YORK®	**YORK® YD Model "C" Centrifugal Chiller with OptiSpeed™ VSD Frequently Asked Questions**	
FREQUENTLY ASKED QUESTIONS	New Release	Form: 160.69-FAQ1 (0615)

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EXECUTIVE SUMMARY

The YORK YD Model "C" Dual Centrifugal Compressor Chiller was upgraded to offer OptiSpeed™ Variable Speed Drive (VSD) to our industry-leading YORK chiller product portfolio.

The intent of this document is to assist the Johnson Control systems and service sales force in addressing common questions from customers about performance, product design and competitive positioning.

See the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD Engineering Guide form 160.69-EG3 for more details.

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SELECTION AND PERFORMANCE

1. What is the nominal capacity range of the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD?

Answer:

The YD Model "C" with OptiSpeed™ VSD capacity varies for each operational condition and voltage.

- For Medium Voltage VSD applications, the YD Model "C" nominal capacity range is 1,500-6,000 Tons (5,300-21,100 kW) at AHRI condition.

- For Low Voltage VSD applications the YD Model "C" will extend Johnson Controls VSD Chiller capacity availability, almost doubling the range offered by our flagship product: the YK single compressor centrifugal chiller.

See the YD operational range for several regional markets below:

- **USA & Mexico:** up to 3,000 tons at AHRI conditions.
- **Dubai:** up to 2,000 tons for 400v/50Hz.
- **Abu-Dhabi, Qatar, Kuwait:** up to 2,000 tons for 415v/50Hz.
- **Turkey, Egypt:** up to 8,000 kW for 380v/50Hz.
- **Saudi Arabia:** up to 1,900 tons for 380v/60Hz.
- **Brazil:** up to 2,500 tons for 380v/60Hz.
- **South Korea:** up to 8,400 kW for 380v/60Hz.
- **India:** up to 8,500 kW for 415v/50Hz.
- **Australia:** up to 9,500 kW for 415v/50Hz.
- **Singapore:** up to 9,500 kW for 415v/50Hz.

2. What are the best applications for the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD?

Answer:

The ideal application for the YORK YD Model "C" chiller depends on the size of the installation and the voltage available at the jobsite:

- For Medium Voltage OptiSpeed™ VSD (Floor mounted) applications, the best application is above 3,500 tons such as district cooling, large government buildings, central utility plants replacing old Titan (OM) Chillers or old 17DA Carrier chillers.

- For Low Voltage OptiSpeed™ VSD (Unit mounted) applications, the best application is around 1,600 to 2,800 tons in comfort cooling applications for hospitals and office buildings extending the YK Low voltage VSD product line.

3. How does the new offering of the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD impact the chiller's performance?

Answer:

The YD Model "C" maintains the reputation of Johnson Controls for developing equipment that delivers outstanding part load efficiency. The addition of an OptiSpeed™ Variable Speed Drive will improve the part load performance (upwards of 13%) across the product's capacity range, compared to a non-VSD YORK YD Model "C" chiller.

Furthermore, when YD chillers are arranged in series counter flow, they provide even greater energy savings. Series counter flow reduces compressor head on each chiller, cutting system energy use by up to 10% compared to a parallel piping arrangement.

4. Johnson Controls has always promoted the energy advantages of utilizing entering condenser-water temperatures down to 55°F (12.7°C) with YORK centrifugal chillers. Is this still true with the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD?

Answer:

Yes, and another improvement introduced in recent years allowed it to go further, as low as **50°F (10.0°C)** in some conditions**.** The YD chiller is engineered for maximum efficiency at both design and off-design conditions. By taking advantage of the colder tower-water temperatures, appreciable power savings are realized from reduced lift (head) operation. The minimum entering condenser water temperature for full- and part-load operation is provided by the following equation (See the Engineering Guide form 160.69-EG3 for more details):

Min ECFT = LCHFT – COND. RANGE + 5°F + [12 * (% Load / 100)]

Where:

ECFT = entering condensing fluid temperature
LCHFT = leaving chilled fluid temperature
COND.RANGE = leaving condenser fluid temperature - entering condenser fluid temperature at given load condition.

5. Does the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD comply with LEED Energy & Atmosphere credit 4 (EAc4) and ASHRAE 90.1- 2015?

Answer:

The YD chiller utilizes a low volume of HFC-134a refrigerant and achieves very high efficiency operation. Most models will meet both EAc4 and the minimum efficiency required by ASHRAE 90.1-2015 standard. Verification can be achieved via the YCS^2 program in YORKworks (the Scatterplot screen).

6. Is operating at real-world conditions important?

Answer:

Absolutely. As stated by AHRI's well-known and accepted NPLV equation, chillers do not operate at design conditions more than 1% of the time. Understanding real-world operating conditions and taking advantage of colder entering condenser-water temperatures will deliver reduced operating expenses and reduce the environmental impact.

PRODUCT DESIGN

1. Is the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD a completely brand-new design?

Answer:

No, the YD was launched in 2002 and was a compilation of proven technologies. The addition of a VSD was a demand from our customers who were interested in taking advantage of the YD chiller's existing smaller footprint and lower installation cost while also achieving additional energy savings from a VSD. The YD Model "C" with VSD product was developed to achieve the lowest installed cost per ton in large applications with superior "real world" performance.

2. Does the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD utilize the OptiView™ control panel?

Answer:

Yes**,** the YD uses the same platform as the YK product line for chiller control and building system integration.

3. Are there any difference between the OptiSpeed™ VSD used with the YK Model "G" and YD Model "C"?

Answer:

No, there is no difference between OptiSpeed™ VSD used in the YD model "C" and YK model "G". (Low Voltage and Medium voltage).

