Detailed Introduction of WZ160 Backhoe Loader

(1) General overview

In the construction of railway and highway, excavation of large-sized tunnel plays a key role in deciding construction progress, so the quality of a backhoe loader influences the construction progress.

Backhoe loader made in ZZHZ features:

1. High efficiency, energy savings and low noise
2. Double power hydraulic system, choosing to use in different occasions; diesel power hydraulic system should be chosen as the machine moves in the tunnel or works outside; while the electric hydraulic device featuring high efficiency, safe and environmental protection should be chosen as the backhoe loader works in the tunnel with narrow space and bad air quality.

Entire hydraulic drive: hydraulic motor drives the loader to move and carry the ballast, its working institution is driven by hydraulic cylinder. The control panel controls power and hydraulic system of the complete machine. Hydraulic system adopts pilot control, featuring reasonable layout and convenient maintenance.

3. Safety device is installed in the electrical system and hydraulic system to ensure safe and smooth work of the machine
4. Better generality, can be used in tunnel construction and tunnel muck hauling as well as loading scattered items outdoor. The backhoe loader is used in large scale tunnel, national defense and hydroelectricity construction projects such as colliery, mine, road and railway.

5. The backhoe loader continuously excavate, scrabble and convey ballast to shuttle type mine car and other vehicles, featuring smooth loading, large-scope excavating, not sprinkled material, high efficiency and strong continuity.

Max applicable gradient: 11°

Theoretical productivity: ZW160 type- \(-160m^3/h\)

6. Model structure display:
main parameter: theoretical productivity: 160 m³/h
second feature: loading
first feature: excavating

(2). Technical parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>WZ-160/55.75L</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading capacity</td>
<td>m³/h</td>
<td>160</td>
<td>Theoretical</td>
</tr>
<tr>
<td>Min turning radius</td>
<td>m</td>
<td>Complete machine 8.5.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crawler 4.5.0</td>
<td></td>
</tr>
<tr>
<td>Total weight</td>
<td>kg</td>
<td>22000</td>
<td></td>
</tr>
<tr>
<td>Axle distance</td>
<td>mm</td>
<td>2900</td>
<td></td>
</tr>
<tr>
<td>Road clearance</td>
<td>mm</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Width of bucket plate</td>
<td>mm</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>Excavating height</td>
<td>mm</td>
<td>5160</td>
<td></td>
</tr>
<tr>
<td>Excavating width</td>
<td>mm</td>
<td>6730</td>
<td></td>
</tr>
<tr>
<td>Excavating distance</td>
<td>mm</td>
<td>1835</td>
<td></td>
</tr>
<tr>
<td>Discharge height</td>
<td>mm</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>Excavating depth</td>
<td>mm</td>
<td>492</td>
<td></td>
</tr>
<tr>
<td>Max gradeability: °</td>
<td></td>
<td>12?</td>
<td></td>
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<tr>
<td>Scraper chain speed</td>
<td>m/s</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Moving speed</td>
<td>km/h</td>
<td>2.4-4.0</td>
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<tr>
<td>Internal combustion engine power</td>
<td>kw</td>
<td>115?</td>
<td></td>
</tr>
<tr>
<td>Main motor power</td>
<td>kW</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Hydraulic oil tank volume</td>
<td>L</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Rated operating pressure</td>
<td>MPa</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Hydraulic oil temperature °C</td>
<td></td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Unit pressure of ground connection kPa</td>
<td></td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>dB(A)</td>
<td>92</td>
<td></td>
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<tr>
<td>Electrical insulation</td>
<td>3-phase ground connection MΩ</td>
<td>1.5</td>
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</tr>
<tr>
<td></td>
<td>Interphase MΩ</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Out dimension</td>
<td>Length mm</td>
<td>10349</td>
<td>In transportation</td>
</tr>
<tr>
<td></td>
<td>Width mm</td>
<td>2450</td>
<td>In transportation</td>
</tr>
<tr>
<td></td>
<td>Height mm</td>
<td>2724</td>
<td>In transportation</td>
</tr>
</tbody>
</table>
(3). Applicable condition

