



Enriching Lives

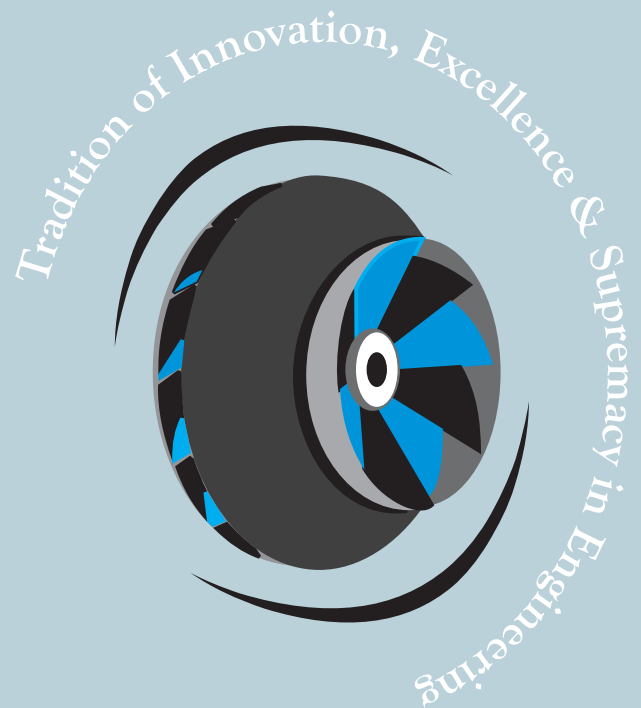
TURBOT[®]TEK
Centrifugal Chillers
Series KSC / KDC



KIRLOSKAR CHILLERS PRIVATE LIMITED
A Kirloskar Group Company

About Kirloskar Chillers

Kirloskar Chillers, the youngest company in the group, revolutionized the Indian HVAC industry by introducing a range of HFC chillers way back in 1995. Today, a rich manufacturing experience spanning a decade and half and a strong customer-oriented, entrepreneurial approach are distinctive features of Kirloskar Chillers' operations. These have been finely honed into a winning combination, suited to offer fully flexible and customized technology solutions to the market. With a comprehensive range of state-of-the-art technology products, an AHRI certified test bed facility and the backing of a wide spread, competent post-sales service network, we are in the business of bringing joy to our customers.



A CENTURY OF ENGINEERING EXCELLENCE

About Kirloskar Group

Kirloskar Chillers is proud to be part of more than a century old Kirloskar Group, which has been seminal to Indian agricultural and industrial development. Every company in the group has been a pioneer in the fields where India needed innovation. In today's era, we are spearheading the efforts to introduce energy efficient and eco friendly GREEN products in the Indian market.

TRADITION OF TRUST

Conforming to Global Standards

At Kirloskar Chillers, we are strongly committed to offering products that bring customers the best in terms of quality and performance. In order to achieve customer satisfaction, we acquired international accreditations that offer peace of mind to our customers.

In 2005, we became the first chiller manufacturer in India to acquire AHRI Certification for our water cooled chiller products. Equipment covered by the AHRI certification program include water cooled centrifugal and screw chilling packages rated from 200 TR to 1000 TR for 50 Hz at ARI standard rating conditions, with electric driven motor not exceeding 5000 V.

In 2008, we became the first chiller manufacturer in India to set up an AHRI certified test facility.

For our customers, these certifications guarantee specified performance as well as its actual demonstration at our factory.



OPTIONAL ITEMS / ACCESSORIES

- **Marine Water Boxes** : The evaporator and condenser can be provided with marine water boxes on the water connection side which provides easy access to the tubes for inspection, cleaning and removal without disturbing the water connections.
- **High Water Pressure Heat Exchangers** : The evaporator and condenser can be supplied suitable for 21 bar water pressure for high water pressure applications (Standard heat exchangers are suitable for 10.5 bar pressure).
- **Cupro – Nickel or Stainless Steel Tubes** : The heat exchangers can be supplied with 90:10 Cu-Ni or SS 316 / SS 304 / Titanium tubes instead of copper tubes for any corrosive conditions.
- **Soft Starters** : Soft starters can be provided as an option instead of a star delta starter.
- **Variable Frequency Drives** : The chiller can be supplied with an optional variable frequency drive for compressor motor which allows reduction in speed in case of reduction in lift and load on the unit. When variable frequency drives are used with a centrifugal compressor motor, significant improvement in part load performance can be achieved. The improvement in efficiency and reduction of annual energy cost is maximized when there are long periods of part load operation, combined with low compressor lift (lower condenser water temperatures).
- **Hot Gas Bypass** : for operation below 10% or low loads for extended periods.
- **Passes** : 1, 2 or 3 pass heat exchanger designs.
- **Chiller Sequence Manager (Plant Manager)** : to handle multiple unit installations and control & monitoring of low side equipment.
- **Witness testing** : at factory at single / multiple load points as per AHRI guidelines.

