



**TURBOLEV™**

Innovation for a Better & Greener Future

Water Cooled, Variable Speed, Oil Free Centrifugal Chillers with  
Magnetic Bearing Compressor

**KIRLOSKAR CHILLERS PRIVATE LIMITED**  
A Kirloskar Group Company



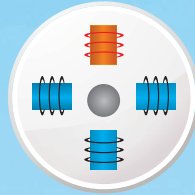
Enriching Lives

Kirloskar Chillers, a future-focused organisation, has been at the forefront of HVAC technology since it commenced operations in 1996. Periodically introducing innovative products & solutions for comfort cooling, process cooling and heating applications, the Company has consistently demonstrated its commitment to achieving customer satisfaction in every aspect of its business.

In line with the Kirloskar Group corporate philosophy of bringing out innovative and technologically advanced products, Kirloskar Chillers introduces the **TURBOLEV™** range of water cooled variable speed Centrifugal Chillers using compressors with magnetic levitation bearings.

Equipped with 'next-gen' centrifugal compressors and certified in accordance with AHRI 550/590 & AHRI 551/591, these chillers offer highly energy efficient, reliable and extremely quiet operation, becoming the preferred choice for commercial spaces such as hotels, hospitals and in the IT industry (including data center cooling) as well as a multitude of process cooling and air-conditioning applications in various industrial segments.

In the years to come, **TURBOLEV™** chillers would be the logical solution for buildings proposing to opt for Green Building rating in accordance with the USGBC / IGBC or 'GRIHA' certification systems.



## Technology

The **TURBOLEV™** series of chillers uses the principle of magnetic levitation on applying an electric field, adapted to suit the chiller application.

Magnetic levitation, already a proven technology in aerospace, oil and gas exploration and transportation applications, is combined with variable-speed centrifugal compression and supported by digital electronics to run the compressor without any contact between the rotating dynamic and static parts, allowing the compressor to operate in a frictionless environment so as to achieve the highest efficiencies.

Centrifugal compression offers substantially higher isentropic efficiency compared with other compressor designs. Used most effectively in a centrifugal compressor, a variable-speed drive further enhances part load efficiency. The combination of this technology with magnetic levitation results in a machine with an unparalleled bouquet of benefits – extremely quiet operation and very high efficiency without the need of lubrication which is so essential in conventional compressors.



## Key Benefits of TURBOLEV™ Chillers:



### Oil-free Operation:

In conventional chiller designs, oil is used for lubrication of the compressor bearings. A part of this oil carries over to the heat exchangers, thus decreasing their heat transfer efficiency, leading to a negative impact on chiller performance. These chillers need a complex oil recovery mechanism to return the oil to the compressor.

**TURBOLEV™** chillers operate without the need for lubrication of the compressor bearings owing to their non-contact design, thus this 'oil-free' operation eliminates the issues related to oil lubrication

- No oil management system hardware required such as oil separator, oil heater & cooler, oil pump, oil filter & associated controls.
- No oil coating on tube surfaces, drastically improves heat transfer efficiency.
- Oil-free operation reduces maintenance activities & downtime costs - no oil changes or filter cleaning / replacement required.
- No oil recovery issues even when operating continuously at extremely low loads.



### Outstanding Energy Efficiency:

Most chillers operate for a substantial part of their life at various conditions of part load. **TURBOLEV™** chillers with in-built Variable Speed Drive (VSD) and 2-stage compressor design achieve excellent full load & part load performance, resulting in substantial savings in operating costs.



### Soft Start:

Soft start module significantly reduces in-rush current at start up, provides advantages to line power systems & reduces thermal stresses on the stator. The start-up in-rush current of compressors used in these chillers is only 2 Amps.



### Liquid Refrigerant Level Control

Liquid level in condenser is maintained slightly higher to ensure effective cooling of power electronics & VSD, making them reliable & durable.



### Exceptionally Quiet Operation:

Due to the absence of metal to metal contact, as occurring in chillers with conventional bearings, sound levels are extremely low, i.e. < 73 dbA, and vibration levels are virtually non-existent. The silent operation makes **TURBOLEV™** chillers a compelling choice where silence is particularly desirable, e.g. air-conditioning of hospitals, schools or installations located close to residential areas.



### Compact VSD:

Refrigerant cooled VSD reduces the size of the unit, making the panel compact as compared with conventional air cooled VSDs.



### Surge Line Control:

For conventional centrifugal compressors, surge detection & control is the main challenge. For compressors used in **TURBOLEV™** chillers, accurate performance mapping is carried out so as to precisely predict the impeller surge line, enabling it to run within a safe bandwidth.



### Environmentally Responsible:

Offered with ozone-friendly refrigerant HFC-134a with no phaseout schedule. High energy efficiency of these chillers further reduces the carbon footprint.

# Design & Constructional Features of TURBOLEV™ Chillers:



## Magnetic Bearings:

Compressor rotor shafts and impellers levitate during rotation & float on a magnetic cushion. Two radial & one axial magnetic bearings are employed to make rotor - impeller system stable. Centered rotation is instantaneously self-corrected & maintained.

Sensors provide real-time feedback of orbit information of the shaft to digitally controlled bearings which enable shaft to quickly self-align. When not powered, the rotor is supported by touchdown bearings.

## Variable Speed:

Compressor motor speed changes in accordance with heat load and / or condenser water entering temperature. With reduction in speed, there is significant reduction in energy consumption. Part load efficiency is so outstanding that TURBOLEV™ consume approximately 30% less energy than screw chillers of equivalent capacity.



## High Performance Heat Exchangers:

Condensers & evaporators use internally & externally enhanced copper tubes which translate into superior heat transfer. Flooded evaporator designs are inherently more efficient. Evaporator & suction line are insulated with 32 mm thick closed cell nitrile foam to minimize losses & improve efficiency as well as prevent sweating in humid climates.



## Electronic Expansion Valve:

Advanced electronic expansion valves ensure accurate control of refrigerant flow to the evaporator based on suction superheat, and ensure proportionate refrigerant flow over the entire range of capacity modulation.



## K-Smart Controller:

Intelligent K-Smart controller is an advanced microprocessor based controller with extremely fast processing speed. A 13" LED touch screen displays all essential parameters such as, refrigerant & oil pressures, evaporator & condenser water temperatures, power input parameters etc. The controller intelligently ensures healthy operating conditions & protects chiller from possible unsafe conditions with respect to input power or operating pressures or temperatures.

Multilevel access control protects the chiller from operation by unauthorized personnel. K-Smart controller is interface-friendly for Bacnet, Modbus, LonWorks protocols for BMS integration.