1. The backhoe loader has a wide work range moving by crawler. In the tunnel construction, WZ160 backhoe loader is suitable for tunnel section above 3.5m
2. Work face demands better drainage condition, lower water level than work face level. No strict demand on walking road, working environment temperature: -5～40℃ (please negotiate with the manufacturer when the environmental temperature is above that)
3. The backhoe loader usually loads rock ballast with loose density ≤1.8t/m3, hardness < 12, when the ballast hardness rises, it will speed up to ware the spear parts and reduce service life of the complete machine. WZ160 backhoe loader load the ballast with a thickness < 600mm
4. The backhoe loader is suitable for construction in mine roadway, suitable for construction projects such as railway tunnel, road tunnel and water & electricity division tunnel without explosive mixture such as gas and coal dust.

The backhoe loader uses double power producers: motor with 50HZ 380V (660V)A.C power supply, internal combustion engine with self fuel tank. They are used in different conditions according to working conditions. All electrical systems choose qualified electrical elements, high efficiency assembly of internal combustion engine.

Attention:

WZ160 backhoe loader can not work in construction projects such as railway tunnel, road tunnel and water & electricity division tunnel with explosive mixture such as gas and coal dust

No people in front of the backhoe loader when the machine works!

When the muck loader enters into the machine, fierce strike on the baffle of the conveying trough is forbidden.

(4). Structure and principle

1. Structure and working principle

a. The backhoe loader is made up of crawler type chassis, loading & excavating mechanism and muck hauling mechanism.

Crawler type chassis is made up of “four wheels and one crawler” (namely drive sprocket wheel, thrust wheel, guide wheel mechanism, support sprocket wheel and crawler), walking frame and underbed (includes U-style box girder crawler support, front framework and side framework). The underbed is U-style box girder framework.

b. walking device: independent drive hydraulic motors are installed for each crawler, hydraulic motor drive sprocket wheel drives the crawler to rotate, thus the backhoe
loader can move.
c. when the backhoe loader turns a direction, use the operating handle to control the
direction of the hydraulic motor, convenient and flexible, can realize to turn direction
on site or at moving.
Turning condition: when two motors supply oil at the same time and have a reverse
turning direction, 90°turning can be realized on site; when one side hydraulic motor
supplys oil and turn the direction, motor at the other site keeps still, the backhoe
loader turns direction around the crawler.
2. Excavating mechanisms
a. excavating mechanisms for the backhoe loader: 1. bucket, 2. connecting rod, 3.
cylinder backplate, 4. cylinder for bucket, 5. forearm, 6. jointed arm, 7. cylinder for
forearm, 8. arm; 9. rotation hoisting holder, 10. rotation cylinder, 11. arm cylinder, 12.
cylinder backplate.
b. all structural members are welded by alloy steel plate, featuring perfect
performance such as high strength, fatigue resistance and shock resistance. Hydraulic
cylinders are from professional cylinders factories in accordance with national
standard. Sealing elements, hydraulic elements and high pressure hoses for connection
are state general standard parts, easy to purchase and maintain.
c. pin connection among various mechanism assembly, wear-resistant steel jacket for
important joint sleeves, convenient for change and maintenance, oscillating bearing
for the piston rod head of the cylinder make it rotate flexibly.
d. operating angle of the backhoe loader
   at working, excavating institution rotate in certain angle around longitudinal centre
   line of the backhoe loader, its angle: **50° for WZ160**
e. lubrication for excavating institution
the excavating institution has 19 lubrication points, before operating the machine
every time, no.3 albany grease should be filled to lubricate. Grease standard number:
GB491-1987
3. Muck hauling mechanism: WZ160 backhoe loader has muck rough and double
row muck hauling mechanism
Muck hauling mechanism: convey trough basic section, 2. convey trough building-out section 1, 3. convey trough building-out section 1, 4. convey trough building-trough building-out section 2, 5. driving wheel structure, 6. hydraulic motor driving shaft components, 7. baffle plate, 8. carrying trough cylinder support, 9. double row chain scraper chain components, 10. convey trough support, 11. push plate cylinder, 12. double row scraper chain driven shaft, 13. flexible muck board, 14. front insertion board.

Muck hauling mechanism is fixed on the underbed by support shaft.

a. driven wheel device installed at front of the convey trough is an important member to realize rotation of scraper chain, wear-resistant steel plates are installed respectively at the upper part and bottom part of the convey trough, they can be replaced when there is a serious wear.
b. hydraulic motor drives main chain wheel to rotate, thus realize the movement of scraper chain, featuring big traction and reliable operation.
c. the rise and fall of cylinder for jacking up the trough can make the head of the convey trough rise or fall, which can be used to clean the work face or get away from obstacles on the road forward.
d. ballast block institution is designed with active ballast board trough which can collect rock ballast at front of the backhoe loader in a wide range and increase ballast loading speed.
e. adjustable control of two push plate cylinders controls ballast board rough opening and closing, control handle controls the work of the ballast board rough.
f. muck loading mechanism of WZ160 backhoe loader uses edge duplex chain design, realize double driving with two hydraulic motors, thus enhance the discharging ballast ability. Adopt new assembly process, convenient maintenance.

4. Brake system

Brake system is calculated and selected as the design hydraulic system chooses moving motor, it can ensure the backhoe loader not to slide down on the normal road with 20°slope.

a. brake principle. When the backhoe loader stops, tension force of spring withholds the brake shoe piece, then the brake shoe piece clasps tightly the brake wheel of the moving motor, thus realizing braking. When the backhoe loader starts the engine, hydraulic oil tube of brake device feeds oil upward to compress spring, making brake shoe piece clasping with brake wheel loose, then the brake device opens.

Warning: opening and braking of brake system is synchronous with starting and
stopping of the backhoe loader, other operation actions are unnecessary.
b. adjust the brake system: when it is necessary to adjust the brake system of moving motor, the adjustment should be in accordance with moving motor operating instructional manual.

5. **Hydraulic system**

Hydraulic system is made up of opening circuit by fuel tank, relief valve, hydraulic pump, hydraulic motor, oil cylinder and oil-way accessories. Hydraulic system selects wear-resistant hydraulic oil GB11118.1-94, L-HM46-46. Special situation should refer to hydraulic pump operating instructional manual.

a. fuel tank volume: 600L, inside set up oil filter (oil return, oil taking) and oil level indicator.
b. system cooling type: oil cooling, use air oil cooler to reduce oil temperature and extend continuous work time.
c. control cabin is located at side of the complete machine, pilot control valve and electric switch are installed inside, according to the panel indicators, they can control each part of the whole machine and control each action of the backhoe loader reliably.
d. manual hydraulic control quadruple valve and foot hydraulic control quintuplet valve are installed in the control cabin, they control muck hauling motor, ballast board rough cylinder, cylinder for jacking up rough and moving motor, chosen according to different working situation
e. the backhoe loader adopts double power hydraulic system, one hydraulic system for excavating, moving and mucking hauling mechanism, rated pressure can be adjusted according to each function. It can exclude internal interference of hydraulic system to a maximum extent, increase working reliability and maintenance performance of hydraulic system, so the working efficiency of the backhoe loader is improved.

6. **Power system**

According to the machine type, WZ160 backhoe loader chooses double piston pump or duplex gear pump driven by their own motor and internal combustion engine as the power of double system, choosing hydraulic system supplying pressure oil to the
complete machine, motor and hydraulic pump are installed at left side of the complete machine, internal combustion system at right side.

### Motor model and hydraulic motor

<table>
<thead>
<tr>
<th>No</th>
<th>Machine</th>
<th>Motor model</th>
<th>Rated voltage</th>
<th>Motor power</th>
<th>Hydraulic pump</th>
<th>Hydraulic pump type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>WZ160</td>
<td>YBK250M-4</td>
<td>380V/660V</td>
<td>90KW</td>
<td>Swash-plate axial variable double pump</td>
<td>China</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coaxial type axial variable double pump</td>
<td>Imported</td>
</tr>
</tbody>
</table>

7. Electrical principle

When 90kw and other motors chosen by WZ backhoe loader connect wires, they are directly started by vacuum electromagnetic starter. Control press button controls starting and stopping, transfer switch controls the power transformation. All electrical elements of WZ160 backhoe loader are qualified products with safety mark certificate in regulated validity period.