	69	69	69	69
Shipping Weight (lb)	1,800	1,900	2,100	2,400	3,700	3,800	4,100	4,700
Operating Weight (lb)	2,000	2,100	2,300	2,600	4,000	4,200	4,600	5,200
Unit MCA @ 460/3/60 <sup>1</sup>	105	105	130	155	185	185	230	275

<sup>1</sup>MCA is Minimum Circuit Ampacity (for wire sizing)

## Remote Air-Cooled Condenser Chiller General Data (60 Hz)

Model	TCR60	TCR70	TCR80	TCR90	TCR120	TCR140	TCR160	TCR180
Nominal Capacity (ton)	60	70	80	90	120	140	160	180
Number of Refrigerant Circuits	1	1	1	1	2	2	2	2
Refrigerant Type	R134A	R134A	R134A	R134A	R134A	R134A	R134A	R134A
Refrigerant Charge (lb)	Varies based on system refrigerant piping – see Installation Guidelines manual							
Number of Capacity Steps	Variable Speed Compressor for Continuously Variable Capacity Adjustment							
Minimum Unloaded Capacity (ton)	18	18	18	18	18	18	18	18
Chiller Liquid Line Connection Per Circuit (in)	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>
Refrigerant Discharge Line Connection Per Circuit (in)	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>
Process Fluid Inlet & Outlet Flange Size (in)	3	3	4	4	4	4	6	6
Length (in)	103	103	109	109	109	109	115	115
Width (in)	27	27	27	27	54	54	54	54
Height (in)	69	69	69	69	69	69	69	69
Shipping Weight (lb)	1,800	1,900	2,100	2,400	3,700	3,800	4,100	4,700
Operating Weight (lb)	2,000	2,100	2,300	2,600	4,000	4,200	4,600	5,200
Unit MCA @ 460/3/60 <sup>1</sup>	174	174	174	174	309	309	309	309

<sup>1</sup>MCA is Minimum Circuit Ampacity (for wire sizing)

## Remote Condensers General Data (60 Hz)

Model	LEVF-16410	LAVF-24310	LAVF-24410	LAVF-26410
Nominal Capacity (ton)	70	80	90	140
Quantity Require for Each Chiller	1 for TCR60 1 for TCR70	1 for TCR80 2 for TCR160	1 for TCR90 2 for TCR180	1 for TCR120 1 for TCR140
Number of Refrigerant Circuits	1	1	1	2
Refrigerant Type	R-134A	R-134A	R-134A	R-134A
Refrigerant Charge (lb)	Varies based on system refrigerant piping – see Installation Guidelines manual			
Number of Fans	6	8	8	12
Inlet & Outlet Size (in)	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>
Length (in)	342	234	234	342
Width (in)	45	91	91	91
Height (in)	61	61	61	61
Shipping Weight (lb)	2,784	2,626	2,851	5,218
Operating Weight (lb)	Varies based on system refrigerant charge and operating conditions			
Unit MCA @ 460/3/60 <sup>1</sup>	22	29	29	43

<sup>1</sup>MCA is Minimum Circuit Ampacity (for wire sizing)



7720 North Lehigh Avenue  
Niles, Illinois 60714-3491  
Tel: (847) 966-2260  
Toll Free: (888) 828-7387  
Fax: (847) 966-9358

Email: [info@thermalcare.com](mailto:info@thermalcare.com)  
Website: [www.thermalcare.com](http://www.thermalcare.com)

Manufacturer reserves the right to change specifications or design without notice or obligation. Thermal Care is a registered trademark of MFRI, Inc.