## K-Smart Plant Manager:

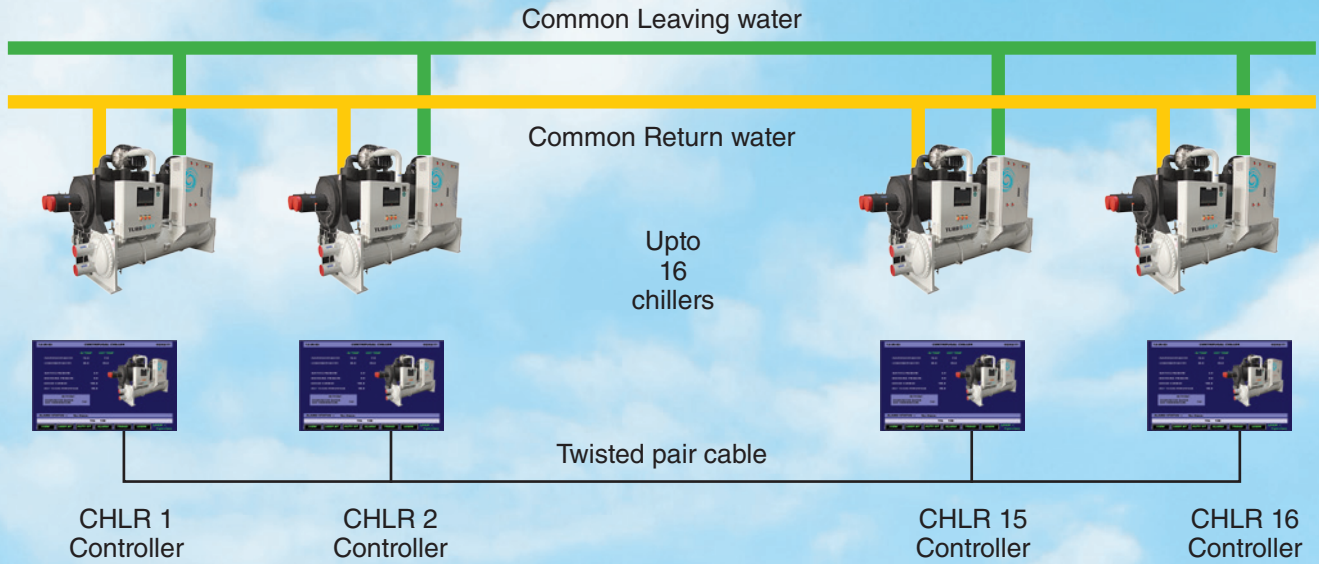
An advanced PLC-based controller can be offered for multiple chiller installations for controlling the chillers and related equipment in the plant such as primary pumps with VFDs, motorized valves, cooling tower fans, etc.

The benefits of K-Smart Plant Manager are:

- Energy optimization by operating chillers within the best efficiency band.
- Flexibility in adding features such as data logging, plant scheduling, remote monitoring, etc.
- Customization to achieve the level of automation desired by the customer.

## 'K-Smart' Multi Chiller Control:

'K-Smart' controller for all Kirloskar chillers has built in capabilities of controlling multiple chillers.



## Technical Datasheet:

MODEL	UOM	KCM 300.14	KCM 350.14	KCM 400.14	KCM 500.14	KCM 300.24	KCM 350.24	KCM 400.24	KCM 500.24
Cooling Capacity	TR	95	131	156	187	191	263	312	374
Compressor Type	Centrifugal with VSD								
No. of Compressors	No.	1	1	1	1	2	2	2	2
Capacity Control Mechanism	IGV and Speed Variation								
Approx. Ref Charge	Kg	160	170	175	195	225	300	385	395
<b>EVAPORATOR</b>									
Evaporator Type	Shell and Tube - Flooded Type								
Evaporator Tube Side Water Volume	Ltr	80	90	100	125	155	175	245	285
Water Nozzle Size	NB	125	125	125	150	200	200	200	200
<b>CONDENSER</b>									
Condenser Type	Shell and Tube - Flooded Type								
Condenser Tube Side Water Volume	Ltr	100	110	120	135	150	245	235	300
Water Nozzle Size	NB	125	125	125	125	150	150	200	200
<b>APPROX. OVERALL UNIT DIMENSIONS</b>									
Length	mm	3340	3340	3340	3340	3375	4215	4385	4385
Width	mm	1150	1150	1150	1285	1400	1400	1475	1475
Height	mm	1850	1850	1850	1950	2025	2025	2275	2275
<b>APPROX. UNIT WEIGHT</b>									
Shipping Weight	Kg	2200	2250	2300	2400	2455	3150	3950	4205
Operating Weight	Kg	2380	2450	2520	2660	2760	3570	4430	4790

### Note:

Cooling capacities declared above are at the following conditions:

- 1) Evaporator water Inlet / Outlet temperatures 12 / 7°C respectively
- 2) Condenser water Inlet / Outlet temperatures 30 / 34°C respectively
- 3) Input Power supply: 400 V / 50 Hz / 3-Phase



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