4. How many OptiSpeed™ drives does a YORK YD Model "C" Dual Centrifugal Compressor Chiller have?

Answer:

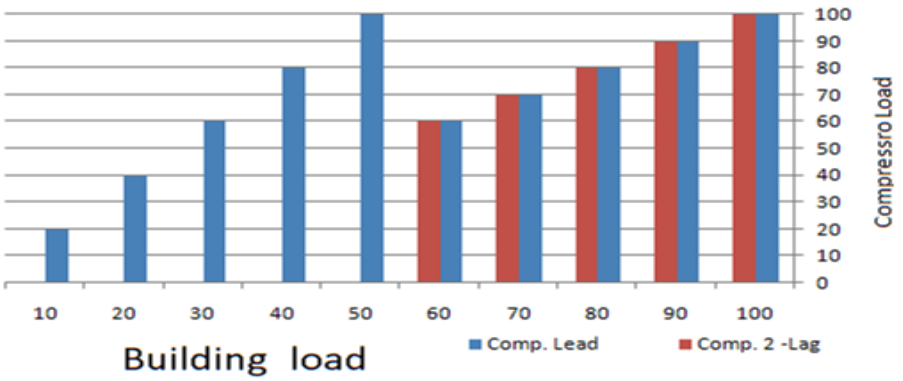
There are two VSDs, one for each motor operating at the same frequency and both providing zero inrush during the start of the unit. The VSD has the capability to reduce the frequency as low as 30Hz/25Hz (60Hz/50Hz units respectively).

5. At partial loads, how do the compressors work in a YD model "C"?

Answer:

To achieve the best operational performance, the OptiView™ Control Center measures all the conditions of the chiller and determines the best frequency to operate the motors and number of compressors operating and always avoids operating in a surge condition.

Between a 0% load to 50% load, most of the time, only one compressor operates, taking advantage of all the condenser shell's heat transfer surface area to reject the heat. After 50% load, the second compressor starts and shares the load with the compressor which is already operating.



6. Will the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD chiller be utilizing the OptiSound™ Control feature?

Answer:

OptiSound™ Control is a standard feature on both YD chiller drivelines. Our customers have consistently provided positive feedback regarding the sound and operational advantages this proprietary technology provides. In fact YD chillers operate as low as 83 dba in most conditions.

The YD chiller represents at least 7 dba less than Trane CDHF at full load and more than 10 dba less at partial load.

7. What is the % current Total Harmonic Distortion (THD) on the OptiSpeed™ variable speed drive? Does it meet the requirements of IEEE?

Answer:

The YORK OptiSpeed™ medium voltage variable speed drive uses a 24-pulse isolation transformer front end to convert AC power to DC power. This limits current distortion produced by the drive to a very low level that exceeds the requirements of IEEE-519 2014.

The YORK OptiSpeed™ low voltage variable speed drive has the application for an optional harmonic filter that helps customers meet the recommended limits of IEEE 519.

8. What is the OptiSpeed™ variable speed drive's power factor?

Answer:

The YORK OptiSpeed™ medium voltage drive uses a 24-pulse isolation transformer and the low voltage variable speed drive with harmonic filter correct the power factor to 0.97. A low voltage variable speed drive without a harmonic filter corrects the power factor to 0.95.

9. Can I install a capacitor device to correct the power factor between the OptiSpeed™ VSD and the motor?

Answer:

There is no need to add capacitors. Capacitors must never be applied between OptiSpeed™ VS and motor. The system was designed to be directly connected with no additional equipment installed.

10. Does the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD require multiple points for wiring?

Answer:

Yes, the YD VSD chiller requires multiple points of wiring**:**

The YORK OptiSpeed™ medium voltage variable speed drive requires one medium voltage power source per drive and one low voltage power source for the chiller auxiliaries like the lube system (VSOP panel) and OptiView™ control panel. In cases where a special sales quote (SQ) is submitted, the power source for chiller auxiliaries may be powered from the drives, including a transformer to the drive.

The YORK OptiSpeed™ low voltage variable speed requires one low voltage power source per drive and one low voltage power source for the chiller auxiliaries like the lube system (VSOP panel) and OptiView™ control panel. In cases where a special sales quote (SQ) is submitted, the power source for chiller auxiliaries may be powered from the drives.

11. Can the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD chiller be used as a heat pump?

Answer:

The YD is not well suited for heat pump applications. The maximum temperature water that this chiller can produce is approximately 110°F (43°C), which is generally too low for heat pump application needs. A YORK Compound YK chiller (CYK) is well suited for heat pump duty for high capacity applications.

12. What shipment forms are available for the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD chiller?

Answer:

The YD chiller could be shipped as:

- A single piece (Form 2 – The refrigerant is shipped separated) for compressors K1, K2 & K3 units which achieves capacities up to 2,800 tons at AHRI conditions.

- Knocked down into major subassemblies like evaporator, condenser, driveline, etc. (Form 3 or 7) for all compressor sizes. Protective coverings are furnished on the motor starter and unit mounted controls, and the water nozzles are capped with fitted plastic enclosures. This shipment form is particularly convenient for existing buildings where equipment room access does not allow rigging a factory-packaged chiller.

13. How are the motors cooled in the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD?

Answer:

Both motors on the YD are air cooled. This provides a reliable solution for large industrial applications. However, for special applications alternative motor types are available for both motors. The YD chiller has several enclosed motor types available, such as Totally Enclosed Water to-Air Cooled (TEWAC). Please note that non-standard motor types will increase chiller lead time.

14. Does the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD require the use of Totally Enclosed Water to Air Cooled (TEWAC) motors to operate in high temperature regions with normal ambient equipment rooms?

