Present State of Hanwha Techwin Turbo Compressor Authentication

- ISO14001 Authentication
- Korea New Technology Authentication
- IR52 Jang Young Sil Award
- ISO9001 Authentication
- CE Authentication
- ASME-compliant
- ISO8573-1 Class zero Authentication

The information in this publication is subject to change without a notice for improvement.
**Introduction to Hanwha Techwin**

**History**

Based on over 35 years of accumulated experience in precision machine industry from Gas Turbine to Compressor Business, Hanwha Techwin has been chosen by more than 1,000 customers worldwide.

- **1997** 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
- **2014** Contract to Supply the World’s 1st Integrity-Graded 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

Hanwha Techwin is one of the fastest growing solution providers in its industry since 1997. During the last two decades Hanwha Techwin delivered over 4,000 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 (GCC)
  - 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

**Way to ease your mind**

Excellent solution and thorough service will guarantee customer’s peace of mind

- **Stable Operation**
  - Complying with global industry standards as ISO9001, API672 and customer specific requirements
  - 100% OIL-Free compressed air without any contamination
  - ISO 8573-1 specifies purity classes of compressed air
  - *ISO 8573-1 specifies purity classes of compressed air with respect to particles, water and oil independent of the location in the compressed air system at which the air is specified or measured*
  - Using three-dimensional design system to eliminate potential design flaws in the design phase
  - Thorough quality control system to reduce any risk exposure
  - The fastest growing in the industry since 1997
  - Certified by major players in various industries in the Middle East, Europe, Americas, etc.

- **Budget Savings**
  - High efficiency oriented components and low maintenance design will provide customers with lower life-cycle cost
  - Flexible KIV adjusting the flow rate in accordance with the fluctuation of air consumption to reduce energy consumption up to 7%
  - Wear resistance materials as stainless steel for minimizing abrasion and corrosion
  - Precise 5-Axis machined impeller and long life guaranteed oil and gas seals
  - Simple and no wearing structure leads minimized maintenance effort and cost
  - Energy saving analysis to diagnose current status and find the root cause of energy waste can minimize the unnecessary cost and keep customers’ profit high

- **Risk Minimization**
  - Preventive maintenance program provides a guideline or an actual check service for keeping customer’s equipment healthy
  - Remote Monitoring System does daily check of customer’s equipment, and provides prompt alarm / notification service once any problem happens
  - RUSH112 service and wide range of service network minimizes downtime when emergency situation occurs

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**Dependable SM Series**

**Stable operation**

**Budget Savings**

**Risk minimization**

**Turbo Compressor Delivered**


1st 500th 1,000th 3,000th 4,000th
Optimized design to maximize customer benefit
Low maintenance and highly efficient design play a key role to maximize customer profit

Energy Saving Inlet Guide Vane
• Precise control of air flow by efficient inlet air control
• Reduction of power consumption through partial load control
• Low pressure loss with airfoil profiled vanes

Durable Coolers
• Water-in-tube inter & aftercooler bundles allow simple maintenance and easy cleaning
• Corrosion / erosion resistant material applied for protecting damage of other components
• Minimizing pressure drop by optimized airflow

Simple & Neat Package
• Complete full package for plug & run provides easy and low-cost installation
• Full enclosure is applicable for clean appearance and quiet operation which creates a comfortable work environment (Low noise with sound enclosure)
• Minimizing maintenance cost by simple structure

Leak-Free Lubrication System
• Minimum air leakage reduces losses and increases overall efficiency
• Leakproof gearbox prevents impurities from entering the process
• Complete lubrication system package (Including Oil reservoir, Auxiliary oil pump, Oil heater, Oil demister)

Maintenance Friendly Gearbox
• Easy maintenance by horizontally split structure
• Minimum cost for inspection and maintenance

Highly Efficient Main Drive Motor
• Highly efficient package saves energy
• Custom motors are available reflecting client requirements (option)

