Portable Wire Rope Testers

Technical Specifications

Quantitatively inspect internal and external flaws, including fatigue.
Correctly evaluate wire rope residual bearing capacity and service life.

TCK Wire Rope Inspection Technology Co., Ltd.
I. Introduction of TCK-BX Portable Wire Rope Testers

TCK-BX portable wire rope testers adopt patented Weak Magnetism inspection technology and have been recognized as the solution to the problems of “Hidden Dangers, Waste, and Low efficiency” of wire rope use. This equipment is able to correctly evaluate the residual carrying capacity and service life of in-service wire ropes by quantitatively detecting both internal and external flaws such as broken wires, corrosion, abrasion and fatigue. With this technical breakthrough in NDT technology, it is possible for the first time in the world to scientifically evaluate in-service wire rope’s residual bearing capacity, safety coefficient, and service life.

TCK portable rope testers weigh only 2 KG, about 1/6~1/25 of the weight of conventional NDT testers. The sensitivity of TCK Dou sensors could reach 5 V/G and the accuracy for evaluating the percentage loss of effective bearing metallic cross-sectional area is above 99.5%. It is also easy to operate, with unique auto-unlocking device and friendly interface designs.

When an inspection is completed, TCK rope testers are able to display on the LCD screen testing data, flaw graph, data table, and test report. After connecting to a computer and printer, a formal test report could be printed, which provides scientific reference for users to use wire ropes more safely and replace wire rope more appropriately.
II. Models and Inspecting Range

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Inspection Range (Rope Diameter mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>TCK-BX30 (B)</td>
<td>2-16</td>
</tr>
<tr>
<td></td>
<td>TCK-BX40 (B)</td>
<td>10-26</td>
</tr>
<tr>
<td></td>
<td>TCK-BX55 (B)</td>
<td>18-42</td>
</tr>
<tr>
<td></td>
<td>TCK-BX65 (B)</td>
<td>28-54</td>
</tr>
<tr>
<td>Advanced</td>
<td>TCK-ZN3060</td>
<td>30-60</td>
</tr>
<tr>
<td></td>
<td>TCK-ZN0636</td>
<td>6-38</td>
</tr>
<tr>
<td>Customized</td>
<td>TCK-BX80 (T)</td>
<td>&gt;60</td>
</tr>
</tbody>
</table>

III. Inspection Process

Weak magnetic loading → Detecting, data acquisition & processing → Data analyzing & test report printing
IV. Technical Specifications

1. Inspection technology: weak magnetism inspection technology;
2. Inspection Sensitivity: $A_{\text{max}} = 5 \text{ V/G}$; Sensitivity modulation value: $A = 2.6 \text{ V/G}$;
3. Operating magnetic field strength: $< 20 \text{ MT}$;
4. Test rope diameter range: 1-200 mm (as defined by specific models);
5. Testing interval differentiation rate: $0.002 \text{ m}$;
6. Rope speed: $V_{\text{max}} = 30 \text{ m/sec}$; controlled rope speed range: $V = 0.2-13 \text{ m/sec}$; safety testing rope speed: $V < 2 \text{ m/sec}$; inspecting resolution not affected by rope speed;
7. Inspection accuracy: $P_{\text{max}} < 0.05\%$;
8. Uncertainty for measuring the percentage loss of effective metallic bearing cross-sectional area (LMA): $P < 1\%$;
9. Inspected rope length collating error: $C < 10 \text{ mm/100 m}$;
10. Slight defects: detecting capability $> 90\%$
    Major defects: detecting capability $> 99\%$
11. Total weight for the testing head unit: standard model $\leq 2\text{KG}$; advanced model $\leq 3.6\text{KG}$
12. Dimension (length, width, and height) for the testing head unit: standard model $= 268 \times 195 \times 172 \text{ mm}$; advanced model $= 420 \times 160 \times 275 \text{ mm}$
13. Wide-space inspection and the gap between the sensor and the surface of the rope: 20-30 mm
14. Temperature range: $-30^\circ\text{C} \sim +55^\circ\text{C}$; No temperature drift
15. Work environment humidity: $\leq 95\% \text{ RH}$. 
V. Structure and Components

1. Configuration of TCK-BX Portable Wire Rope Testers (standard model)

<table>
<thead>
<tr>
<th>Components of TCK-BX Series Rope Testers</th>
<th>Dimension (mm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TCK-BX wire rope tester unit</td>
<td>520 × 265 × 360</td>
<td>11</td>
</tr>
<tr>
<td>2. TCK-RC weak magnetic loader</td>
<td>268 × 175 × 195</td>
<td>2.3</td>
</tr>
<tr>
<td>3. Dedicated charger</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>4. Special tools</td>
<td></td>
<td>0.055</td>
</tr>
<tr>
<td>5. User manual, program software disc and data cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. EVA sponge protective liner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. TCK-BX wire rope testing head unit</td>
<td>268 × 175 × 195</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Mechanical Structure of TCK-BX Portable Wire Rope Testers

TCK-BX portable wire rope testers come with auto-unlocking device, which can self-unlock from the wire rope in emergency situation. The protective caps avoid oil sludge splattering, and the guide wheels at both ends of the tester keep the target wire rope in the center of the tester and also act as buffers for the bouncing and vibration of the wire rope.
Customer-centered product designing concept:
all wearing parts are designed to be easily replaced by the customers.