Answer:

No, this is an important question, in most of the cases the ventilation required by ANSI/ASHRAE Standard 15, "Safety Standard for Refrigeration Systems," to large chillers and the machinery rooms that house them or the VAC system installed to protect the electronic components like drives, control panel will take care of the heat generated by the motors.

A YD unit uses high efficient motors and reject less than 0.5 % of the total cooling load produced in tons to the equipment room.

Our competitors use hermetic motors which reject a similar or larger amount, but they send this heat to the cooling tower, increasing the requirement for make-up water.

Below is an example to demonstrate in a real word application, the amount of heat rejected by a YD Model "C" with OptiSpeed™ VSD in cities with high temperature design weather like the Mid-East region.

Tons	Average Hours in Dubai (UAE)	Bin temp (.oF)	Average Wet Bulb (.oF)	Cond. Ent. Flow Temp. (.oF)	YD VSD Efficiency (kW/ton)	Power consumption (kW)	motor losses %	Heat rejected by both motors (Tons & %)	
2,500	15	110-115	85.0	86.4	0.61	1,535	3.8	**17**	**0.66%**
2,500	88	105-110	84.0	84.3	0.59	1,465	3.8	**16**	**0.63%**
2,500	459	100-105	82.0	81.3	0.55	1,378	3.8	**15**	**0.60%**
2,500	962	95-100	79.0	78.3	0.52	1,295	3.8	**14**	**0.56%**
2,500	846	90-95	76.0	76.3	0.50	1,245	3.8	**13**	**0.54%**
2,500	1336	85-90	74.0	74.3	0.48	1,195	3.8	**13**	**0.52%**
2,500	1170	80-85	72.0	71.3	0.45	1,135	3.8	**12**	**0.49%**
2,500	1141	75-80	69.0	68.3	0.43	1,073	3.8	**12**	**0.46%**
2,500	879	70-75	66.0	65.4	0.41	1,015	3.8	**11**	**0.44%**
2,500	1013	65-70	63.0	62.6	0.39	973	3.8	**11**	**0.42%**
2,500	543	60-65	60.0	59.7	0.38	943	3.8	**10**	**0.41%**
2,500	274	55-60	57.0	56.0	0.37	925	3.8	**10**	**0.40%**
2,500	14	50-55	53.0	55.0	0.37	925	3.8	**10**	**0.40%**
							Average	**12**	**0.49%**

15. Does YORK YD Model "C" Dual Centrifugal Compressor Chiller have Motor Monitoring Board (MMB) option like YK?

Answer:

No, the YD model "C" doesn't have the MMB OptiView™ Control Center feature yet. We are working to develop this feature for the OptiView™ Control panel, like the YK, in the future.

16. Can we add motor monitoring (MMB) system for YD Model "C" Dual Centrifugal Compressor Chiller as a special quote (SQ)?

Answer:

Yes YD Model "C" has an option to monitoring the motors winding and bearing temperatures, as a SQ, but first of all, we would like to re-inforce to our customers an important consideration about these accessories. Monitoring the temperature of winding and temperatures are mandatory requirements used in hermetic system to avoid a catastrophic motor failure, which could contaminate the refrigerant system. Saying that, our competitors push for these accessories to be included with the intention to increase the cost of an open drive chiller, which are not subject to this problem and offset their disadvantage.

As mentioned before if the spec is ready for quotation and you need to provide a MMB with communication to the control center our recommendations are to:

- Try to deviate off this offer and justify saying this is an accessory applicable to hermetic drivelines only to mitigate the risk of catastrophic motor failure a refrigerant contamination.
- Request an SQ for an extra panel (Red Lion) attached to the Optview Control Center for motor Winding and Bearing monitoring. It is an expensive solution, which we strongly do not recommend.

17. Is it possible to have "Quick-start" option for YD Model "C" Dual Centrifugal Compressor Chiller?

Answer:

No, the YD model "C" doesn't have the **"Quick-start"** option yet. It is our plan to investigate this solution, but no commitment date could be provide at this time.

18. Does the YD Model "C" Dual Centrifugal Compressor with OptiSpeed™ VSD Chiller provide a soft start?

Answer:

Yes. In some installations, it is of interest to know exactly how the VSD's start sequence is structured. For example, in a hospital where the VSD may be applied to a stand-by generator which otherwise may not be capable of starting a chiller in the typical Wye-Delta fashion.

The initial VSD output accelerates the chiller motor from 0 Hz to 2 Hz (0 Hz -1.67 Hz for 50 Hz) in 4 seconds. Once the motor has attained a speed corresponding to 2 Hz (1.67 Hz for 50 Hz), the VSD accelerates the system at a rate of 1.5 Hz per second (1.25 Hz/sec for 50 Hz), accelerating the system to full speed in a little more than 40 seconds. During startup, the VSD varies the voltage and frequency in such a way to maintain the same proportion that exists between the two at design conditions.

Using the above described starting sequence, the VSD provides an extremely soft start. The required inrush amps to start the chiller never exceed the FLA rating of the given motor and are typically only 10 to 20% of FLA. Mechanical forces on the motor windings and motor heating are reduced by 20% to 50% over what might occur with an electromechanical starter. The result is less mechanical shock to the chiller and a longer motor life.

19. What is the YD Model "C" Dual Centrifugal Compressor Chiller maximum number of starts per hour?

Answer:

The OptiSpeed™ VSD allows up to 5 starts per hour without any recycle timer. If a unit is subjected to more than 5 repeated starts (or start attempts), the system should be inspected because there is a potential issue with the installation or application.

20. What is the YD Model "C" Dual Centrifugal Compressor Chiller with VSD shut-down and re-start up sequence after a power failure?