Concentrating on efficiency with reliability
Core Unit is the heart of SM Series to achieve high efficiency and reliability by strictly selected optimized components and simple design

State-of-the-art 5-Axis Machined Impeller
• Precisely balanced and designed for stability and high efficiency
• Wide operational flexibility with turndown ratio of 30-40%
• 115% over-speed spin test to guarantee reliability
• SUS impellers for extended life cycle with low vibration and low noise

Long Life Thrust Bearing
• Tilting pad journal bearings applied on pinion gears offer reliable operation and almost permanent life without replacement
• Low friction loss sleeve journal and taper landed thrust bearings are applied on bull gear

Precise Bull Gear and Pinions
• High precision gear system provides long life time, low vibration and low noise
• Taper land bearings effectively support axial loads delivered from pinion gears that improve stability of rotation and efficiency
• Easy inspection of gear system without stage disassembly

Leak-Free Oil & Gas Seals
• Supplies 100% oil-free air in accordance with ISO8573-1 class zero for minimizing loss from downtime
• 4 stages of sealing which satisfies API specification
• Split structure for easy check and maintenance

Precise Control of Air Flow by Efficient Inlet Air Control
• Reduction of Power Consumption Through Partial Load Control
• Low Pressure Loss with Airfoil Profiled Vanes

Simple & Neat Package
• Complete Full Package for Plug & Run Provides Easy and Low-Cost Installation
• Full Enclosure is Applicable for Clean Appearance and Quiet Operation Which Creates a Comfortable Work Environment (Low Noise with SoundEnclosure)
• Minimizing Maintenance Cost by Simple Structure

Leak-Free Lubrication System
• Minimum Air Leakage Reduces Losses and Increases Overall Efficiency
• Leakproof Gearbox Prevents Impurities from Entering the Process
• Complete Lubrication System Package (Including Oil Reservoir, Auxiliary Oil Pump, Oil Heater, Oil Demister)
### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>SM3000</th>
<th>SM4000</th>
<th>SM5000</th>
<th>SM6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Rate m³/hr</td>
<td>3,300 - 5,300</td>
<td>5,300 - 8,400</td>
<td>8,400 - 15,000</td>
<td>15,000 - 21,000</td>
</tr>
<tr>
<td>CFM</td>
<td>1,950 - 3,100</td>
<td>3,100 - 4,950</td>
<td>4,950 - 8,850</td>
<td>8,850 - 12,400</td>
</tr>
<tr>
<td>kW HP</td>
<td>210 - 680</td>
<td>310 - 1,010</td>
<td>490 - 1,540</td>
<td>1,050 - 3,150</td>
</tr>
<tr>
<td>Discharge Pressure bar A</td>
<td>3,5 - 18</td>
<td>3,5 - 18</td>
<td>3,5 - 18</td>
<td>3,5 - 18</td>
</tr>
<tr>
<td>Dimension (L×W×H) mm</td>
<td>P 4,750 x 2,100 x 2,500</td>
<td>S 3,150 x 1,880 x 2,100</td>
<td>5,100 x 2,250 x 2,500</td>
<td>6,200 x 2,300 x 2,550</td>
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<tr>
<td>Weight kg P</td>
<td>8,700</td>
<td>10,250</td>
<td>12,950</td>
<td>17,550</td>
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<tr>
<td>Package type</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>S</td>
</tr>
</tbody>
</table>

### Monitoring System

#### Customer Oriented Monitoring System
Provides convenient operation and accurate control

- High-resolution Color LCD Touch Screen Panel
  - Touch screen size : 7.0" Wide or 10.2" Wide
  - Resolution / Color : WVGA 800 x 480 / 65k Color

- Reliable and Stable Control System
  - Conforms to EMC international standard during in operation: CE, RE, C5, RS, ESD, Surge, Burst (CISPR 11 Class A, IEC 61000-4)

- User Friendly Interface with Improved Operability and Legibility
  - Conversion to ICON / animation of main information as operation / stop, valve status etc.
  - Quickly and easily switchable screen by navigation bar

