

### **DIL-FREE** TURBO COMPRESSORS

### Safety Precautions For your safety, be sure to read the user's manual before using.

- •Information contained in this catalog is that as of October, 2017.
- Note that specifications, dimensions and appearance contained in the catalog may be changed without notice for improvement.
   Note that the color tone of the product on the catalog may appear different from that of the actual product for reasons
- attributable to printing.
- Note that the addresses may be changed.TRA, TRE and TRX are trademark of IHI Corporation.

### **IHI Rotating Machinery Engineering Co.,Ltd.**

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# Your Best Choice, IHI Turbo Compressors.



### IHI, making turbo compressor history

The history of IHI turbo compressors starts with a licence agreement in 1970.

Since then, IHI has accumulated continuous technological innovation and built its own technologies, developing the whole product line-up from original designs.

Further, in 1994, IHI succeeded in developing the world's smallest class of turbo compressor, the Tx series. In addition to strengthening the market value of compact turbo compressors,

this product also enhanced the IHI product line-up.

High performance and product quality can be seen in IHI's rich experience and proven track record.

Our development concept is "Always looking ahead from a user perspective",

and we are always trying to find benefit for our customers.

There are over 7,000 IHI turbo compressors at work throughout the world today.

IHI is continuing to make turbo compressor history.

### Energy-saving

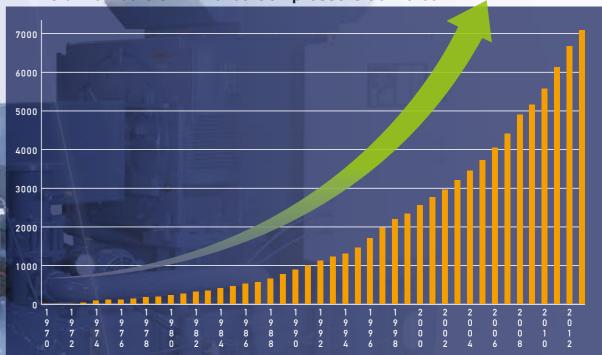
World class efficiency achieved by utilizing our advanced rotating machinery technology. IHI turbo compressors bring high level energy saving to production operations, meeting today's stringent energy saving needs.



### User Customization

In the manufacturing workplace, compressed air needs are constantly changing. IHI matches optimal design to your production operation, in order to offer you the best choices.

### **Total numbers of IHI Turbo Compressors delivered**



### 100% Oil-Free Air



IHI turbo compressors have passed the latest ISO8573-1 Class 0 oil free certification, which is the highest grade for compressed air's oil free quality, by an independent third-party test house TÜV in Germany.

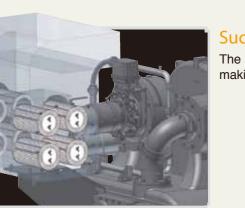


### Easy Maintenance

IHI turbo compressors have a simple and robust design, in order to reduce maintenance costs. We have worked hard to simplify day to day maintenance procedures so that our products can provide a stable supply of compressed air throughout the year, with minimal maintenance.

## **IHI Turbo Features**

### [New]Microprocessor Control Panel \*Except for Tx-M Model



### **Suction Filter**

Gear Case -

Inlet Guide Vane

The suction filter uses a cartridge type element, making it very easy to maintain.

Air Discharge Outlet —

Breather Filter -

**Drive Motor** 

MODEL:TRE

IHI

### Operating Conditions

For ease of daily monitoring, key measurements, data and operating conditions can be checked via the control panel's easy-to-read graphics.

### ■ Trend Graph

The control panel provides a graphical interface that allows operators monitor key trends (discharge air pressure, motor current and shaft vibration), helping them to keep on top of operational conditions and plan maintenance routines.

Measurement data can be recorded in the memory for each of the last five of both serious and minor shutdowns, along with the time of shutdown, and can be used for the rapid investigation of the shutdown cause.

### **■** Causes & Countermeasures

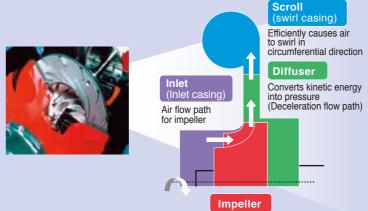
In the event of a failure, causes and possible countermeasures can be checked onscreen, providing operators with clear guidance.

### ■ Data Communication

It makes eisier to check the operation condition by support of MODBUS® RTU.

 $\ensuremath{\text{*MODBUS}}^\ensuremath{^{\mathbb{B}}}$  is registered trademark of Schneider Automation Inc.

## **How turbo compressors work**



M 44 4 5 5 200MM 200MOUT

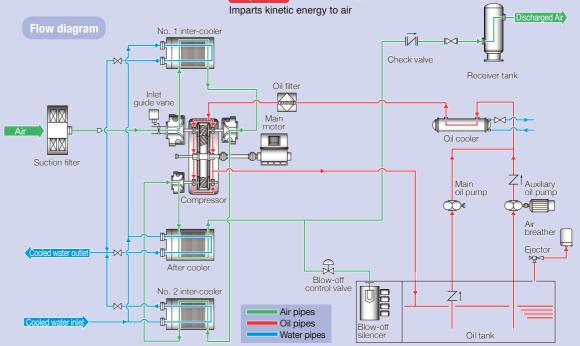
A turbo compressor is a compressor that gives kinetic energy to gas or air, etc., through the centrifugal force of an impeller, and then converts the kinetic energy into pressure through a deceleration flow path that includes a diffuser. The pressurized air is cooled by a high performance cooler directly below before proceeding to the next step, thus maintaining a high level of efficiency.

### **Compressor Frame** (one-piece gear case and air coolers)

Air Coolers

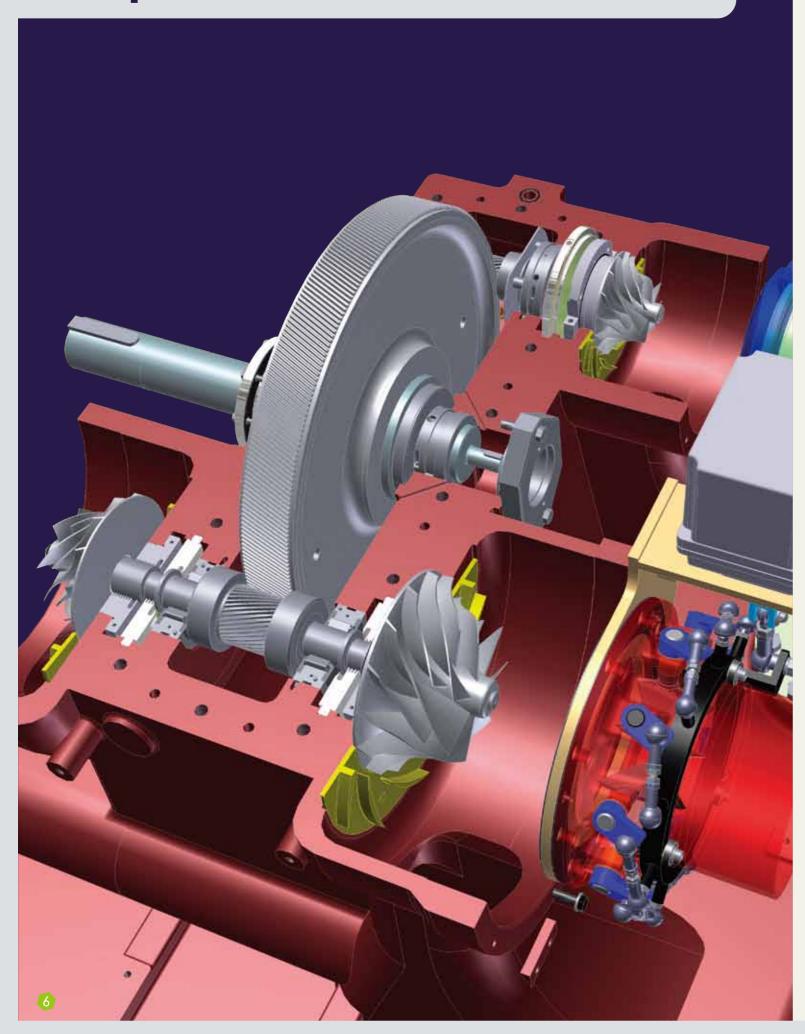
The gear case and air coolers are cast together in a single, robust and compact construction. The compressor unit and air paths are surrounded by a thick, seamless wall that is also highly effective in cutting noise.





# Simple & Reliable

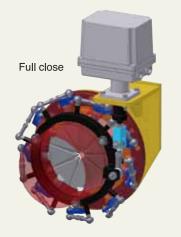


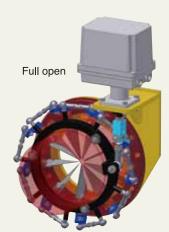


### Inlet guide vane (IGV)

With the inlet guide vane (inlet throttle valve), air supply can be controlled in accordance with consumption. Further, the inlet guide vane enhances efficiency by providing preswirl flow to the air taken into the compressor in the same rotative direction as the impeller.

\*Except for Tx-M Model





### Tilting pad journal bearing

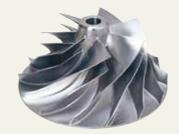
Tilting pad journal bearings, which realize high-speed and stable operation, are adopted. Pad tilt will change in accordance with bearing load changes, which provides excellent compliance with load changes in the compressor.





### Impeller

The three dimensional impeller, designed by making the fullest use of IHI's extensive experience and cutting edge CFD technology, enables world top class efficiency and a wide operating range. The use of both titanium and high strength stainless steel means there is no need to worry about wear or corrosion.





### Diffuser

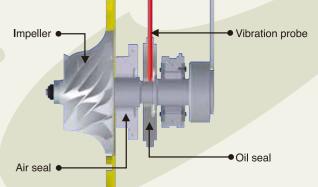
The velocity energy imparted to air by the rotation of the impeller is efficiently converted into pressure energy by the diffuser. Because the impeller and diffuser are analysed together using cutting edge CFD technology, air turbulence is kept to an absolute minimum, and operating noise is extremely low.





### Labyrinth seal

For the air seal and oil seal, the labyrinth type, which has no contact with the shaft, is adopted, so there is no wear resulting from operation and no periodic replacement is required.

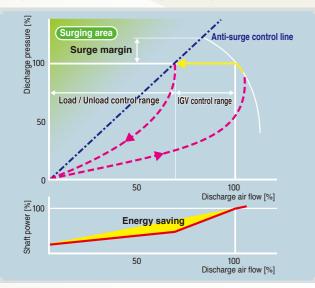




## Value in Use

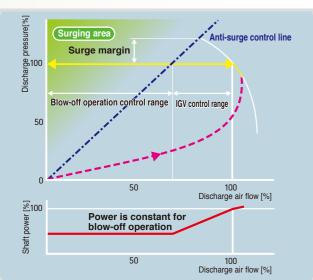


A dual control system created by combining advantages of "constant-pressure control" and "load / unload control". Energy saving operation has been realized with efficient compressor control at each operation point.



### 2 Constant pressure + Anti-surge control

Even if consumption of air would change between 0% to 100%, compressor keeps stable condition at a constant pressure.



### 3 IGV synchronous capacity control (option)

In case of controling the capacity of more than one compressore, IHI offers our IGV synchronous capacity control for multiple compressors.

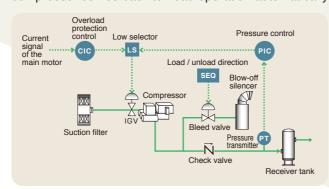
This control realizes the wider constant pressure cotrol range and decrease of unload time for Energy saving by combination of IGV constant pressure control and the Group control panel.

IGV control range (constant-pressure control range)
 Discharge air flow is adjustable by IGV Opening/Closing.
 IGV is controlled to keep discharge line pressure constant.

### · Load / Unload control range

When consumption of air flow decreased, compressor turns into Unload operation automatically.

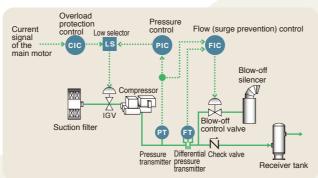
And next, when discharge line pressure decreased, compressor comes back to Load operation automatically.

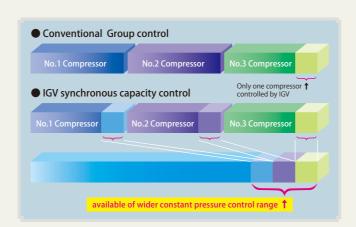


### Energy-sav<mark>ing</mark>

IGV is controlled according to an amount of plant air consumption. In this case, discharge pressure is kept constant and operation condition of compressor is kept stable too.

When air consumption become lower than the throttling range of IGV, discharge pressure is kept by controlling of blow off control valve.







### Optimal impeller design

Optimal impeller design, matching the required airflow and pressure, contributes to energy saving.









### Various options

To meet the needs of individual customers, we offer a variety of options, such as enclosures and Group control panel, etc.







### Tilting pad journal bearing

Tilting pad journal bearings are used for the bearings of the high speed rotation impeller. Since this is a non-contact bearing, there is no wear, and the life of the part is

semi-permanent.

\*Depending on the conditions of usage, the inner pad only may need to be replaced.



### Impeller

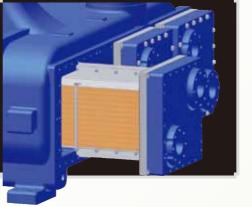
The impeller is made from titanium and stainless steel, which are very resistant to corrosion and wear. Because there is no need for periodic replacement, maintenance costs can be kept low.





To ensure the stable operation of the compressor, the coolers need to be cleaned periodically. The air coolers mounted on IHI turbo compressors are designed to allow water to flow along the pipes, and their construction makes cleaning very easy.

◆Cooler fin and cooler tubes



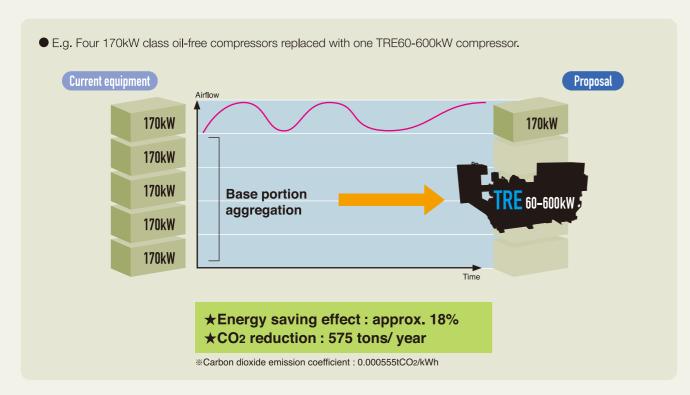


# **Energy-saving**

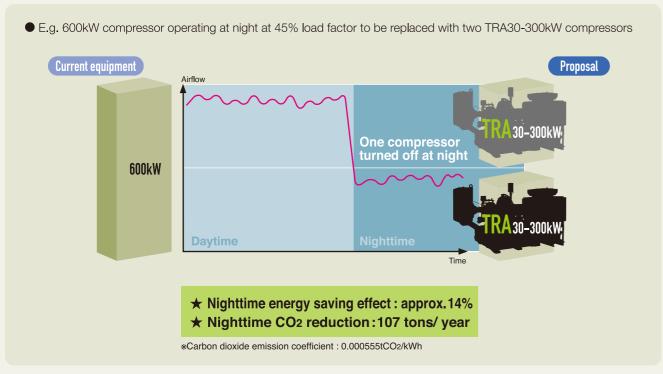
### CHHITurbo Compressor

### **Base load machine selection**

**Aggregation** Case where multiple small and medium sized compressors are used with little airflow fluctuation



**Optimization** Case where a large compressor is used with large airflow fluctuation

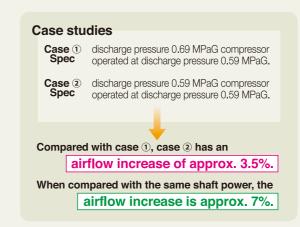


Note: assuming average annual operating time of 8,000 hours

### Optimal pressure settings

IHI turbo compressors are available in a wide range of variations to match the plant air pressure.

Discharge pressure 0.69 MPaG(red curves in figure at right)
Discharge pressure 0.59 MPaG(green curves in figure at right)



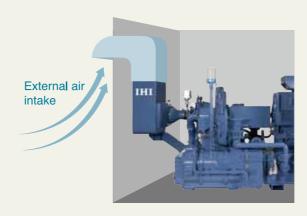
## Control system selection (IGV energy saving effect)

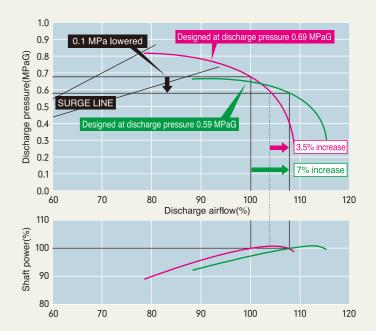
The compressor's inlet has vanes whose angles can be changed in order to reduce the impeller air intake. This is more effective than using a butterfly valve to add pressure loss in order to reduce airflow, and if the same airflow is discharged, the dynamic power can be kept low.

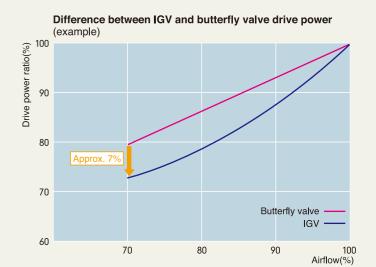
### Intake temperature selection

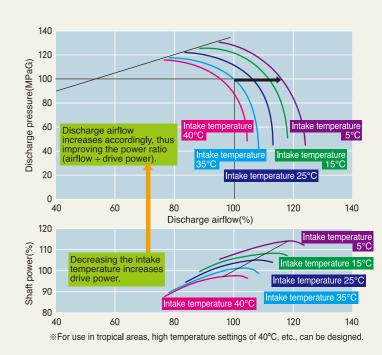
IHI turbo compressors are designed to operate under the severe/tough summer conditions of ambient temperature 35°C and relative humidity 80%. Lowering the temperature and humidity will improve the drive power ratio accordingly. Therefore, energy saving effect is also obtained by using an "external air intake", sucking in cool air from outside.

\*\*The motor overload prevention function prevents air intake if the airflow exceeds the motor's maximum capacity.