Answer:

See below. The shut down and re- start sequence for a YD Model "C" Dual Centrifugal Compressor Chiller with VSD, which is very similar to a standard YK model "G":

1. Unit is running.
2. Power Failure.
    - Minimum Coastdown Time **(estimated 240 seconds** for K7 Compressors / **estimated 150 seconds** for all other Compressors)
3. Power on. (Depending on when power is restored the coastdown time and re-boot time can be simultaneous.)
4. Re-boot the Optview Control Panel and Finalize to Chiller Off. **(estimated 190 seconds)**
    - Re-boot the Optview Control Panel
    - Both Compressors Discharge Valves Closed
    - Both Compressors PRVs Closed
    - Variable Orifice Opened
    - Hot Gas Closed
5. Pre-lube for re-start. **(estimated 50 seconds)**
    - Select Lead Compressor with least run hours.
    - Open Lead Compressor Discharge Valve.
    - PRV Closed
    - Variable Orifice Preset/Held
    - Hot Gas Closed
6. Unit is running again.
    - VSD Run Signal Enabled
    - PRV Controlled by Capacity Control
    - Variable Orifice Preset/Held/Ramp
    - VSD to Start Frequency
    - Discharge Valve Standard Control
    - Hot Gas Standard Control
    - Slow Ramp-up of Speed

21. Where Can I find more details about start-up and shut-down logic of the YD Model "C" Dual Centrifugal Compressor Chiller?

Answer:

You can find more information in the "OptiView™ Control center Centrifugal Liquid Chillers" Operations Manual (FORM.160.69-O1).

22. Can I apply a YD Model "C" Dual Centrifugal Compressor Chiller equipped with OptiSpeed™ VSD to a generator?

Answer:

Yes, the OptiSpeed™ VSD can be applied to a generator. No modifications are required for a generator application. We have several VSD installations running on generator power without difficulty. It is necessary that the generator's output voltage be maintained within the specified range defined in the Engineering Guide (FORM 160 69-EG3) and frequency be maintained within +/- 1

HZ (on all applications). This is usually not a problem for most generators, since motor current at startup is limited to less than 1X the Full Load Amps (FLA). The transfer of power between the utility and generator and back again must be delayed as to cause the chiller to fault and then restart. Not providing this delay may cause failure within the OptiSpeed™ VSD or instability within the generator.

23. What is the proper wire sizing when using an OptiSpeed™ VSD?

Answer

The input power wires to the OptiSpeed™ VSD are sized at 1.25 times the full-load amps of the compressor motor, plus oil pump amps and control transformer amps. Note: OptiSpeed™ compressor drive to Compressor Motor wires need only be 1.25 times the compressor motor FLA, since the oil pump and control power are not part of the equation at this point.

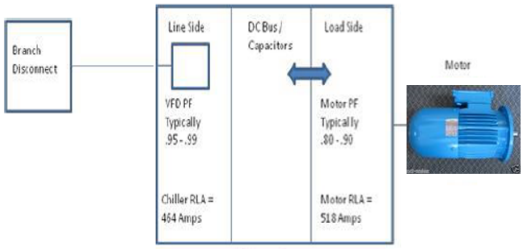
24. Why doesn't the measured input amps of the OptiSpeed™ VSD agree with the rated FLA?

Answer

The input current to the OptiSpeed™ VSD may be considerably lower, compared to the output current. This is due to the power factor at the input to the OptiSpeed™ VSD being greater than .95, and nearly unity when the Low Voltage Harmonic Filter option is included.
Chiller FLA must be measured at the motor terminals, where the power factor is the normal motor power factor. Use a true RMS reading meter to make these measurements.

Measured input amps < rated FLA at performance page

For variable speed chillers, the measured input amps is generally lower than the rated FLA at the performance page. See the example below. Consider two sections of the VSD; The line side (incoming power) and the load side (motor). The line side and the load side are separated by the capacitors; device that store and send the require energy to the motor. The extra energy is required because the motor PF (power factor) is typically around 0.90 where the VSD PF is typically 0.95-0.99.



Typical VSD Topography

Note: Drive kW = Chiller kW

Note: Motor kW = Chiller kW * VFD Efficiency (.975)

Motor	
Motor RLA	518
Chiller RLA	464
Chiller Inrush Amps	464
Output Type	Full Load
Percent Load	100.00
Chiller Capacity	600 Tons
Chiller Input kW	356 kW
Chiller Input Power	0.592 kW/Ton

A 600 ton Chiller with a unit mounted VSD requires a 464 amps (Chiller FLA) and the motor requires 518 amps (Motor FLA) . The Difference of 41 amps is the reactive current flowing bak and forth between the motor and the DC capacitors.

Volts = 460 Eff_{drive} = .975
PF_{drive} = .99 Eff_{motor} = .95
PF_{motor} = .9

$$\text{Line Side Amps} = \frac{\text{Drive kW}}{1.732 \times \text{Volts} \times \text{Eff. (drive)} \times \text{PF (drive)}} = 464 \text{ Amps}$$

Note: Drive kW = Chiller kW

$$\text{Load Side Amps} = \frac{\text{Motor kW}}{1.732 \times \text{Volts} \times \text{Eff. (motor)} \times \text{PF (motor)}} = 518 \text{ Amps}$$

Note: Motor kW= Chiller kW x VSD Efficiency (0.95 to 0.99)

25. Is it necessary to validate a correct motor rotation on a VSD equipped YD Model "C" Dual Centrifugal Compressor Chiller?

Answer:

No, it should not be necessary for us to validate correct motor rotation on VSD-equipped YD chillers. On all of our VSD Centrifugal Chillers, provided the wiring from the VSD to the motor is correct, the VSD will provide the correct phasing to the motor, no matter how the three phases are connected from the incoming power to the VSD. This is true of LV and MV.