- Complete Control Package

### Automatic Control
- Optimization of surge control margin
- High turnout ratio through minimizing surge margin
- Precise pressure control in overall operation range
- Local / Remote control function
- Self check and automatic resolution logic against errors

### Scope of Supply

- Real-time monitoring by PC and smartphone
  - Warning and trouble shooting message transferred once alarm or shutdown occurs
- Compressor remote management and energy saving solution
Hanwha Techwin provides total care service, called Smart Care, ranging from current equipment diagnosis to urgent repair service to get rid of customer risks. This prevents unnecessary energy loss and minimizes downtime that may occur.

**Energy Diagnosis**

Operators expect equipment to run in an optimized mode. In many cases, however, it is hard to notice small changes leading to inefficiencies in its operation. Hanwha Techwin provides diagnosis service inspecting if current equipment is being operated properly and efficiently. Through this Service, customers can learn which part causes energy loss and how to improve the efficiency. Ultimately customers minimize waste and maximize profitability.

**Preventive Maintenance**

- Semi-annual & annual by service agent

**Energy Diagnosis**

- Check & diagnostic service as a special service

**Unscheduled Maintenance**

- Emergency situation or customer requirement
  - Rush 112
  - Wide service network

**Preventive Maintenance program**

To prevent malfunction during operation, Hanwha Techwin provides 4 programs by operating time and specific programs are customized per each customer’s requirements. This program will enable customer equipment running stably without any problem so that customers can minimize downtime, low life cycle cost through saving additional trouble shooting cost.

**Rush 112 Worldwide**

Hanwha Techwin is willing to provide immediate service to customers worldwide based on RUSH 112 philosophy.

- Give a response within 1 hour
- Visit user site within 1 day
- Provide an initial resolution within 2 days

**Optimum flow rate & pressure**

The best value fitting the actual demand

**Diagnosis of current condition**

- Compressed air consumption
- Operating pressure
- Power consumption
- Facility / Piping condition
- Noise / Vibration

**Identifying Gap and Solution**

- Leading to the solutions
- Lots of reasons for energy loss as excessive pressure, pipeline leakage, heavy fluctuation of flow rate, superannuated equipment

**Register into 4CUST Support and Helpful advices**

* 4CUST: Customer-centric 4C oriented system (4C: Consumer, Cost, Convenience, Communication)
* AMC: Authorized Maintenance Center
* ASC: Authorized Service Center
Introduction to Hanwha Group

Hanwha Businesses

64 years of business experience with 190 global networks

2015 Total assets of $146billion and total sales of $53billion

Manufacturing & Construction
- Hanwha Corporation
- Hanwha Techwin
- Hanwha Thales
- Hanwha Chemical
- Hanwha General Chemical
- Hanwha Toray Petrochemical
- Hanwha Fine Chemical

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

Services & Leisure
- Hanwha Hotels & Resorts
- Hanwha Galleria
- Hanwha Galleria Tmeworld
- Hanwha 63 City
- Hanwha E&C
- Hanwha Station

Global Network

190 Global Networks (as of June 2015)

Provides prompt service for customers around the world, Hanwha Techwin has built a large number of centers globally. Customers can ask for service at anytime through those centers and get solutions in time.

Wide Service Network

58 Affiliates all over the world
Driving Performance SM100 Series

SM100 series focuses on accomplishing enhanced performance and efficiency to satisfy customers particularly seek performance-centered products.