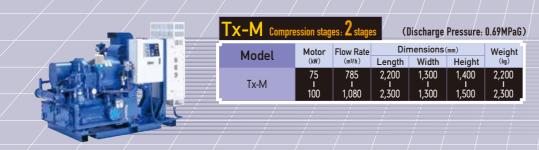








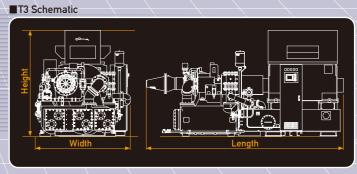
# IHI Turbo Compressor Line-up

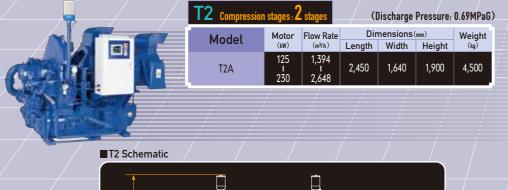


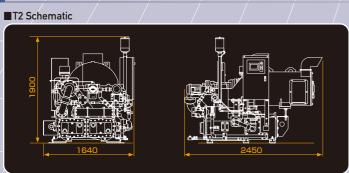


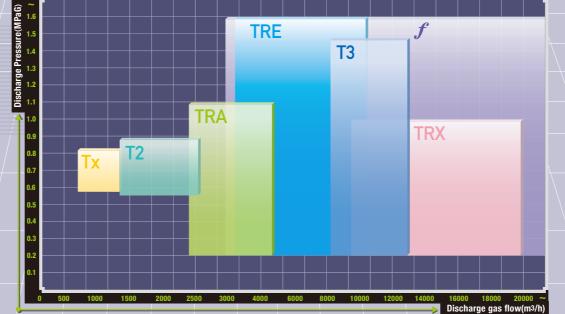




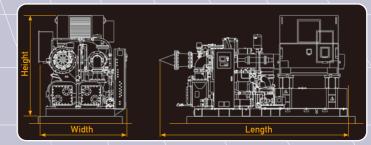








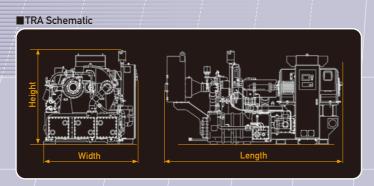




	TRA Compression stages: 3 stages			(Discharge Pressure: 0.69MPaG			
l	Model	Motor (kW)	Flow Rate	Din Length	nensions( Width	mm) Height	Weight (kg)
	TRA 20 I TRA 40	250 I 450	2,470 I 4,940	3,700 I 4.000	2,000	2,000 I 2,200	7,100 I 8,500



TRE Compres	])	Discharge	Pressure:	0.69MPaG)		
Model	Motor (kW)	Flow Rate (m³/h)	Dimensions(mm)			Weight
Model			Length	Width	Height	(kg)
TRE 30	375	3,600	4,100	1,950	2,000	8,300
TRE 90E	950	10,550	5,200	2,300	2,800	13,500



■TRE Schematic

	TRX Compres	(Discharge Pressure: 0.69MPaG)					
	Model	Motor (kW)	Flow Rate (m3/h)	Dimensions(mm)			Weight
				Length	Width	Height	(kg)
	TRX 90	900	9,500	4,800	2,100	2,150	13,500
	TRX 180	1.800	20.000	1 6.000	1 2.300	1 3.300	1 20.000

The above tables display flow rate ranges at typical discharge pressures.
 Flow rate(m³/hr) is converted to compressor suction conditions as indicated below.
 Reference conditions: Atmospheric pressure: 0.1013MPa(abs.)

Suction pressure: 0.0993MPa(abs.)
Suction temperature: 35°C
Relative humidity: 80%

4. Flow rate is measured at inlet point.





Starting out as a shipbuilding company in 1853, IHI has contributed to industrial development as one of Japanese leading companies. Today, IHI is developing its business in a number of fields, including resources, energy, Rotating machinery, aero engine, space, etc., and is putting its technological strength to use in a wide range of industrial fields.

Also, as a global company with a vast network of over 100 overseas affiliate companies, we deliver our products to customers in countries and regions throughout the world.

Utilizing our superior technical strength and extensive network, IHI will continue to contribute to industrial development and improved customer value, working as an essential partner to our customers.

### Company Profile

<ul><li>Founded</li></ul>	1853
Capital	¥107,165 million
<ul><li>Employees (consolidated)</li></ul>	29,494 (as of March 31, 2016)
• Works	8
Branches in Japan	8
Overseas representative offices	14
Affiliated companies in Japan	73 (as of March 31, 2016)
Subsidiary companies	52
Associated companies	21
Overseas affiliated companies	158 (as of March 31, 2016)
Subsidiary companies	125
Associated companies	33
Consolidated net sales	¥1,539,388 million (Year ended March 31, 2016)

Changes in sales volume	million yen
March, 2016	1,539,388
March, 2015	1,455,844
March, 2014	1,304,038
March, 2013	1,256,049
March, 2012	1,221,869
March, 2011	1,187,292
March, 2010	1,242,700

### When making inquiries, please provide the following data:

- 1. Capacity
- 2. Discharge conditions: pressure and temperature
- 3. Suction conditions: ambient pressure, temperature and humidity
- 4. Coolant conditions: water quality and temperature
- 5. Power supply data: frequency and voltage
- 6. Usage and other operational information
- 7. On-site environmental conditions (outdoor or indoor)
- 8. Other requirements

Note: To obtain the most suitable compressor for your needs, please provide the most detailed information possible

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