On Solid State Starter equipped YD units, the starter does not correct for incorrect phasing from the incoming power, but it will prevent the motor from starting if the incoming phasing is not correct. On units without a VSD or Solid State Starter the phase rotation would need to be checked and the motor jogged to insure correct rotation.

26. What are the temperature limits for location YD Model "C" Dual Centrifugal Compressor Chiller with VSD?

Answer:

The standard YD Model "C" units are designed for indoor location, in a NEMA1 classification area, having 40°F to 104°F (4.4°C to 40°C) ambient temperature limits and a maximum relative humidity of 95%, non-condensing. In case of higher temperatures, contact the Application Engineering team for a Special Quote for special motor, Special Control Panel and special VSD Medium Voltage or Low Voltage.

27. How is the OptiSpeed™ VSD cooled?

Answer:

The type of cooling depends of the OptiSpeed™ VSD voltage:

For Low Voltage application
The OptiSpeed™ VSD is water cooled with a closed loop cooling system. It uses condenser water through a plate and frame heat exchanger, and an isolated and separate closed loop through the power component heat sinks and internal cooling coils. The maximum supply cooling water temperature is limited based on condenser tube fouling per table below:

CONDENSER FOULING FACTOR (ft^2-°F-hr/BTU)	MAX ECWT
0.00025	100°F/37.8°C
0.00050	95°F/35.0°C
0.00075	91°F/32.8°C

In case of higher fouling factor contact Application Engineer team for SQ to use the Chilled water loop. (Evaporator).

For Medium Voltage application
The OptiSpeed™ VSD is air cooled rejecting the heat to ambient. The OptiSpeed™ MV VSD inverter utilizes IGBT technology to create a synthetic AC waveform to power standard 3300V and 4160V motors. This waveform has inherent losses associated with it that must be accommodated. Please contact the Application Engineer team for a specific load reject for each MV VSD model. In the OptiSpeed™ MV VSD you can reasonably expect to see a 3.5% motor heat rejection to atmosphere. Expect losses to be linear with load.

28. How does the altitude affect the OptiSpeed™ VSD?

Answer:

The effect of altitude also depends of the OptiSpeed™ VSD voltage:

For Low Voltage application
Due to less dense air at higher altitudes, the maximum entering condenser water temperature, or supply cooling water, must be reduced per the below table:

ALTITUDE	MAX ECWT
0 Ft (0 m)	100.0°F/37.8°C
5,000 Ft (1,500 m)	95.6°F/35.5°C
10,000 Ft (3,000 m)	89.6°F/32.0°C
15,000 Ft (4,500 m)	82.3°F/27.9°C

Sufficient clearance to permit normal service and maintenance work should be provided around the entire unit.

For Medium Voltage application
The MV VSD is air cooled and due to less dense air at higher altitudes the unit should be re-rated for altitudes above 5,000 feet (1,500 m) above the sea level, please contact the Application Engineering team for specific selections.

Our competitor use a 3,000 ft. (900 m) design, in applications above this altitude they need to oversized the MV Drive.

29. Can I use a step down transformer to YD model "C" with Low voltage VSD unit?

Answer:

In most installations, the transformer which supplies the chiller is the same transformer which supplies most of the other loads in the same building. These transformers are usually very large with respect to the chiller load.

However, in some cases there will be an individual transformer, sized and dedicated to the chiller alone. For example, when a 460V VSD is used and the existing power is 4160V. A 460V step-down transformer should be installed.

Another example is when a retrofit VSD is added to an existing chiller that was operated at 4160 volts, a step-down transformer could be an option to avoid a more expensive MV VSD.

Such transformers must be specially sized whenever a VSD is involved. Failure to properly size the transformer may result in unreliable operation. A rule of thumb which may be used for sizing dedicated transformers for VSDs is as follows:

$$\text{Transformer KVA} = \frac{\text{Volts} \times \text{chiller FLA} \times 1.732 \times 1.35}{1000}$$

When installing a VSD on an existing transformer the total KVA requirement of the VSD chiller and all branch circuits must be considered. The transformer supplying the VSD shall be sized such that the transformer voltage does not sag more than 5% when subjected to load excursions. The steady state operating voltage should be within the voltage range defined at the Engineering Guide (FORM 160 69-EG3).

Also check out the following document from Johnson Controls Literature for more details:
"VSD Transformer Pricing For Special Voltages" - Form 160.00-P2.