Flexible packages according to your needs

• Packaged plug & play type for easy installation
• Standard type without base frame, silencer, cooling water manifold and enclosure
  • Silencer and cooling water manifold can be added as an option

Advanced efficiency and performance through design modification

• Thrust collar applied to enhance operation reliability and mechanical efficiency by reducing mechanical loss and oil consumption
• Labyrinth seal of non-contacting type minimizes mechanical loss and needs of replacement
• Reduced distance between shafts to minimize oil mist friction and mechanical loss for improved performance and isothermal efficiency

Hanwha Techwin
## Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>SM3100</th>
<th>SM4100</th>
<th>SM5100</th>
<th>SM6100</th>
<th>SM7100</th>
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<tr>
<td><strong>Flow Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m³/hr</td>
<td>3,300 - 5,500</td>
<td>5,500 - 9,000</td>
<td>9,000 - 15,000</td>
<td>15,000 - 24,500</td>
<td>24,500 - 32,000</td>
</tr>
<tr>
<td>CFM</td>
<td>1,950 - 3,250</td>
<td>3,250 - 5,300</td>
<td>5,300 - 8,850</td>
<td>8,850 - 14,400</td>
<td>14,400 - 18,800</td>
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<tr>
<td><strong>Power</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kW</td>
<td>200 - 580</td>
<td>300 - 930</td>
<td>500 - 1,500</td>
<td>800 - 2,500</td>
<td>1,000 - 3,100</td>
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<tr>
<td>HP</td>
<td>270 - 780</td>
<td>400 - 1,200</td>
<td>670 - 2,010</td>
<td>1,070 - 3,350</td>
<td>1,340 - 4,155</td>
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<tr>
<td><strong>Discharge Pressure</strong></td>
<td>Bar A</td>
<td>3.5 - 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psi A</td>
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<td>3.5 - 11.4</td>
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<tr>
<td><strong>Dimension (LxWxH)</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>P</td>
<td>5,250 x 2,250 x 2,500</td>
<td>5,500 x 2,250 x 2,500</td>
<td>6,250 x 2,250 x 2,550</td>
<td>7,100 x 2,250 x 2,550</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>3,210 x 2,150 x 1,920</td>
<td>3,800 x 2,300 x 2,050</td>
<td>4,750 x 2,490 x 2,130</td>
<td>5,290 x 2,400 x 2,420</td>
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<td>inch</td>
<td>P</td>
<td>207 x 89 x 98</td>
<td>217 x 89 x 98</td>
<td>246 x 89 x 100</td>
<td>244 x 89 x 100</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>126 x 85 x 76</td>
<td>150 x 91 x 81</td>
<td>187 x 98 x 84</td>
<td>208 x 95 x 95</td>
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<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kg</td>
<td>P</td>
<td>8.600</td>
<td>9.500</td>
<td>13.150</td>
<td>17.900</td>
</tr>
</tbody>
</table>

**Scope of Supply**

<table>
<thead>
<tr>
<th>P Package type</th>
<th>S Standard type</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️ ☑️ Air Intake Filter</td>
<td>☑️ ☑️ PLC Control System</td>
</tr>
<tr>
<td>☑️ ☑️ Inlet Guide Vanes</td>
<td>☑️ ☑️ Base Frame</td>
</tr>
<tr>
<td>☑️ ☑️ Blow Off Valve</td>
<td>☑️ ☑️ Cooling Water Manifold</td>
</tr>
<tr>
<td>☑️ ☑️ Silencer</td>
<td>☑️ ☑️ Sound Enclosure</td>
</tr>
<tr>
<td>☑️ ☑️ Check Valve and Expansion Joint</td>
<td>☑️ ☑️ Dual Oil Filter</td>
</tr>
<tr>
<td>☑️ ☑️ Complete Lubrication System</td>
<td>☑️ ☑️ Block Valve</td>
</tr>
<tr>
<td>☑️ ☑️ Aftercooler</td>
<td>☑️ ☑️ Companion Flange</td>
</tr>
<tr>
<td>☑️ ☑️ Drain Traps on all coolers</td>
<td>☑️ ☑️ Auto Trap</td>
</tr>
<tr>
<td>☑️ ☑️ Modbus / PROFIBUS Interface</td>
<td>☑️ ☑️ Motor Winding / Bearing Protection</td>
</tr>
</tbody>
</table>

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