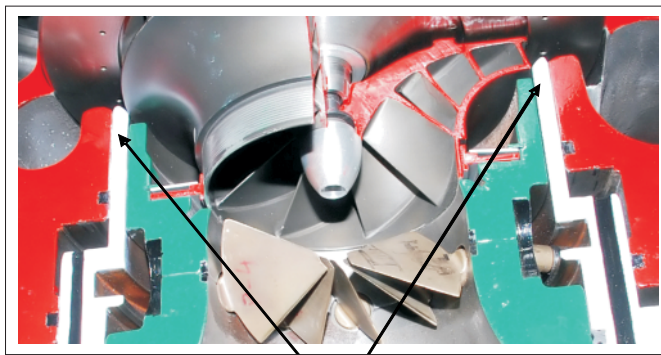
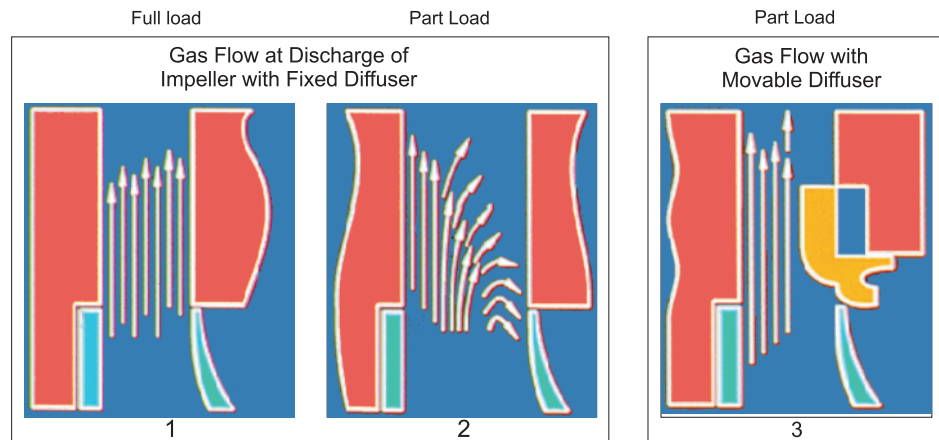
As a process of continuous improvement, Kirloskar chillers reserves the right to change the specifications and details in this catalog without any notice.

MANUFACTURING FACILITY



The Movable Diffuser Advantage:

One of the unique features of TURBOTEK® centrifugal compressor is the moveable discharge diffuser geometry. It lowers the surge point of the compressor, i.e. the point at which the compressor enters a stall or surge condition.

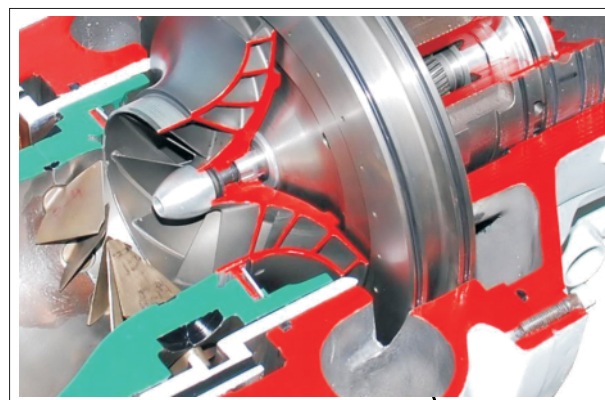


The movable discharge diffuser, closing the discharge area at low compressor loads

At low loads, reduced gas flow through a fixed discharge area results in low gas velocities and the gas can stall or surge in the impeller. When in a stall condition, the refrigerant gas is unable to enter the volute due to its low velocity and remains stalled in the impeller. In a surge condition the gas rapidly reverses direction in the impeller causing excessive vibration and heat. In our compressors the discharge area is reduced as load decreases to maintain gas velocity and greatly reduce the tendency to stall or surge.

The Liquid Refrigerant Injection Advantage :

A small amount of liquid refrigerant is taken from the condenser and injected directly into the compressor discharge area. The liquid droplets absorb sound energy and reduce the compressor's overall sound level. The liquid refrigerant evaporates thus reducing the discharge superheat of the refrigerant gas, in turn reducing its volume. Due to the reduced volume the gas velocity reduces, reducing the overall sound of the unit.