30. What is the maximum distance for install a OptiSpeed™ MV VSD for YD model ”C” unit?

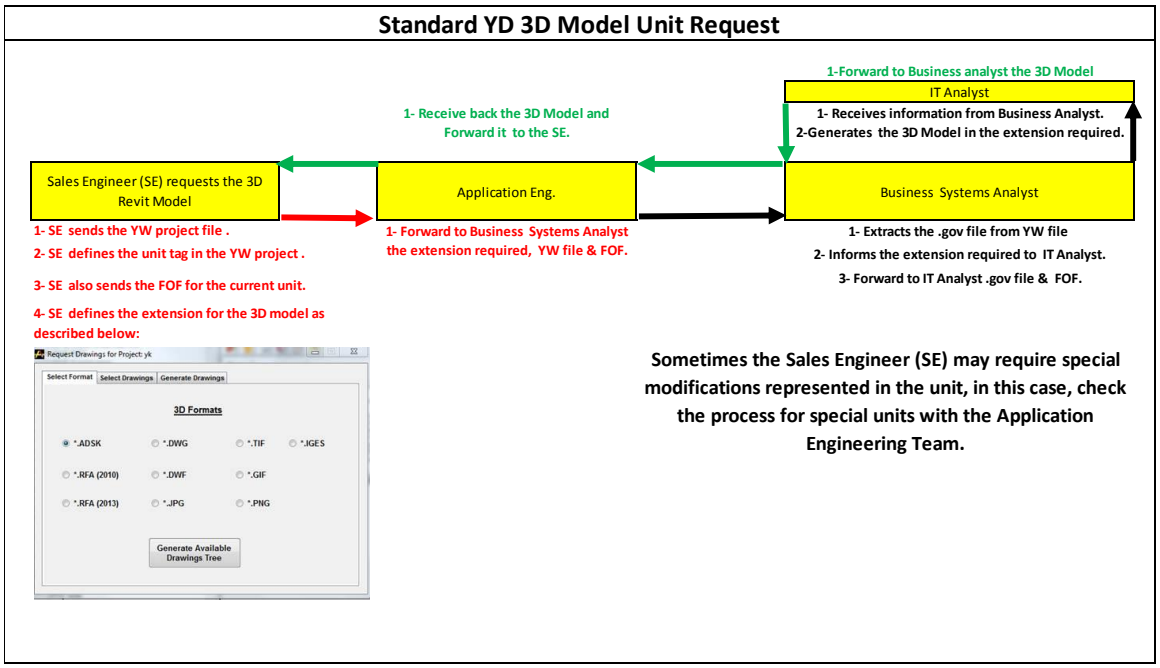
Answer:

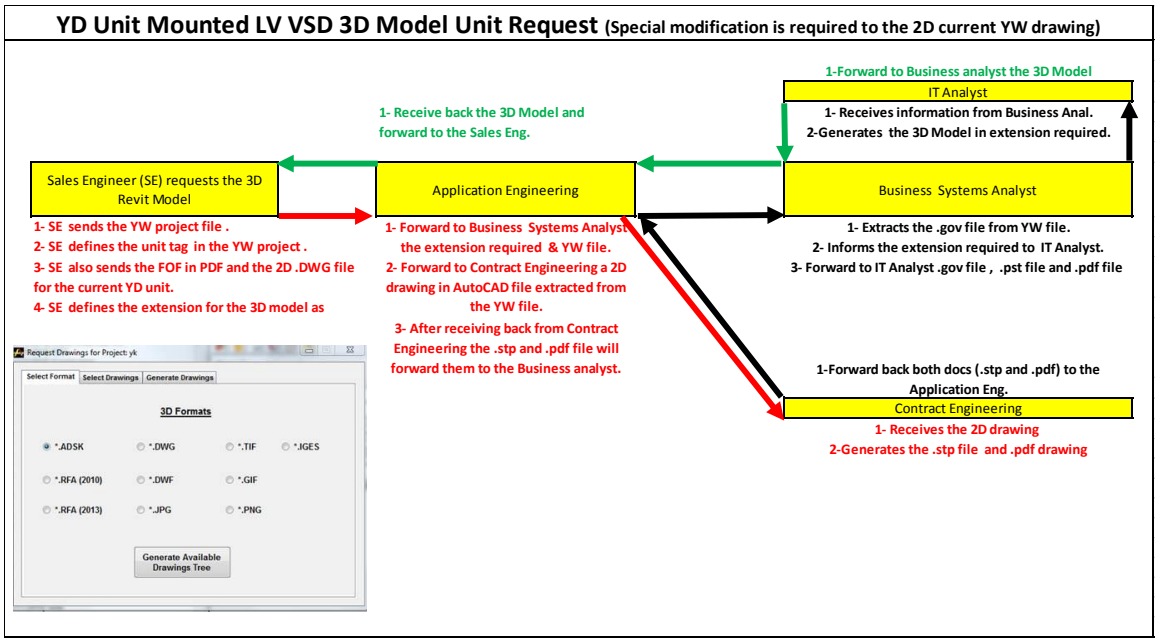
The distance between the OptiSpeed™ MV VSDs and the YD model “C” chiller must be limited to 500 feet (150m) of wire or less. Voltage drop becomes excessive and rising above the 5% voltage drop limitation. The peak voltage applied to the motor windings becomes excessive and may cause premature failure. When distance exceeds 500 ft. (150 m), contact the Application Engineering team.

31. How can I access a 3D model of the YD model “C” with or without unit mounted OptiSpeed™ LV VSD?

Answer:

YORKworks can generate a 2D drawing for a standard YD but not for YD with VSD. The processes below explain how to get a 3D for each:





32. How many and what size of lugs have the YD model "C" OptiSpeed™ VSD Circuit Breaker?

Answer:

The following terminal lugs are factory furnished for field wiring supply connection as standard. In case of any different configuration, it will be required a SQ. All lugs are rated AL-9CU

Input Voltage - Frequency	Chiller Motor Code & VSD Circuit Breaker Rating	Line Side Lugs BBL per terminal	Wire Range (kcmil or ncm)	Grounding Lug wire range - Qty.
440V/460V/480V - 60Hz	EW-EZ, EA-EB, FA-FB 1200 amp	4	3/0 to 500	# 4 AWG to 500 kcmil four bbl
380V - 60Hz	EW-EZ, EA-EB, FA 1200 amp			
415V - 50Hz	5ES-5EX 1200 amp			
380V/400V - 60Hz	5ES-5EX, 5FA 1200 amp			

33. What is the YD model "C" OptiSpeed™ VSD Circuit Breaker rating?

Answer:

See the table below with the information for each VSD Circuit breaker. In case of any different configuration, it will be required a SQ.