Front guide wheels
and protection cap

Rear guide wheels
and protection cap

3. Function Units of TCK-BX Portable Wire Rope Testers

1) DC electromagnetic coils;
2) TCK system self-diagnosis module --- automatically check the system status before inspection;
3) TCK digital module --- AD/DA signal conversion;
4) TCK “Eagle Eye” detecting module --- calibrating and signal extracting;
5) TCK S/N quality module --- signal quality fidelity;
6) TCK 128 x 128 LCD Display --- real-time display of testing results;
7) Embedded 32-bit industrial CPU --- support 32M data recording, storing, retrieving, processing, converting and displaying;
8) Large capacity program storage system;
9) Large capacity data storage system --- maintaining testing data for 10 years without power supply;
10) Imbedded hardware real-time clock.
VI. Functions of TCK-BX Portable Wire Rope Testers

1. Quantitatively detecting both external and internal flaws such as broken wires, abrasion, corrosion, fatigue, and other defects; and correctly evaluating the inspected wire rope’s residual bearing capacity, safety coefficient and service life;
2. Real time Sound/Light alarm function during the inspection process;
3. Online automatic calibrating technique to ensure the accuracy of inspection results;
4. Self-diagnosis function to ensure the system operate reliably;
5. Quantitatively calculate broken wires in one lay length or 6D/30D length and rope diameter reduction;
6. Integrated design of testing instrument and meters, with no need for external power supply and cable connection;
7. With a working space of 20-30 mm between the testing heads and the wire rope surface and the opposite motion mode of the guide wheels and wire rope, TCK portable rope testers have exceptional passing capability, which is not affected by broken wires, rope deformation, oil sludge, dirt and other factors, and capable of inspecting under any working conditions;
8. During inspection, the tester’s inner bush will not rub against the wire rope directly and intensively; and it is designed for permanent use, with no need to replace or maintain.
9. Trigger type self-unlocking device, which quickly unlock the tester from the rope in emergency situation to ensure the safety of the inspectors and the equipment;
10. Easy for operation because of simple instrument keyboard setting, rolling linear logic interface switch, indicative man-machine conversation, and embedded intelligent program operation;
11. As soon as an inspection is completed, the inspectors can check the inspection data, flaw curves, analysis report, and numerical inspection result on the tester’s LCD screen; if the tester is connected to a printer, a formal test report can be printed out;
12. High performance rechargeable Lithium Polymer battery unit;
13. Testing head employs high strength, insulated anti-corrosive material to prevent electricity leakage, short circuit, and electric shock by lightning;
14. Quantitative inspection methods and evaluation rules meet the requirements prescribed in MT/T970-2005 Non-destructive and Quantitative Inspection Methods and Evaluation Rules for Wire Rope.
and other industries’ standards and requirements;
15. The instrument is CE certified and has no electromagnetic pollution; it does not interfere with the normal operation of other electronic and communication equipments in the work locale;
16. Water, dust, oil and moisture proof.

VII. Key Features of TCK-BX Portable Wire Rope Testers

1. High inspecting precision, sensitivity and accuracy: the sensitivity of TCK Dou Sensors is 70,000 -250,000 times higher than traditional sensors; with high differentiation rate, the Dou sensor is able to inspect quantitatively all types of wire rope defects;
2. Reliable performance: quantitative uncertainty for measuring the percentage loss of effective bearing metallic cross-sectional area (LMA) and other flaws such as broken wires, corrosion and abrasion (LF) < 0.5%;
3. High level integration: all function modules are integrated, including system self-diagnosis module, digital automatic calibration module, “Eagle Eye” module, S/N quality module, signal fidelity module, and anti-interference module;
4. Fast data processing capability: by analyzing the original data extracted by TCK testers from the wire rope, TCK patented software is capable of evaluating the working condition of the rope in use. It will not only display the testing result and print out the test report in real time, but also exchange data between the tester and a PC at fast speed;
5. Small size and light weight: TCK-BX standard rope testers weigh less than 2 KG or 1/6~1/20 lighter than traditional wire rope NDT testing equipments. Therefore, it is very easy to operate;
6. Wide applicability: applicable to wire rope inspections under complex working conditions and not be affected by the inspectors’ experience or skills, rope speed, noise, water spraying, warped wires, oil dirt and other factors;
7. Accurate inspection results: capable of quantitatively measuring the percentage loss of effective bearing metallic cross-sectional area (LMA), caused by internal and/or external broken wires, abrasion, corrosion, fatigue and other defects and thereby evaluate the residual bearing capacity and service life of the inspected wire rope.
VIII. Analysis Software and Test Report

1. TCK (Lower Computer) Embedded Inspection Software V 1.2
   It is installed in TCK-BX portable testers and its main functions include calibrating the
tester on the target rope (establishing the reference value or standard for inspecting
the rope), real-time signal extracting, data storage and processing, data retrieval,
memory management and equipment self-diagnosis.

2. Test Report

3. TCK Wire Rope Quantitative Inspection System V3.0 (Upper Computer)
   Its main functions include testing data processing, data communication, flaw
curve analysis, data table management, data/report displaying and printing,
and file management.
IX. Applications of TCK-BX Portable Wire Rope Testers

TCK-BX portable wire rope testers have been used widely in many industries, such as mining, petroleum, steel plants, heavy equipment manufacturing, ports, transportation, construction, water conservancy, resort, aerospace, and the military. Worldwide, there are over 1,000 users.