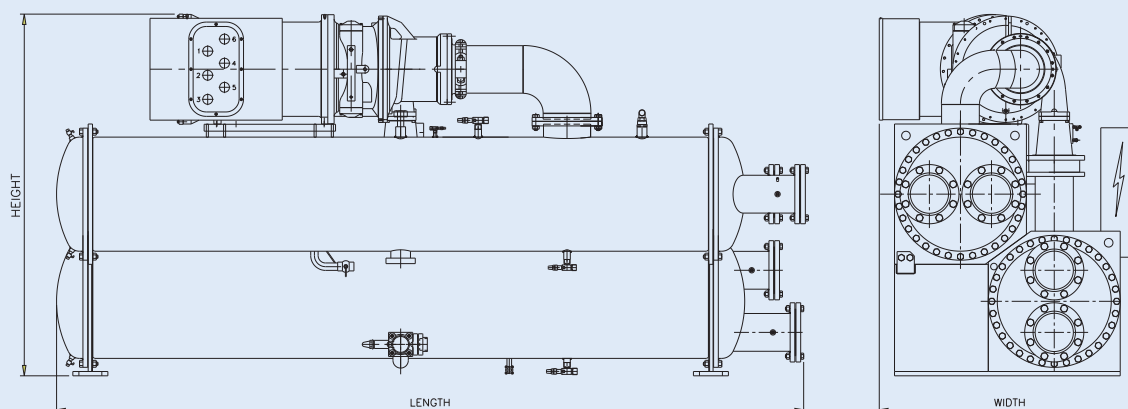
Radial Ports Inject Liquid Refrigerant in the Discharge Volute of the Compressor

The Lubrication System :

- TURBOTEK® Centrifugal Chillers use a motor driven gear pump for lubrication of and heat removal from compressor bearings, gears and internal parts.
- The Gear Pump provides lubricant under pressure to hydraulically operate the unloading piston for positioning the inlet guide vanes for capacity control.
- TURBOTEK® Centrifugal Chillers are supplied pre-charged with required quantity of Lubricating oil. KDC series dual compressor chillers have completely independent lubrication systems for each compressor.