Input Voltage - Frequency	Chiller Motor Code	VSD CIRCUIT BREAKER RATING (AMPS) @ 600VAC, 60HZ OR 480VAC, 60HZ OR 400VAC, 50/60HZ TRIP		SEMI-CONDUCTOR FUSE RATING (AMPS) @ 700VAC WITHSTAND	GROUND FAULT TRIP (AMPS)
		TRIP	WITHSTAND		
440V/460V/480V - 60Hz	EW-EZ	1200	100000*,†	1100	240
440V/460V/480V - 60Hz	EA-EB, FA-FB	1200	100000*,†	1600	240
380V - 60Hz	EW-EZ, EA-EB, FA 1200 amp	1200	100000*,†	1600	240
415V - 50Hz	5ES-5EX 1200 amp	1200	100000*,†	1600	240
380V/400V - 60Hz	5ES-5EX, 5FA 1200 amp	1200	100000*,†	1600	240

* Per U.L. Listing of VSD

† RMS Symmetrical Amperes

COMPETITIVE POSITION:

1. How can I select and get a price for the YORK YD Model "C" Dual Centrifugal Compressor Chiller with OptiSpeed™ VSD?

Answer:

YD Model "C" with VSD selection and ratings are available in YCS² (YORK Chiller Selection Software) which is accessible through YORKworks. The Bill of Materials (BOM) portion of YORKworks for YD model "C" with VSD, which includes Order Forms, Pricing Forms, and Unit

Drawings is scheduled for end of 2015. For now, pricing requires a Special Quote. See the instructions to request an SQ in the YD Model "C" SQ Tutorial.

2. How do we compare the North America market price of a (1) 2,500 ton YD Model "C" Dual Compressor Chiller with Low voltage VSD vs. (2) YK in parallel arrangement or (2) YK in Series Counter-flow Arrangement (SCF) to a similar Trane Dual Compressor CDHF?

Answer:

The YK Series-Counter Flow Arrangement is still our best offer (price and performance), but most opportunities in a mature market like North America are related to replacement chillers, where the floor space is restricted and we are faced with Trane CDHF as a Basis of Design (BOD) in most cases. Considering this situation the **YD Model "C" Dual Compressor Chiller with Low voltage VSD will fill a gap in our portfolio with a competitive position.**

	YD	YK	YK	Trane-CDHF
Unitary Capacity (tons)	2500	1250	1250	2500
# of units	1	2	2	1
# of Compressors per unit	2	1	1	2
Arrangement	Single Circuit	Parallel	SCF	Dual Circuit in SCF
Starter	VSD w/filter	VSD w/filter	VSD w/filter	AFD w/filter
Voltage/Frequency	460V / 60Hz	460V / 60Hz	460V / 60Hz	460V / 60Hz
Unit Market Price (North America - Std Unit)	100%	105%	90%	100%
Installation cost add for multiple units	xxx	+5%	+7.5%	xxx
Total Installed Cost	100%	110%	97.5%	100%
Difference vs. Trane CDHF	**0%**	**10%**	**-7.5%**	**xxx**
Full Load (kW/ton)	0.582	0.582	0.583	0.582
NPLV (kW/ton)	0.385	0.372	0.369	0.390
Difference vs. Trane CDHF	**-1%**	**-5%**	**-7%**	**xxx**
Footprint (All units)	22' x 14'-5'	20' x 23'	18' x 18'-6"	25' x 13'-2"
Difference vs. Trane CDHF	**-4%**	**+40%**	**+4%**	**xxx**
Passes	2/2	2/2	1/1	1/1
Refrigerant	HFC-134a	HFC-134a	HFC-134a	HCFC-123
Minimum Ent. Cond. Temp (AHRI Cond.)	50 °F	50 °F	50 °F	66 °F
Sound Level (Full Load)	81 dBA	82 dBA	82 dBA	90 dBA

Conditions:
40.oF @ 2gpm/ton
85.oF @ 3 gpm/ton

3. What is Trane's CDHF performance sweet-spot and what is their performance weakness point in the North America market?

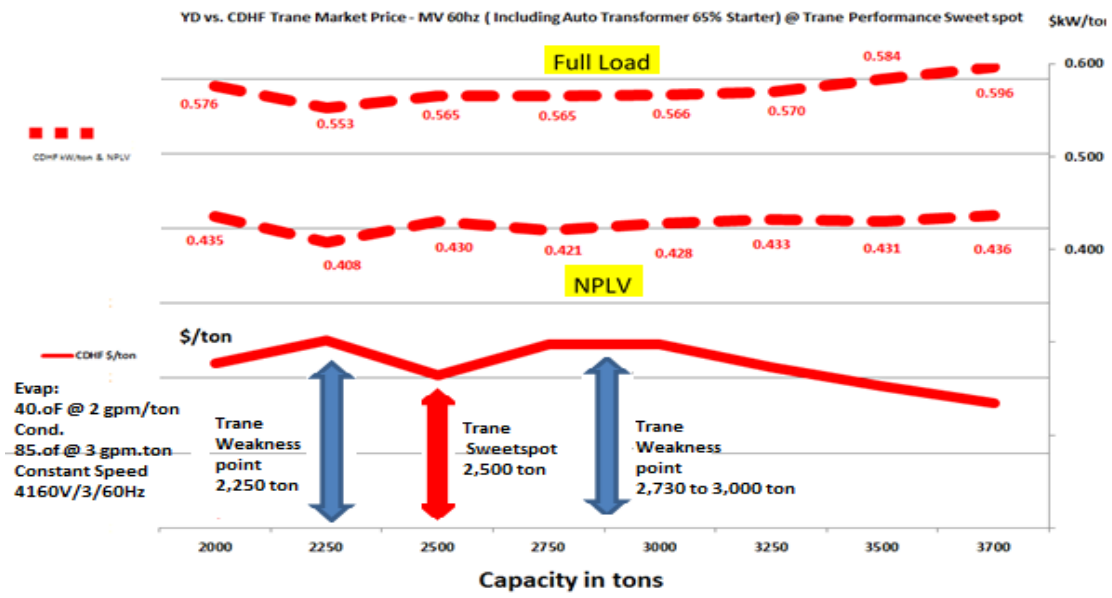
Answer:

Trane will try always to offer a CDHF unit constant speed with unit mounted auto-transformer starter around 2,500 tons with full load performance around .56 kw/ton.
Their weakness points are below 2,250 tons and 2,750 to 3,000 tons

This analysis is based on:

- 40°F Evap. leaving temperature @ 2 gpm/ton
- 85°F Entering Condenser temperature @ 3 gpm/ton
- Constant Speed Unit and 4160v/3/60Hz

As informed in the graphic below:



4. What is the Low Voltage VSD Trane maximum Amps and what is Trane unit mounted starter offer?

Answer:

This information will be important to define the maximum capacity offer for our competitor. Trane at this moment can handle more amps than YORK Chiller Centrifugal Products, but we are working to off-set their advantage.

Trane CenTravac Chiller Low Voltage starter and Drive:

Low Voltage (208–600 V)

Remote-Mounted	Unit-Mounted
Wye-Delta • Up to 1,700 amps	**Wye-Delta** • Up to 1,316 amps • Up to 1,120 amps with disconnect/circuit breaker option
Solid-State • Up to 1,120 amps with disconnect or circuit breaker required	**Solid-State** • Up to 1,120 amps with disconnect or circuit breaker required
Adaptive Frequency™ Drive • 460/480/575/600 V • Up to 1,360 amps (460/480 V) • Up to 1,120 amps (575/600 V)	**Adaptive Frequency Drive** • Up to 1,210 amps • Circuit breaker standard 460–480 V
	Adaptive Frequency Drive AFD3 • Up to 636 amps • Circuit breaker standard 575–600 V

5. What is the Medium Voltage Starter Trane offer?

Trane CenTravac Chiller Medium Voltage starter (Constant Speed):

Medium Voltage (2,300–6,600 V)		Medium Voltage (10,000–13,800 V)
Remote-Mounted	Unit-Mounted	Remote-Mounted
Across-the-Line • Up to 360 amps • Isolation switch, power fuses standard	**Across-the-Line** • Up to 288 amps • Isolation switch, power fuses standard	**Across-the-Line** • Up to 94 amps • Isolation switch, power fuses standard
Primary Reactor • Up to 360 amps • Isolation switch, power fuses standard	**Primary Reactor** • Up to 205 amps • Isolation switch, power fuses standard	**Primary Reactor** • Up to 94 amps • Isolation switch, power fuses standard
Autotransformer • Up to 360 amps • Isolation switch, power fuses standard	**Autotransformer** • Up to 205 amps • Isolation switch, power fuses standard	**Autotransformer** • Up to 94 amps • Isolation switch, power fuses standard

6. What is the Low Voltage VSD Carrier maximum Amps offer?

Answer:

	COMPONENT	FRAME 2 COMPRESSOR	FRAME 3 COMPRESSOR*	FRAME 4 COMPRESSOR*	FRAME 5 COMPRESSOR*	FRAME E COMPRESSOR*	FRAME 6 COMPRESSOR*	FRAME 7 COMPRESSOR*
	Std Tier VFD — 380, 400, and 460-v (230, 335, 445 A)	X	X					
	Std Tier VFD — 380, 400, and 460-v (485, 550 A)		X	X				
	Std Tier VFD — 380, 400, and 460-v (605, 680 A)		X	X				
	Std Tier VFD — 380, 400, and 460-v (765 A)			X				
	Std Tier VFD — 380, 400, and 460-v (855, 960, 1070 A)			X	X	X		
	Std Tier VFD — 380, 400, and 460-v (1275 A)				X	X		
Max, Amp at Current Offer with Active Rectifier (No filter) ⇨	Std Tier VFD — 380, 400, and 460-v (1530 A)				X	X		
	LiquiFlo™ 2 VFD — 380, 400, and 460-v (442 A)	X	X					
	LiquiFlo 2 VFD — 380, 400, and 460-v (608 A)		X	X				
	LiquiFlo 2 VFD — 380, 400, and 460-v (900 A)			X	X	X		
Max, Amp at Current Offer with Harmonic Filter ⇨	LiquiFlo 2 VFD — 380, 400, and 460-v (1200 A)			X	X	X		
	LiquiFlo 2 VFD — 575-v (390 A)	X	X					

7. What is the Low Voltage VSD Daikin (McQuay) VSD unit mounted offer?

Answer:

This point should be stressed to our customer, because Daikin has a very limited option of unit mounted VSD starter, requiring extra space and extra cost for field installation

VFD Mounting

VFDs from size VFD 019 through VFD 072 can be factory-mounted on the same units and in the same location as conventional starters or can be free-standing as shown below. Sizes VFD 090 through 120 are for free-standing only.

Table 12: VFD Mounting Options

Chiller Model	Unit Mounted at Factory[1]	Unit Mounted in Field	Free-Standing[2]
WSC/WDC 063-087	X		X
WSC 100-126		X[3]	X
WDC 100-126			X
WCC 100-126		X[3]	x

Note 1: Optional reactor is field-mounted and wired to unit mounted VFD.
Note 2: Optional reactor is factory-mounted in the VFD enclosure.
Note 3: Brackets and interconnecting cables shipped with unit.

8. What is the VSD Chiller Centrifugal offer from our competitors in North America (60Hz)?

Answer: