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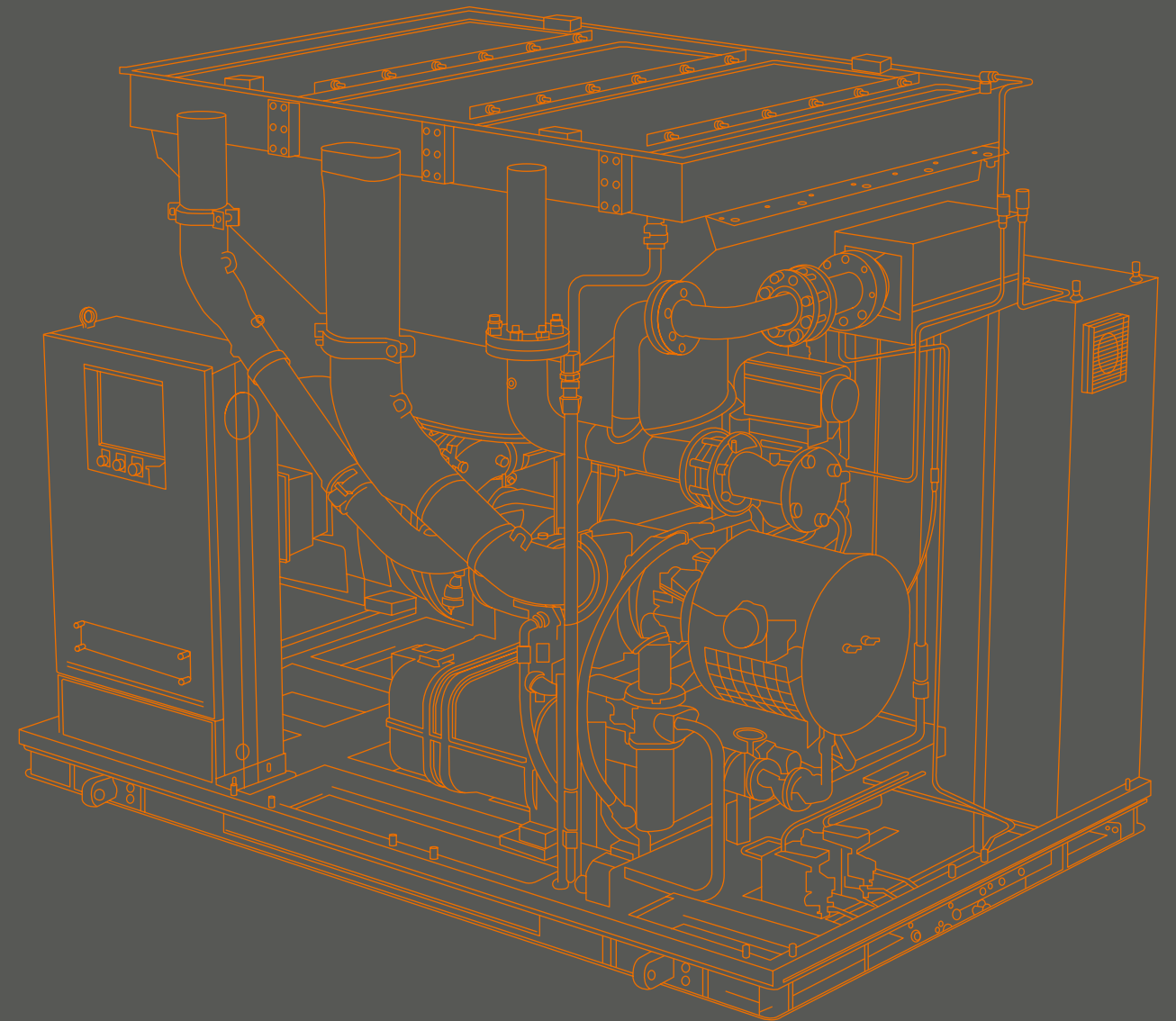


Present State of Hanwha Power Systems
Turbo Compressor Authentication

- ISO9001
- ISO14001
- ISO8573-1 Class0
- OHSAS18001
- CE
- ASME
- A Member of CAGI

The information in this publication is
subject to change without a notice.

AIR-COOLED TURBO AIR COMPRESSOR SA SERIES



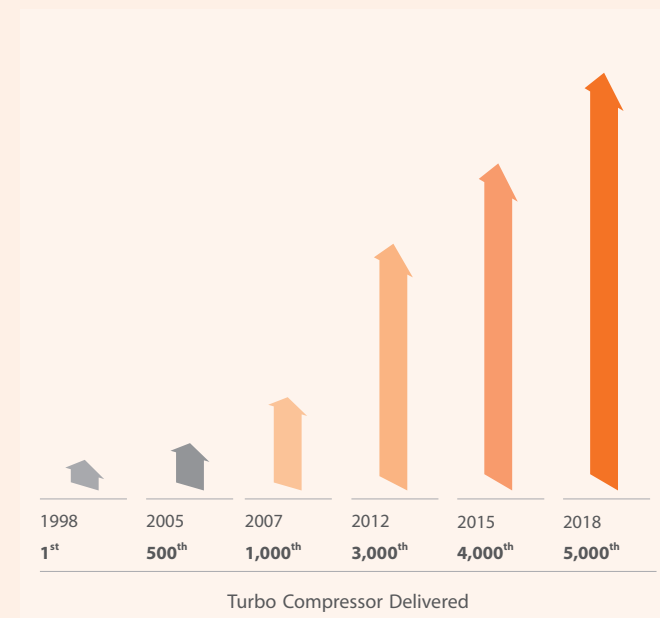
History

Based on over 40 years of accumulated experience in precision machine industry from Gas Turbine to Compressor Business, Hanwha Power Systems has been chosen by more than 1,000 customers worldwide.

- **1977** Company Established (Samsung Techwin) in Samsung Group
- **1979** Overhaul and Repair of Aircraft Gas Turbine Engines
- **1996** Industrial Gas Turbine Developed
- **1997** First model of Turbo Compressor Introduced
- **2011** Penetrated into Gas Compressor Market
- **2013** SA3100, the World's Largest Capacity of Air Cooled Compressor Introduced ISO8573-1 (Class 0) Certified
- **2014** Contract to Supply the World 1st Integrally Geared Centrifugal Compressor for Offshore VRU Application
- **2015** New Beginning in Hanwha group as "Hanwha Techwin"
Penetrated into the Offshore Market with Turbo Air & Gas Compressors
Launched Long-term Aftermarket Service Program
Expanding Portfolio by Cooperation with Screw Compressor Manufacturers
- **2016** Saudi Aramco Approved Vendor registered (API617 Process Compressor & Blower)
Reciprocating compressor packager agreement with GE Oil&Gas
- **2017** MOU signed with KEPCO to jointly develop Oxy-Fuel Gas Turbine technology
New beginning as "Hanwha Power Systems"

Hanwha Power Systems is one of the fastest growing solution providers in its industry since 1997.

During the last two decades Hanwha Power Systems delivered over 5,000 units of turbo compressors worldwide.



Industries & Applications

Upstream & Offshore

- Flash Gas, LP, MP
- Vapor Recovery / Instrument Air

Refinery

- Make-up, Recycle, Booster (H₂, Wet)
- Sulfur Recovery / Process Air / Instrument Air

LNG

- Boil off gas (Terminal, LNG Plant)
- High Pressure (Terminal)
- Low / High duty (LNGC, LNG FPSO)

Power Generation

- Fuel Gas Booster / N₂ booster (IGCC)
- Syngas / Instrument Air

Air Separation

- Main Air / Booster Air or N₂
- Cryogenic Expansion

Fertilizer / Gas Processing

- Process Air / Process Gas (NG, NH₃, CO₂)
- N₂ Booster / Instrument Air / NGL

Petro-chemical

- High Pressure (Terminal)
- Refrigeration (Propane, Propylene)
- PTA / Boil off gas / Process Air / Instrument Air

Environment & Energy Saving

- Aeration for wastewater treatment
- Pneumatic conveying materials
- Mechanical vapor recompression

Hanwha Power Systems is proud to introduce the SA Series, air-cooled turbo air compressor, designed with proven technology. SA Series does not need cooling water supply so customers can achieve savings in water consumption, water treatment, and cooling water tower installation. SA Series provides an improved performance map for customers in various industries especially in areas with water scarcity or bad water quality, severe coldness area and high mountain region.

Benefits



No Cooling Water Tower Needed

With air cooling fan, customer does not need to make an investment for a cooling water tower and water supply



High efficiency

5-axis machined impellers and optimized pinion speeds using industry proven bearing and seal technologies
-API 672 standard applicable



Precise Control

Full PLC controller and total control monitoring system available



Low Operation Costs

Easy maintenance structure and components designed for extended life are applied



"SYSTEM" package solutions available

Easy and quick installation with all standard or optional accessories pre-mounted (plug & play)



Optimized Design

Each frame has optimized pressure and flow cuts for actual system air requirements

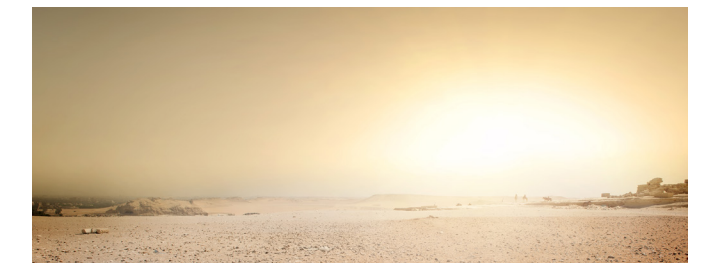


Proven technology

Based on over 5,000 installed plant air, system air, process air and engineered air compressor units

Applications

- Steel, Minerals and Mining, Power plants
- Food and Beverage processing plants
- Oil Refinery, Petrochemical/Chemical
- Electronics, Textile, Automotive, Aerospace and Aviation
- Small and medium sized Air Separation
- Water shortage area and high mountain region



A Package Full of Customer Value

Inlet Guide Vanes

Highly efficient variable inlet guide vanes

- Optimizes the control of the air flow through the efficient regulation of inlet air
- Improves the performance of compressor with part load control and reduces power consumption

Cooling System

Efficient cooler module

- Easy maintenance
- VFD cooler motor to minimize power according to the site climate
- Flexible Noise Control
 - SA2100 : Standard 85dB, Option 80dB
 - SA3100 : Standard 90dB, Option 85dB

Main Drive Motor

Saving energy costs with high efficiency packaged motor

- Custom motors available for different environments(Optional)

Gear Box

Horizontally split gearbox for easy access and maintenance

- Horizontally split structure allows fast inspection and easy access to major components
- Inspection and maintenance checks at minimum costs

Lubrication System

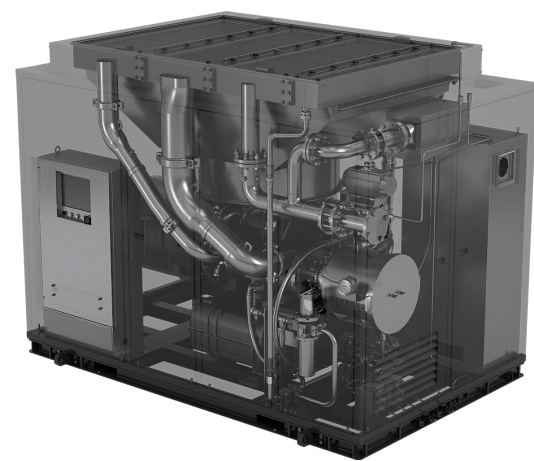
Complete lubrication system package

- Oil reservoir, auxiliary oil pump, oil heater, oil demister
- Compact design for minimal foot print
- High grade 10 μ m filter prevents impurities to gearbox
- Air-cooled oil cooler

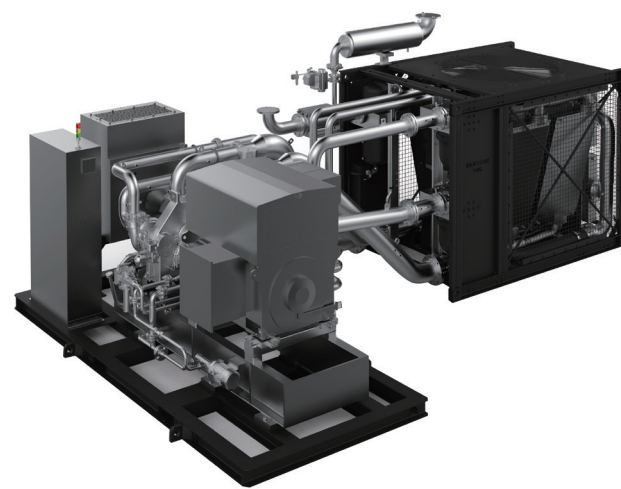
Control System

User-friendly control and monitoring system

- Easy-to-use HMI and high resolution LCD panel
- Various hardwired connections and serial communications available

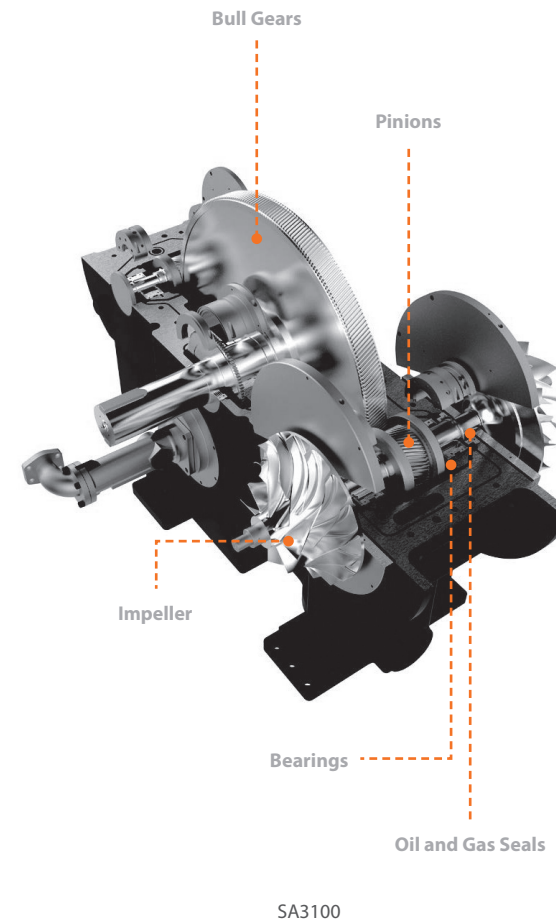


SA2100



SA3100

Designed to Modern Engineered Standards



Bull & Pinion Gears

High precision AGMA 12 & 13 gearing system

- Optimized gear design reduces noise
- Long life time and minimal mechanical loss
- Individually replaceable pinion and bull gear for easy maintenance

Impellers

State of the art master impeller in 17-4 PH stainless steel

- High efficiency 5-axis machined backward swept impellers
- High turndown capability
- Parts balanced in accordance with API672

Bearings

Reliable split bearing systems

- Tilting pad journal bearings applied on pinion gears provide stable operation
- Low friction loss sleeve journal and taper landed bearings and thrust collars
- RTD incorporated into the bearings (SA3100 option)

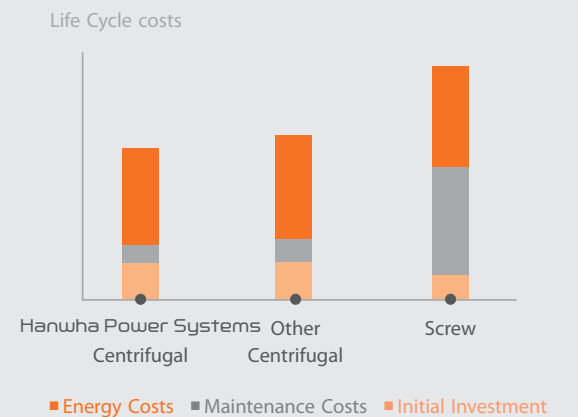
Oil and Gas Seals

Sealing system satisfies API specification

- No need for extra compressed air for sealing
- Perfect prevention of air and oil leakage
- Split type for ease of maintenance

Maximum Energy Saving

Hanwha Power Systems compressors provide customers lower life-cycle costs with high efficiency oriented components and low maintenance design. Wear resistance materials as stainless steel minimizes abrasion and corrosion, and simple and no wearing structure saves maintenance time and costs. Flexible IGV adjusting the flow rate in accordance with the fluctuation of air consumption reduces energy consumption.

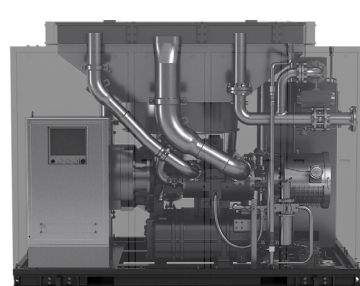
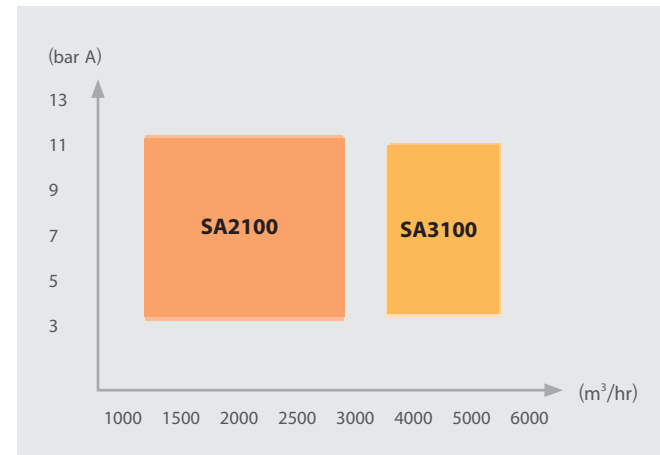


Specification

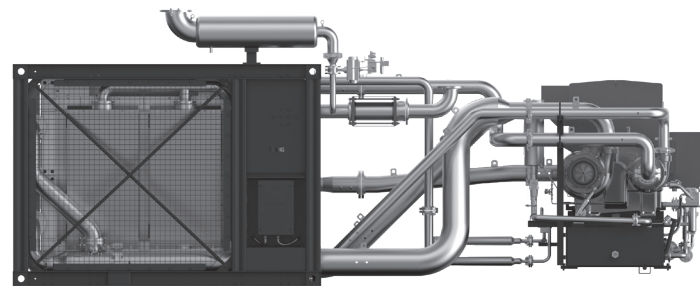
| 모델 | | SA2100 | SA3100 | |
|--------------------|--------------------|-------------|-------------------|-----------------------|
| Capacity | m ³ /hr | 1,200-2,890 | 3,750-5,500 | |
| | CFM | 700-1,680 | 2,200-3,250 | |
| Motor | kW | 150-260 | 400-580 | |
| | HP | 200-350 | 540-780 | |
| Discharge Pressure | bar A | 3.5-11.4 | 3.5-11 | |
| | psi A | 50-165 | 50-160 | |
| Dimension (LxWxH) | mm | Compressor | 3,000x2,340x1,900 | 4,650 x 2,050 x 1,990 |
| | | Cooler | - | 4,420 x 2,110 x 2,290 |
| | inch | Compressor | 118x92x75 | 183 x 81 x 78 |
| | | Cooler | - | 174 x 83 x 90 |
| Weigth | ton | Compressor | 5 | 6 |
| | | Cooler | - | 5.3 |

* Flexible cooler options are available(SA3100).

Product Range



SA2100



SA3100

Scope of Supply

| SA2100 | SA3100 | | SA2100 | SA3100 | |
|-------------------------------------|-------------------------------------|---------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Air intake filter | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Air cooled oil cooler |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Inlet guide vanes | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Sound-proof enclosure |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Blow off valve and silencer | <input type="checkbox"/> | <input type="checkbox"/> | Dual oil filter |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Check valve and expansion joint | <input type="checkbox"/> | <input type="checkbox"/> | Block valve |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Complete lubrication system | <input type="checkbox"/> | <input type="checkbox"/> | Companion flange |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Aftercooler | <input type="checkbox"/> | <input type="checkbox"/> | Auto trap |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Drain valves on all coolers | <input type="checkbox"/> | <input type="checkbox"/> | MODBUS/PROFIBUS interfac |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Main motor | <input type="checkbox"/> | <input type="checkbox"/> | Motor winding/bearing protection |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | PLC control system | | | |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Base frame | | | |

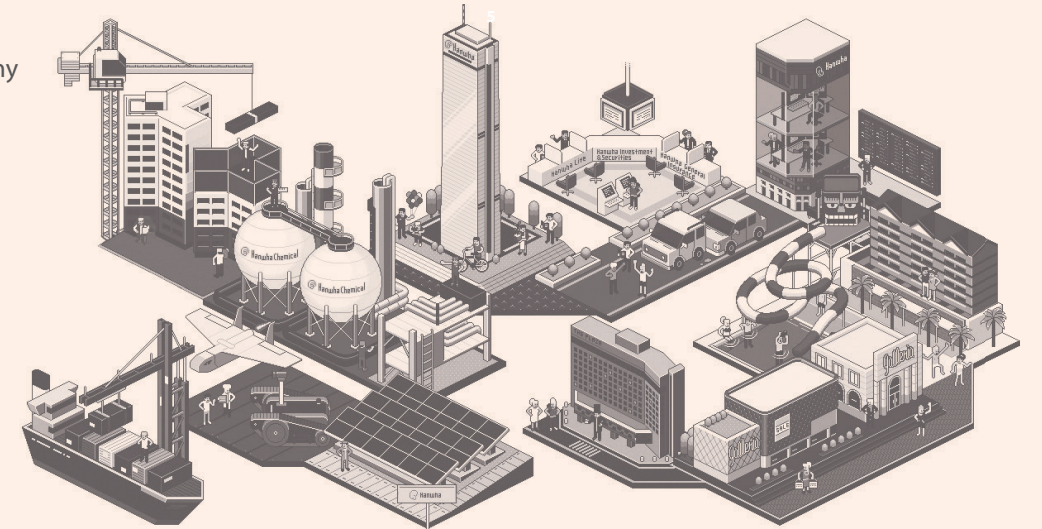
Standard Options

Hanwha Businesses

a FORTUNE Global 500 Company

66 years of business experience with 325 global networks

2017 Total assets of \$177billion and total sales of \$57billion



Manufacturing & Construction

- Hanwha Corporation
- Hanwha Aerospace
- Hanwha Land Systems
- Hanwha Systems
- Hanwha Defense Systems
- Hanwha Techwin
- Hanwha Precision Machinery
- Hanwha Chemical
- Hanwha General Chemical
- Hanwha Total Petrochemical
- Hanwha Advanced Materials
- YEOCHUN NCC
- Hanwha Q CELLS
- Hanwha Energy
- Hanwha Engineering & Construction
- Hanwha City Development

Finance

- Hanwha Life
- Hanwha General Insurance
- Hanwha Investment & Securities
- Hanwha Asset Management
- Hanwha Savings Bank

Services & Leisure

- Hanwha Hotels & Resorts
- Hanwha Galleria
- Hanwha Galleria Timeworld
- Hanwha 63 City
- Hanwha Station Development
- Hanwha Eagles

Global Network

325 Global Networks (December 2017)

- Bakersfield
- Bremen
- Cerritos
- Chicago
- Forest
- Franklin
- Hawaii
- Irvine
- Monroe
- New York
- Opelika
- Pontiac
- Saipan
- Shelby
- Teaneck
- London
- Vancouver
- Monterrey
- Santiago
- São Paulo
- Aix-en-Provence
- Athens
- Berlin
- Bitterfeld-Wolfen
- Bolzano
- Budapest
- Chertsey
- Dietfurt
- Eschborn
- Frydek-Mistek
- Istanbul
- London
- Moscow
- Stuttgart
- Warsaw
- Alkhobar
- Almaty
- Baghdad
- Bismayah City
- Doha
- Dubai
- Kuwait city
- Mod'in
- Maccabim-Re'ut
- Johannesburg
- Nairobi
- Cyberjaya
- Ho Chi Minh
- Jakarta
- Kuala Lumpur
- Manila
- Muara Teweh
- Mumbai
- New Delhi
- Phnom Penh
- Samut Prakan
- Singapore
- Taipei
- Tehran
- Yangon
- Bangkok
- Beijing
- Chongqing
- Dongguan
- Guangzhou
- Hangzhou
- Hong kong
- Lianyungang
- Ningbo
- Qidong
- Shanghai
- Shenzhen
- Tianjin
- Zhangjiagang
- Seoul
- Nagasaki
- Tokyo
- Perth
- Sydney

70 Affiliates all over the world