Physical Data & Dimensions

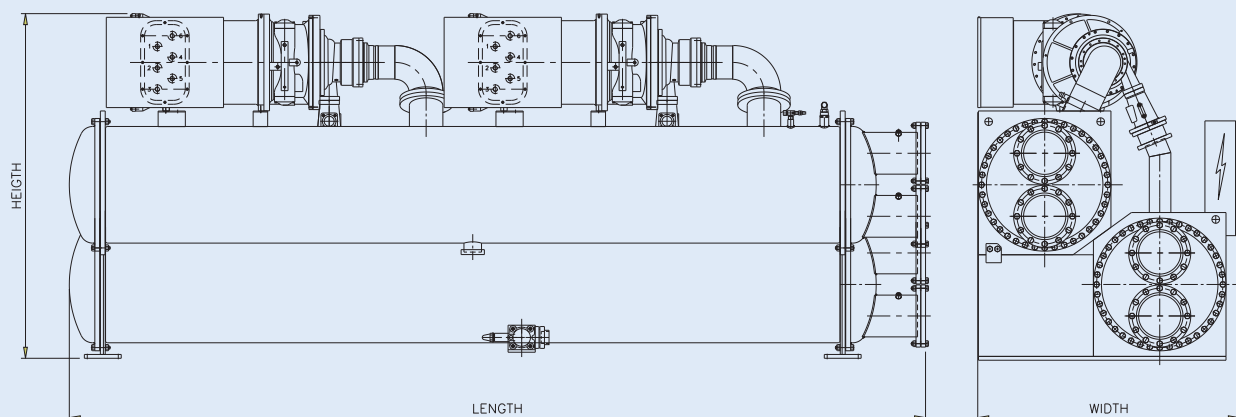
SINGLE COMPRESSOR - SERIES KSC



MODEL	VESSEL CODE		LENGTH (mm)	HEIGHT (mm)	WIDTH (mm)	SHIPPING WT. (Kg)	OPERATING WT. (Kg)
	EVAPORATOR	CONDENSER					
KSC063	E2212	C2212	4170	1920	1070	4800	5250
	E2612	C2212	4170	2030	1170	5250	5800
	E2612	C2612	4170	2190	1220	5700	6400
	E3012	C2612	4240	2290	1350	6300	7100
KSC079	E2212	C2212	4170	1890	1150	5150	5600
	E2612	C2212	4170	1980	1250	5600	6150
	E2612	C2612	4170	2110	1320	6000	6700
	E3012	C2612	4240	2240	1420	6650	7400
	E3012	C3012	4240	2370	1480	7300	8200
	E3612	C3012	4270	2390	1890	8350	9450
KSC087	E2612	C2212	4170	1980	1250	5600	6150
	E2612	C2612	4170	2110	1320	6000	6700
	E3012	C2612	4240	2240	1420	6650	7400
	E3012	C3012	4240	2370	1480	7300	8200
	E3612	C3012	4270	2390	1890	8350	9450
	E3612	C3612	4270	2670	2030	9350	10100
KSC100	E3012	C3012	4240	2470	1550	8800	9700
	E3612	C3012	4270	2520	1890	9800	10900
	E3612	C3612	4270	2520	2030	10800	12300
	E4212	C3612	4320	2520	2190	12000	13750
	E4212	C4212	4320	2590	2340	13300	15450
	E4812	C4212	4450	2700	2490	14550	17100
KSC113 / 126	E3612	C3012	4270	2520	1890	9850	10950
	E3612	C3612	4270	2520	2030	10850	12300
	E4212	C3612	4320	2520	2190	12000	13750
	E4212	C4212	4320	2590	2340	13300	15450
	E4812	C4212	4450	2700	2490	14550	17100
	E4812	C4812	4450	2700	2650	15900	19000

- The lengths given above are for 2 pass models.
- For heat exchangers and compressor combinations other than above or any additional details, please contact Kirloskar Chillers' local area office.

DUAL COMPRESSOR - SERIES KDC



MODEL	VESSEL CODE		LENGTH (mm)	HEIGHT (mm)	WIDTH (mm)	SHIPPING WT. (Kg)	OPERATING WT. (Kg)
	EVAPORATOR	CONDENSER					
KDC063	E2616	C2616	5430	2040	1470	9100	9940
	E3016	C3016	5450	2280	1620	10700	11850
	E3616	C3016	5520	2500	1810	12600	14100
	E3616	C3616	5520	2690	1890	14600	15950
KDC079	E3016	C3016	5450	2410	1460	11400	12550
	E3616	C3016	5530	2540	1810	13050	14550
	E3616	C3616	5530	2690	1890	14550	16400
	E4216	C4216	5560	2540	2350	20200	23400
KDC087	E3016	C3016	5450	2410	1460	11900	13000
	E3616	C3016	5530	2540	1810	13500	15000
	E3616	C3616	5530	2690	1890	15000	16850
	E4216	C4216	5560	2540	2350	20200	23400
KDC100	E3616	C3616	5530	2670	2830	19000	21100
	E4216	C4216	5560	2750	2870	22900	26100
	E4816	C4816	5710	2970	3130	26850	31300
KDC126	E4216	C4216	5560	2750	2830	22900	26100
	E4816	C4816	5710	2970	2870	26850	31300

- The lengths given above are for 2 pass models.
- For heat exchangers and compressor combinations other than above or any additional details, please contact Kirloskar Chillers' local area office.

Kirloskar TURBOTEK® water cooled centrifugal chillers are designed for indoor installation.

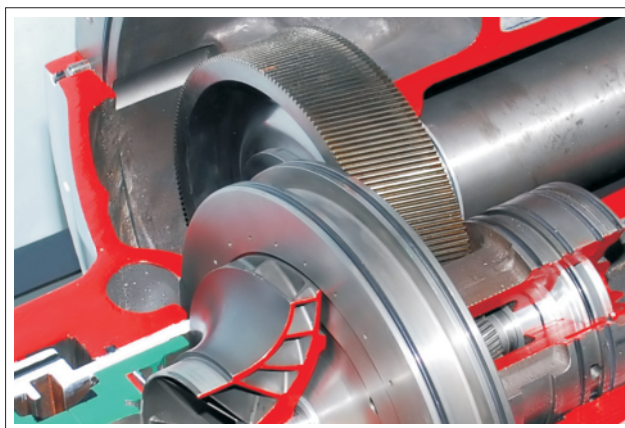
Versions : KSC – using single centrifugal compressor : 250 TR (850 kW) to 1200 TR (4200 kW)
KDC – using two centrifugal compressors : 500 TR (1750 kW) to 2400 TR (8400 kW)

FEATURES AND BENEFITS

The TURBOTEK® centrifugal chiller is packed with unique features which offers sustainable benefits to the customer.

The High Speed Advantage :

The centrifugal compressor is a gear-driven compressor and runs at high impeller rotational speeds but tends to have less vibrations than the larger, heavier, direct drive units. The reason – lower rotating mass than the larger direct drive compressors. In fact the vibrations are so low that you do not need any spring vibration isolators nor do you need to grout the chillers with foundation bolts. The Kirloskar centrifugal chillers can be installed on level surface using just rubber vibration pads without any foundation bolts. All you need to ensure that the level surface is capable of carrying the operating weight of the unit. Another gear drive advantage is the ability to select gear ratios that will provide the optimum impeller tip speed for a given application. Impeller speeds can be selected to provide sufficient pressure lift ability without the excessive tip speeds that lead to inefficient compressor operation.



The HFC 134a Advantage :

TURBOTEK® centrifugal chillers use HFC 134a, offering several advantages other than being an environmentally friendly refrigerant.

HFC 134a not only has zero ozone depletion potential, but is also safe and non toxic as per ASHRAE STD 34 for refrigerant safety. It also has a low GWP and a very low TEWI. It is a positive pressure refrigerant, meaning the pressures inside the entire system are above atmospheric. It not only eliminates the need for a purge unit, but also means no penalty on the performance due to non condensables or moisture entering the system. It also increases the bearings and motor life and eliminates annual oil and filter changes.

Electronic Expansion Valve

The TURBOTEK® Centrifugal chillers are equipped with the most advanced Electronic Expansion Valve to achieve accurate control of refrigerant mass flow, which translate into linear flow of refrigerant over entire operating range through continuous modulation.





The Dual Advantage :

The Kirloskar KDC chillers offers dual compressors on a single set of heat exchangers, offering key advantages, especially in large capacity requirements. It not only saves on the space requirements, but also offers excellent part load efficiency. Inherent redundancy, smaller footprint, lower installation costs, etc. are some of the key advantages offered by the dual compressor Kirloskar KDC TURBOTEK® centrifugal chillers.

OPERATING RANGE

Description	Unit of Measurement	Min	Max
Evaporator inlet water temperature	Deg C	8.0	20.5
Evaporator outlet water temperature	Deg C	4.4	15.5
Evaporator water temperature difference	Deg C	3.0	9.0
Condenser inlet water temperature	Deg C	18.0	40.0
Condenser outlet water temperature	Deg C	20.0	45.0
Condenser water temperature difference	Deg C	2.0	8.0
Minimum leaving glycol temperature	Deg C	- 8.0	
Maximum evaporator water operating pressure	kPa	1000*	
Maximum condenser water operating pressure	kPa	1000*	

* The maximum operating water pressure for the evaporator and condenser can be increased to 2100 kPa with special design, and can be provided as an option.

For any application not covered in the above range, special units may be supplied on request. Please contact your nearest Kirloskar Chillers office.

- **Centrifugal Compressor** : TURBOTEK® centrifugal compressor is a single stage gear driven semi – hermetic centrifugal compressor with high strength aluminum alloy impeller. The compressor is complete with gear drive and loading and unloading mechanism consisting of inlet guide vanes. The electric motor is an accessible hermetically sealed liquid refrigerant cooled squirrel cage two pole induction motor. The motor is available in a wide range of voltages suitable for most requirements across the globe including 50 and 60 Hz applications.
- **Evaporator** : The evaporator is a shell and tube type flooded evaporator with internally as well as externally enhanced copper tubes for better heat transfer. The standard water connections on the evaporator are either flanged or victaulic connections. The evaporator is available in either 1, 2 or 3 water passes as per customer requirements.
- **Condenser** : The condenser is a shell and tube type condenser with internally as well as externally enhanced copper tubes for better heat transfer. The standard water connections on the condenser are either flanged or victaulic connections. The condenser is available in either 1, 2 or 3 water passes as per customer requirements.
- **Lubrication System** : TURBOTEK® centrifugal chiller lubrication system consists of an unit mounted oil submerged oil pump for supplying pressurized oil to the hydrodynamic bearings. The lube oil system also drives the hydraulic loading / unloading mechanism for the compressor. Plate type water cooled oil cooler along with its controls is mounted in the lube oil system for cooling the oil to desired temperature. All the oil piping is made of copper and brazed in position as per the requirement. The chiller is supplied with the first charge of lube oil.
- **Refrigerant Piping** : The suction and discharge piping is fabricated from steel pipes. A pilot operated thermostatic expansion valve / electronic expansion valve is used for precise and accurate control of liquid refrigerant before entering the evaporator. Sight glasses are provided on the liquid line as well as the evaporator and condenser. The unit is supplied with the complete first charge of refrigerant R134a.
- **'K-Smart' Microprocessor Control Panel** : TURBOTEK® centrifugal chiller control system comprises temperature and pressure sensors, input / output boards, power supply board, main processor board and graphic touch screen user interface. The control panel also includes thermal winding protection unit for the compressor motor. The controller is designed to operate the chiller close to its design operating range and monitors various water and refrigerant temperatures, refrigerant pressures, oil temperatures and pressures, – motor current, etc. It also gives signal to the inlet guide vanes for opening and closing depending on the load on the chiller.
- **Thermal Insulation** : All the cold surfaces such as evaporator shell, head covers, suction line, compressor motor, etc. are insulated using 19 mm / 38mm thick closed cell nitrile rubber insulation.
- **Factory Performance Testing** : All TURBOTEK® centrifugal chillers are tested in the factory prior to dispatch on an AHRI approved test facility at 100% load. Part load performance tests as well witness testing at factory is possible.

