

# Compressor development and ecology

## Conventional 2-in-1 scroll

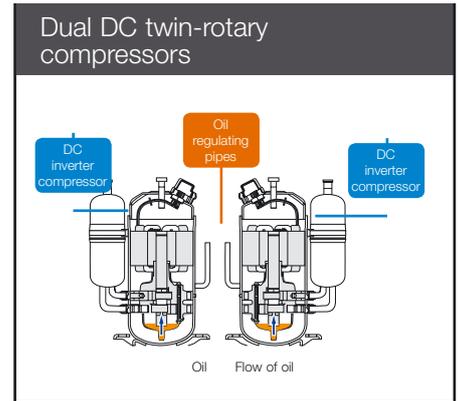
This consists of one inverter-driven compressor and one fixed-speed compressor. Each scroll compressor comprises a fixed scroll (spiral) and an oscillating scroll. The oscillating scroll fits within the fixed scroll. Refrigerant is drawn from the outside of the meshing spirals and squeezed towards the centre of the scrolls, thereby pressurising the refrigerant.

To minimise leakage, the contact force required between the two scrolls is considerable and the scroll surfaces must be lubricated. At low compressor speeds lubrication efficiency is reduced, resulting in increased compressor wear.

## SMMS-SHRM Dual DC Twin-Rotary MiNi-SMMS DC Twin-Rotary

This consists of two inverter-driven twin-rotary compressors. A twin-rotary compressor has two fixed compression chambers. An off-centre roller orbits each chamber to squeeze the refrigerant. The two rollers are both mounted on the same shaft, but are offset to provide counter balance to each other. The contact force required between the roller and chamber wall is lowered.

This means that smaller bearings can be used and lubrication demand is reduced, saving weight and making this type of compressor more suited to lowspeed operation.



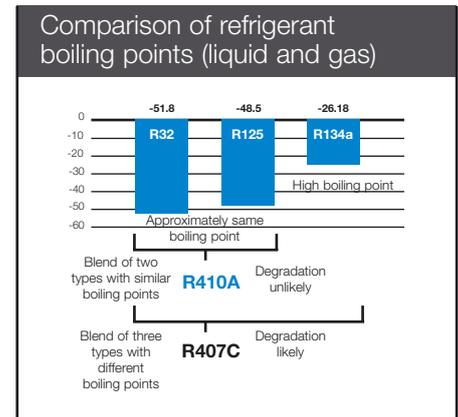
## Leading Technologies

Compressor	2-in-1 scroll	DC twin-rotary	Benefit
Efficiency	Standard	20% improved	Greater energy savings
Weight (comparative, %)	92 kg x 1 (100%)	25.2 kg x 2 (55%)	Lighter and more compact
Volume (comparative, %)	50 l (100%)	15 l (30%)	Higher reliability
Lubrication requirement	(100%)	(2.5%) = 1/40	

## Benefits of using R410A refrigerant.

Incorporating the energy-efficient, non-ozone-depleting R410A refrigerant in air conditioning systems delivers multiple benefits:

- zero ozone-depleting potential.
- significant increase in energy efficiency.
- reduced pressure loss for improved performance.





## Toshiba – focused on energy conservation.

Toshiba has made a significant investment into researching and developing technologies that focus on protecting the environment and saving energy. The inverter control used for Toshiba's VRF range incorporates more, smaller steps to deliver only the required power and achieve the temperature desired by the occupant much faster.

The increase in control steps ensures a more precise and stable temperature and eliminates power surges common in standard, non-inverter systems. This increases energy efficiency, compressor life and user comfort. Toshiba aims to:

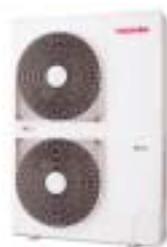
- Reduce CO<sub>2</sub> emissions and limit global warming.
- Recycle and reduce waste emissions.
- Ensure 90% of the components used in the R410A VRF are recyclable.
- Design only products optimised for HFC refrigerants.
- Reduce power consumption with each product feature.
- Use lead-free solder.

### Compact and modular in design.

The extremely compact design of the new MiNi-SMMS guarantees a significant volume reduction for the outdoor unit and enables installation on balconies and patios to be fast and simple.

The SMMS and SHRM outdoor units have the same modular design and dimensions, even with different capacities.

This is of particular benefit when an application requires a combination of the two systems, the result is a smart and consistent appearance on site. The units can also fit into a standard lift making installation quick and easy.



### ISO 14001: environmental care from manufacturing

Area	Sites	Date Certified	Certifying body
Japan Thailand	Toshiba Carrier Fuji site Toshiba Carrier Thailand	Obtained April 1997 (ISO 14001) Obtained May 1998 (ISO 14001)	JACO (Japan Audit and Certification Organization for Environment and Quality) AJA (Anglo Japanese American)