Efficient, reliable solutions for your demands.

HANGCHA BE WITH YOU AT EVERY STAGE

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Hangcha offers a complete range of Stage V engines. This means we have the flexibility to meet individual requirements and to ensure you get the value and performance you need from your engine choice.

**EU V regulations**

**EU V emission limits**

Emission limits for non-road mobile machinery:

<table>
<thead>
<tr>
<th>Engine type</th>
<th>Category</th>
<th>CO</th>
<th>HC</th>
<th>NOx</th>
<th>PM</th>
<th>PN</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI engine</td>
<td>19-56</td>
<td>4.40(*)</td>
<td>HC+NOx&lt;2.70(*)</td>
<td>HC+NOx&lt;2.70(*)</td>
<td>0.070</td>
<td>1+10*</td>
<td>11</td>
</tr>
<tr>
<td>DI engine</td>
<td>19-37</td>
<td>5.0</td>
<td>HC+NOx&lt;6.7</td>
<td>HC+NOx&lt;6.7</td>
<td>0.075</td>
<td>1+10*</td>
<td>11</td>
</tr>
<tr>
<td>DI engine</td>
<td>37-56</td>
<td>5.0</td>
<td>HC+NOx&lt;6.7</td>
<td>HC+NOx&lt;6.7</td>
<td>0.075</td>
<td>1+10*</td>
<td>11</td>
</tr>
<tr>
<td>ALL</td>
<td>56-102</td>
<td>0.19</td>
<td>0.40</td>
<td>0.070</td>
<td>1+10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>102-560</td>
<td>3.5</td>
<td>0.19</td>
<td>0.40</td>
<td>0.070</td>
<td>1+10</td>
<td>11</td>
</tr>
</tbody>
</table>

* Optionally as an alternative, any combination of values satisfying the equation (HC+NOx)×CO0.784≤8.57 as well as the following conditions: CO≤20.6 g/kWh and (HC+NOx)≤2.7 g/kWh.

**EU Stage V requirements apply for variable and constant speed engines**

**Regulation implementation time (for engines)**

- **Entry into force**:
  - Date of application (AS & IA adopted)
  - Mandatory dates of application of Stage V (placing on the market of engines staggered)

**New NRMM Regulation**

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
<th>YEAR 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engines 56-130 kW</td>
<td>Engines for IWV 300-1000 kW</td>
<td>Engines 130-560 kW</td>
<td>Engines for IWV &lt;300 kW</td>
<td>Engines for rail</td>
</tr>
<tr>
<td>Engines 19-56 kW</td>
<td>Engines for ATV &amp; SBS</td>
<td>Engines &gt; 560 kW</td>
<td>Engines for snowmobiles</td>
<td>Engines &lt; 19 kW</td>
</tr>
</tbody>
</table>

* Floating date

**Introduction dates**:
- 1.1.2019 for most applications; 1.1.2020 for 56 – 130 kW.
Regulation implementation time (for engines)

The new Stage V emission standards will start from January 2019. Original Equipment Manufacturers (OEMs) will have 18 months to consume inventory of engines of the previous emissions type into their machines and a further six months to place them in the market. Engine Manufactures must complete production of pre-buy engines by the end of 2018.

OEMs must complete selling products within below period:
- Machines mounted engine 0–56kW, ≥ 130kW: by 31st DEC 2020 (must complete production by 30th JUN 2020)
- Machine mounted engine 56~130kW: by 31st DEC 2021 (must complete production by 30th JUN 2021)

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**Hangcha’s stage EU V products and the technical routes**

Hangcha has always strived to meet emission regulations across the world.

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**Power of Engine**

<table>
<thead>
<tr>
<th>Content</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–56 kW/130kW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td>8A/18/non-regulated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56–130 kW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Selling</td>
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<td></td>
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<tr>
<td>Stage V</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**Hangcha’s stage EU V products and the technical routes**

Hangcha has always strived to meet emission regulations across the world.
Excellent emission: A complete set of Bosch off-road fuel system is adopted, and the international famous BASF coating technology is selected for ATS (After-Treatment System), which is fully verified by joint development with Bosch. Excellent engine raw emission makes the ATS for this series of engines extremely compact. It is suitable for forklift packaging.

Sufficient power: The diesel engine family covers power ranges from 37kW to 95.7kW, the maximum torque can reach 430Nm, the torque backup can reach more than 25%, the engine has sufficient power for the application.

Perfect economy: BOSCH and XINCHAI carried out multi-round engine performance optimization test, and the whole engine map has excellent fuel economy. The minimum specific fuel consumption is less than 275g/kWh. In the common working load, the specific fuel consumption is below 220g/kWh. Other working conditions are about 5 g/kWh less than competitive products.

High reliability: Fully validated reliability: the first-class international suppliers (Bosch, Hutchinson, Eaton and Cummins) are selected. The diesel engine and vehicle have passed the several round reliability validations.

<table>
<thead>
<tr>
<th>Number of Cylinders</th>
<th>Cylinder Diameter x Stroke</th>
<th>Displacement</th>
<th>Rated Power</th>
<th>Maximum Torque</th>
<th>Emission Level</th>
<th>Technical Route</th>
<th>Scope of Application</th>
<th>Transmission Equipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3.94 x 107</td>
<td>2.970L</td>
<td>55.8kW/2200rpm</td>
<td>320N.m/1200~1600rpm</td>
<td>EU Stage V</td>
<td>TC+CR+DOC+DPF</td>
<td>3-94t Forklift</td>
<td>OKAMURA</td>
</tr>
<tr>
<td>4</td>
<td>4.94 x 107</td>
<td>4.5t</td>
<td>66.7kW/2140rpm</td>
<td>350N.m/1200~1600rpm</td>
<td>EU Stage V</td>
<td>TC+CR+DOC+DPF</td>
<td>1-3.5t Forklift</td>
<td>OKAMURA</td>
</tr>
</tbody>
</table>

The engine has been tested for 10000h in total for reliability validation in several round, the reliability has been fully verified. It is worth mentioning that the diesel engine has been tested in Jinan testing center and Bosch WuXi test bench for 3000h. The diesel engine has excellent reliability, and is rated as Bosch off-road project ‘BES’ award.

Two kinds of diesel engines are applied in forklifts and complete the summer tests, high altitude tests and winter tests. The diesel engine, the forklift and the after-treatment system have been validated in these extreme operating conditions, and the DPF soot load test is balanced within 90 hours without any regeneration.

Very low dilution ratio of engine oil, the oil dilution ratio after single regeneration is only 0.44%, much lower than the value of 20% specified in the national standard, the oil change interval of E series diesel engine up to 500h.

DPF has a long maintenance interval. Based on excellent engine raw emission level and regeneration strategy, the ash cleaning interval up to 5000h.
Kubota EU V engines

Clean emissions:
The engine has low original emissions, a high post-processing regeneration efficiency and low regeneration triggering criteria. The engine load only needs to reach 30N.m before the emission temperature that triggers regeneration is reached. Therefore, under normal operating conditions, and the ash cleaning interval reaches 6000h. This enables easy use and low maintenance costs.

Easy maintenance:
The Kubota engine is highly integrated and has a compact engine structure and parts to be maintained arranged on one side to enable easy maintenance.

Outstanding performance:
With stable idle loading performance, a V2607 platform that uses a rear-mounted gear train, PTO full torque output, high performance of resistance to stalling at low speeds, a hydraulic system with its overflow pressure adjusted to the maximum limit, the engine can never stall during idle loading and can restore to the normal idle speed within 6s.

Excellent cold start performance: In the low temperature start test, it can start smoothly within 7 seconds when the water temperature is -25°C.

Great comfort:
With a built-in high-pressure common rail, fuel injector, EGR valve, etc., the engine has low noise, comfortable sounds and less vibration.

<table>
<thead>
<tr>
<th>Number of Cylinders</th>
<th>Cylinder Diameter x Stroke</th>
<th>Displacement L</th>
<th>Rated Power kW/rpm</th>
<th>Maximum Torque N.m/rpm</th>
<th>Emission Level</th>
<th>Technical Route</th>
<th>Scope of Application</th>
<th>Transmission Equipped</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2607-CR-EN</td>
<td>4-87×110</td>
<td>2.615</td>
<td>47.3/2400</td>
<td>221.7/1500</td>
<td>VEPA/</td>
<td>CR+EGR+DOC+DPF</td>
<td>2.5-3.5t all-terrain</td>
<td>F/OKAMURA</td>
<td>4-87×110</td>
</tr>
<tr>
<td>K2607-CR-TENB</td>
<td>4-87×110</td>
<td>2.615</td>
<td>47.3/2400</td>
<td>221.7/1500</td>
<td>VEPA/</td>
<td>CR+EGR+DOC+DPF</td>
<td>2.5-3.5t all-terrain</td>
<td>F/OKAMURA</td>
<td>4-87×110</td>
</tr>
<tr>
<td>K2607-CR-TE6B</td>
<td>4-87×110</td>
<td>3.306</td>
<td>54.6/2700</td>
<td>344.7/2300</td>
<td>VEPA/</td>
<td>CR+EGR+DOC+DPF</td>
<td>4-94×120</td>
<td>F/OKAMURA</td>
<td>4-94×120</td>
</tr>
</tbody>
</table>

GCT EU V engines

High consistency:
The engine adopts closed-loop control. Before leaving the factory, each vehicle has its air-fuel ratio calibrated according to the air volume, and air supply volume adjusted in real time according to different operating conditions, to ensure stable performance and emission.

Clean emissions:
The engine has low original emissions. Basic components of emissions exhausted from the three-way catalytic converter are CO₂ and H₂O. The three-way catalytic converter is maintenance-free within the life cycle.

Reliable quality:
With a history of many years of standardized and lean production, the GCT engines have reliable quality. This has long been proved by the mass product market.

<table>
<thead>
<tr>
<th>Number of Cylinders</th>
<th>Cylinder Diameter x Stroke</th>
<th>Displacement L</th>
<th>Rated Power kW/rpm</th>
<th>Maximum Torque N.m/rpm</th>
<th>Emission Level</th>
<th>Technical Route</th>
<th>Scope of Application</th>
<th>Transmission Equipped</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>GK21 LPG EU StageV</td>
<td>4-89×100</td>
<td>2.488</td>
<td>43.4/2700</td>
<td>183.5/1600</td>
<td>VEPA/</td>
<td>Single-point EFI + three-way catalysis</td>
<td>2-3.5t Forklift</td>
<td>F/OKAMURA</td>
<td>4-89×100</td>
</tr>
<tr>
<td>GK25 LPG EU StageV</td>
<td>4-89×100</td>
<td>2.065</td>
<td>38.4/2700</td>
<td>151/1600</td>
<td>VEPA/</td>
<td>Single-point EFI + three-way catalysis</td>
<td>1.5-1.8t Forklift</td>
<td>F/OKAMURA</td>
<td>4-89×100</td>
</tr>
</tbody>
</table>

Specifications: KUBOTA: N/A, GCT: 2.615L, 2.065L, 2.615L, 2.065L.
Deutz EU V engines

The Deutz TCD3.6L engine adopts the technical route of "high pressure common rail+Turbocharged Inter-cooled+EGR-DOC+DPF" to meet new European emission level. The power system is made in Germany. It adopts 2F three-speed electric proportional transmission and Deutz/TCD3.6 engine which is smooth and reliable. Internationally known Tenneco carrier and its coating technology are selected for post-treatment, with good reliability and long DPF regeneration cycle.

Standard CAN communication instrument, integrative Yongjie instrument engine and gearbox and other key information convenient for maintenance and use. Compared to European 3B model, the limit of MRF is reduced by 14%, and particulate matter decreased by 60%.

### Specifications

| Number of Cylinders-Cylinder Diameter x Stroke | 4-98×120 |
| Displacement | 3.6L |
| Rated Power | 56.4 kW/2300 rpm |
| Maximum Torque | 405 N.m/1300 rpm |
| Emission Level | EU StageV |
| Technical Route | TCI+CR+EGR+DOC+DPF |
| Scope of Application | 5-7t Forklift |
| Transmission Equipped | 2F |

VOLVO EU V engines

Proven and straight-forward design - built on Volvo Group technology. High torque already at low engine speed. SCR, DPF+DOC and uncooled EGR. Compact, simple installation and easy to service. Same engine footprint for all emission standards. Wide range of optional equipment. Excellent passive soot regeneration. Extended oil service intervals 1000h.

| Model | TAD881VE |
| Rated Power | 185kW(2200rpm) |
| Maximum Torque | 1175N.m(1400rpm) |
| Number of Cylinders-Cylinder Diameter x Stroke | 6×110×132 |
| Displacement | 7.7L |
| Emission Level | EU stageV / EPA Tier4 final |
| Technical Route | SCR+DOC+DPF+uncooled EGR |
| Transmission | ZF |

CUMMINS EU V engines

Comparing with the Stage IV engine, this one enjoys 5% more power and 31% more peak torque. The technical route adopts EGR-free design to reduce thermal design power loss and improve reliability.

The Single Module post-processing system combines DPF, SCR and urea mixing tubes into a composite unit, reducing 50% space and 30% weight. High sulfur resistance to meet the limited fuel quality capacity regions’ needs.

| Model | B6.7 |
| Rated Power | 149kW(2200rpm) |
| Maximum Torque | 990N.m(1300rpm) |
| Number of Cylinders-Cylinder Diameter x Stroke | 6×127×124 |
| Displacement | 6.7L |
| Emission Level | EU stageV / US EPA Tier4 final |
| Technical Route | SCR+DOC+DPF+uncooled EGR |
| Transmission | ZF |
Features of EU V vehicles

All 1-10t series vehicles are equipped with interactive instruments.

Interactive instrument: The instrument adopts LCD display with four interactive buttons, and has one CAN bus communication function. The communication protocol is compatible with SAE J1939 standards.

All 1-10t series vehicles are equipped with a new type of heat-insulated high-position emission system respectively to prevent post-processing regeneration emissions from scalding rear people.

4-10t series vehicles are equipped with wet axle.

With Hangcha you can meet all Stage V/Tier 4f emissions standards which provides customer demands for value, innovation and performance. The technologies include common rail fuel systems, diesel oxidation catalysts (DOC) and diesel particulate filters (DPF). Designed and optimised to every engine model, our forklift trucks maximise efficiency and reliability.