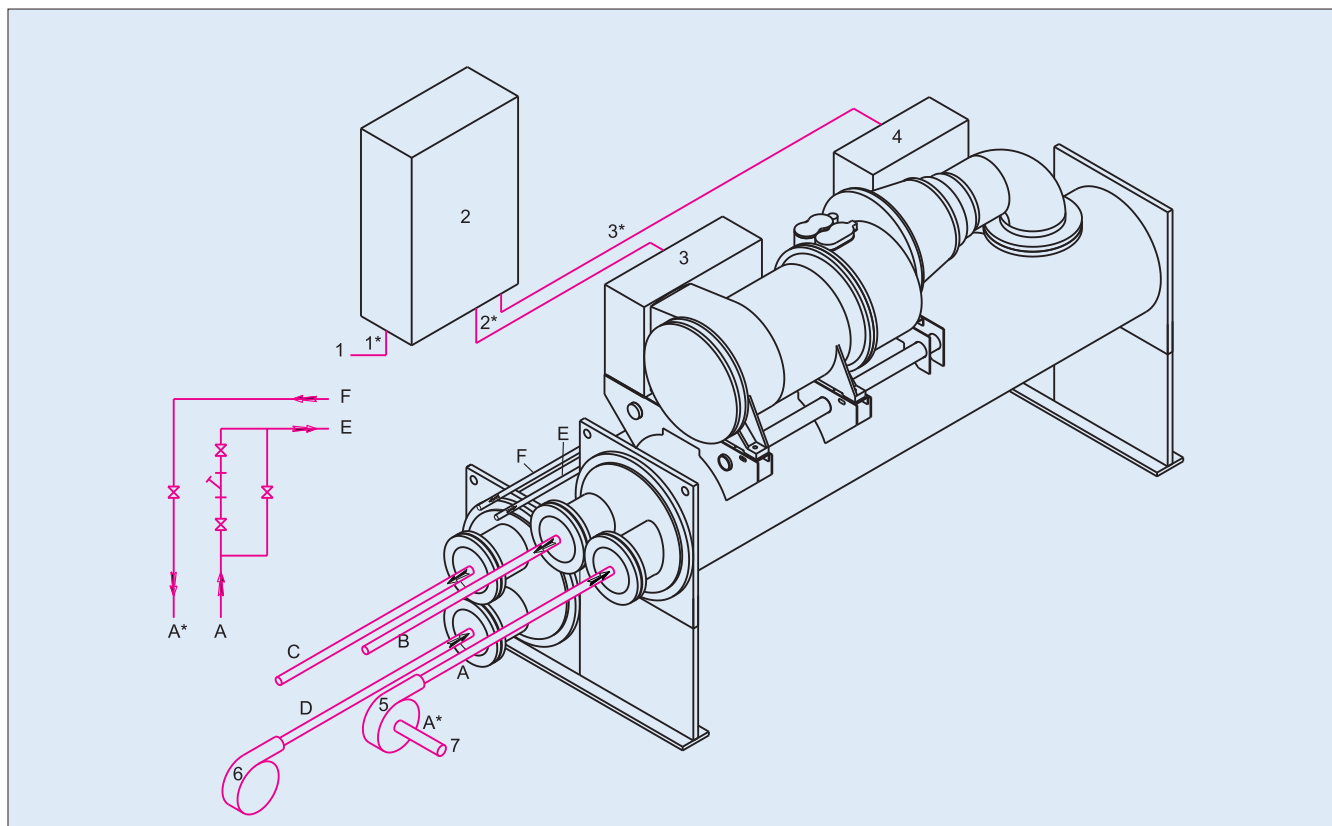
STANDARD FACTORY SUPPLIED ACCESSORIES

- TURBOTEK® centrifugal chiller unit is supplied with a free standing closed transition star delta starter for the compressor motor.
- Pressure differential switches are supplied as standard, factory mounted on the unit for the evaporator and condenser water side to ensure adequate water flow through the heat exchangers.
- Anti vibration rubber pads are supplied loose along with the unit for field installation.

WARRANTY

Every KSC and KDC chiller carries a standard warranty against manufacturing defects and faulty workmanship for a period of 12 months from the date of commissioning or 18 months from the date of dispatch, whichever is earlier. The warranty does not cover consumables such as filters, gaskets, refrigerant, oil, fuses, etc.

Standard Piping & Field Wiring Diagram



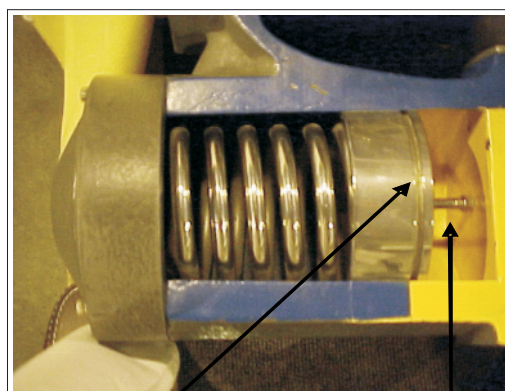
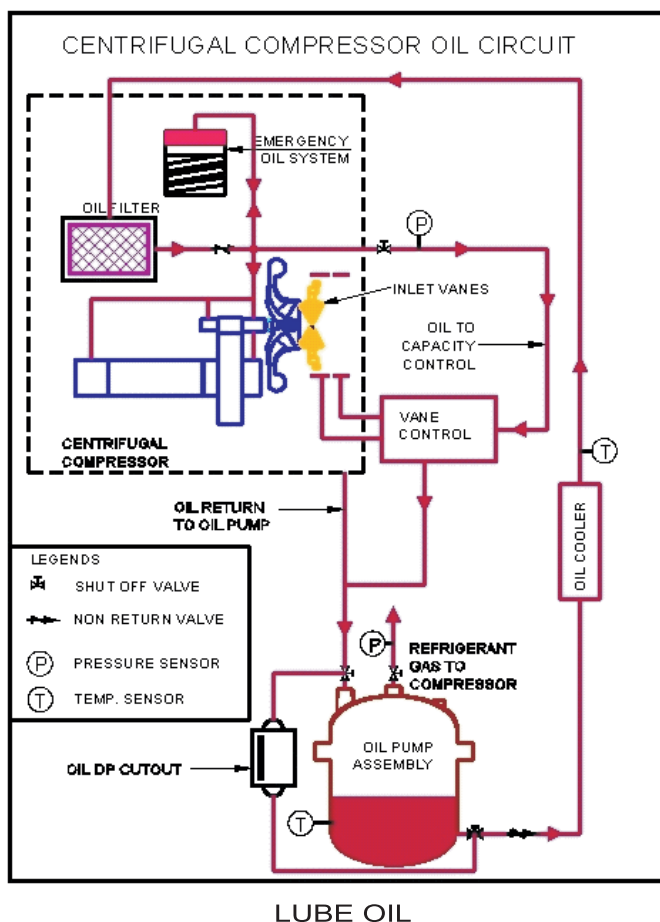
- | | | |
|--------------------|-------------------------------|----------------------------------|
| 1. Circuit Breaker | 2. Freestanding Starter Panel | 3. Compressor Motor Terminal Box |
| 4. Control Panel | 5. Chilled Water Pump | 6. Cooling Water Pump |
| | | 7. Chilled Water Pump Suction |

Line No.	Function	Description
1*	Incoming Supply to Starter Panel	415 V AC, 3 phase, 50 Hz , 1 neutral and 1 grounding OR 6.6 / 3.3 /11 kV AC, 3 phase, 50 Hz , 1 grounding
2*	Power cable to Motor Terminal Box	415 V AC, 6 leads (Minimum ampacity per conductor = 0.72 x RLA)
3*	Control cable from Starter Panel	4.0 Sq mm X 3 Core , Cu Armored 1.5 Sq mm X 11 Core, Cu Armored 1.0 Sq mm X 2 Core, shielded signal cable Additionally if chiller is connected to BMS 1.0 Sq mm X 2 Core, shielded signal cable 1.0 Sq mm X 11 Core, Cu Armored
A	Chilled Water Inlet from Pump Discharge	
A*	Suction of Chilled Water Pump	
B	Chilled Water Outlet to Load	
C	Condenser Water Outlet to Cooling Tower	
D	Condenser Water Inlet from Pump Discharge	
E	To Oil Cooler (tapping from main chilled water inlet to evaporator)	
F	From Oil Cooler (preferably connect to suction of Chilled Water Pump)	

Color Code - ■ Client's Scope ■ Kirloskar Scope

Notes :

- Client must use incoming power cable size as recommended by Kirloskar.
- Requirement of BMS connectivity should be informed during ordering stage.
- Strainers must be installed in condenser water, chilled water & oil cooler water lines.



Spring Loaded Piston

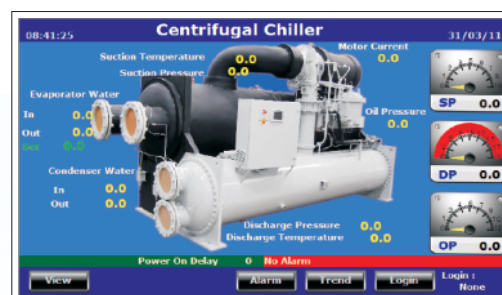
Lube Oil Cavity

- Unique 'coast-down piston' design provides lubrication to rotating parts till they reach stand still condition in the event of a power failure. The TURBOTEK® Centrifugal Compressor is equipped with spring loaded lubricant reservoir which can supply pressurized oil to the bearings during the coast down period of the compressor, thus avoiding any damage to the compressor.

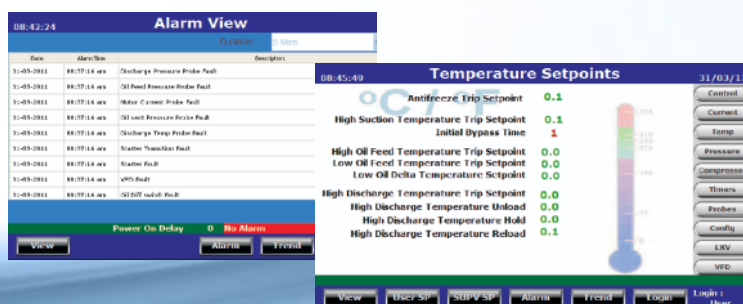
K-SMART Controller Advantages

- The Kirloskar TURBOTEK® Centrifugal Chiller comes with factory installed intelligent controller - K-Smart.

The Controller is a 16 bit microprocessor complete with set of temperature & pressure sensors, expansion boards, etc.



- K-Smart controller is equipped with easy to read backlit touch screen LCD Display, which displays all the important parameters such as refrigerant & oil pressures, chiller & condenser water temperatures, in a simple graphic design.
- It also ensures the safety and other unhealthy conditions, and trips the chiller in case these parameter exceed the set points of chiller by providing alarms of low & high refrigerant & oil pressure, high motor current.
- A unique feature is proactive controls, such as running of chiller in adverse condition, without compromising the unit safety
- Multilevel password protection for various set points, scheduling, auto lead lag are important & standard features of K-Smart Controller
- K-Smart can be easily interfaced with any BMS System either through BACnet / Modbus protocols.
- PC Monitoring of Chiller parameters from remote location is also possible



Some Of Our Esteemed Customers

Pharmaceutical Industry

- Lupin Ltd, Goa, Pune, Aurangabad
- Biocon Ltd, Bengaluru
- Serum Institute of India, Pune
- Strides Arcolad, Bengaluru
- Orchid Chemical & Pharma, Chennai

Textile Industry

- JBF Industries Ltd, Silvassa
- Indorama, Jakarta (Indonesia)
- Indo-Bharat, Jakarta (Indonesia)
- Garden Silk, Jolwa
- Dicitex Décor, Mumbai, Goa, Thane, Tarapur

Other Industries

- Reliance Industries Ltd, Kakinada
- Owens Corning India Ltd., Talaja
- Okaya Energy, Delhi
- Bosch Ltd, Nashik
- BHEL, Surat
- Aditya Birla Science & Tech., Mumbai

Government

- Nuclear Power Corp. of India
- Dept. of Atomic Energy
- Reserve Bank of India
- Bank Note Press
- Hindustan Aeronautics, Lucknow
- National Thermal Power Corporation

Hotels

- Hotel Marriott, Bengaluru
- JW Marriott, Sahar Mumbai
- Hotel Taj Mahal, New Delhi
- Hotel Taj Lands End, Mumbai

Hospitals

- Safardarjug Hospital, New Delhi
- Sri Ramchandra Hospital, Chennai
- RML Hospital, New Delhi
- Chettinad Hospital, Chennai

Commercial Buildings

- Prestige Tech Park, Bengaluru
- World Trade Center, Mumbai
- National Museum, New Delhi
- Indian Institute of Science Education, Pune

Malls

- Amanora Town Center, Pune
- Experia Mall, Mumbai
- Kochi Central Mall, Kochi
- Mani Pink Square, Jaipur



AMANORA PARK TOWN, PUNE



WORLD TRADE CENTRE, MUMBAI



SRM, CHENNAI



PRESTIGE TECH PARK, BANGALORE



DSK SUPINFOCON, PUNE



TAJMAHAL HOTEL, MUMBAI

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Use of the AHRI Certified™ mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.



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