Universal Testing Machine

Model NRI-TS500-50

Please read this Operation Manual carefully before use. Keep it in the reference manual.
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Use of Operation Manual

- Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

- If you find any incorrectly arranged or missing pages in this manual, they will be replaced. If the manual it gets lost or soiled, a new Operation Manual can be purchased. In either case, please contact Narin Instrument Co.,Ltd or your NRI agent and provide the "Model No." given on cover.

- This manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact Narin Instrument Co.,Ltd or your NRI distributor or agent.

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To SUPERVISOR in charge of this equipment.

- If the operator does not read the language used in this manual translate the manual into appropriate language.
- Help the operator in understanding this manual before use in operation
- Keep this manual near the tester for easy access by the operator
Safety Precautions
The following safety precautions must be observed and followed to avoid fire hazard, electrical shock, accidents, and other failures. Keep them in mind and make sure that all the precautions are observed and followed properly. Narin Instrument Co., Ltd. assumes no liability nor any responsibility against any damages, accidents, or problems resulting from negligence of the precautions.

Users
- This product must be used only by qualified personnel who understand the contents of this operation manual.
- If it is handled by disqualified personnel, personal injury may result. Be sure to handle it under supervision of qualified personnel.

Purpose of use
- If the product is to be used for purposes not described in this manual, contact NRI agent/distributor in advance.

Input Power
- Use the product with the specified input power voltage.
- For applying power, use the AC power cable provided. The shape of the plug differs according to the power voltage and areas. Use the cable which is suitable for the line voltage used.

Fuse
- With products with a fuse holder on the exterior surface, the fuse can be replaced with a new one.
- When replacing a fuse, use the one which has appropriate shape, ratings and specifications.

Cover
- There are parts inside the product which may cause physical hazards. Do not remove the external cover. If the cover must be removed, contact your NRI agent/distributor in advance.
Installation

- When installing products be sure to observe Installation Precaution described in this manual.
- To avoid electrical shock, connect the protective ground terminal to electrical ground (safety ground).
- When applying power to the products from a switchboard, be sure work is performed by a qualified and licensed electrician or is conducted under the direction of such a person.
- Be sure to use the AC power cable provided.

Relocation

- Turn off the power switch and then disconnect all cables when relocating the product.
- Use two or more persons when relocating the product which weights more than 20 kg. The weight of the products can be found on the rear panel of the product and/or in this operation manual.
- Use extra precautions such as using more people when relocating into or out of present locations including inclines or steps. Also handle carefully when relocating tall products as they can fall over easily.
- Be sure the operation manual be included when the product is relocate

Maintenance

- To avoid electrical shock, be absolutely sure to unplug the AC power cable or stop applying power before performing maintenance or checking.
- Do not remove the cover when performing maintenance or checking. If the cover must be removed, contact your NRI agent/distributor in advance.
- To maintain performance and safe operation of the product, it is recommended that periodic maintenance, checking, cleaning, and calibration be performed.

SERVICE

- Internal service is to be done by NRI service engineers
- If the product must be adjusted or repaired, contact your NRI agent/distributor.
Operation Caution

1. Load cell is equipped with high precision using the following precautions.
   - Tension / Compression action will not exceed 100% of the maximum capability of load cell
   - Must not press / pull directly to the load cell and / or act in a sudden manner
   - Should be used in an environment that does not change or alter the temperature is not much about ± 2 degrees celsius
   - Load cell criticism should be set to enter nut every position and tightened all the time.
   - Remove the Universal Joint Grip every time the experiment was completed
   - Load cell assembly with crosshead before powering or excite load cell.
   - Before the test, check the operation of the upper limit switch and lower limit.
   - The installation of the testing machine must be grounded (Earth).
   - Upon completion of the test. “Click Stop” or be stopped due to wait 10-20 seconds for processing
   - Do not add to the command of non-washout period processing. Testing program may have to balk

2. The condition of the test
   - Test speed up to 1000 mm / min.
   - The machine should be started prior to the test of not less than 15 minutes and should monitor the actions of the primary. Machine before proceeding.

3. The security of machine
   - The limit switch. adjust in a safe operating distance.
   - Adjust force and stroke limit to prevent over load.
   - Force limit should be set to 80% of the capacity of load cell.
   - Stroke limit adjust the stage safe enough to use.
   - Press emergency to cancel or cut power systems.
   - A power overload protection
1. Intended use of the equipment.

The Universal testing Machine is an electromechanical machine used for precision measurement of mechanical properties for metal rod, concrete, fabric, plastic, rubber, paper, wood etc. Can offer a more economic solution for test; satisfy the test need for finished, semi-finished and material product. It is floor type UTM easy to operate, small volume, high rigidity. User can sole operate this by computer controller serial is simplest type, controller and machine movement operate independently, provided with output signal of stop machine, collocate with different type flexible. Provided with data output function, can connect to computer and do analyses, statistics, save data with NRI software. Also can install other accessories like sensor, extensometer, grips and software depending on the various different specimens.

2. Feature of product.

- **Tensile testing machine** is a dual column floor type testing machine applied by new design and producing skill to have strong structure, saving transmission power and electric current.

- **Driver**
  
  This machine is power by Servo motor & gear
  
  - Servo motor 1.5 kW/3000 rpm
  
  - Ball Screw : 32 x 10 mm.
  
  - Reducing gear 1: 30
  
  - Torque limiters and safety couplings without any risk

- **Load frame**
  
  Is the rigid frame consisting of two strong ball screw and strong desktop. A movable cross head (crosshead) is controlled to move up or down. This is at a constant speed and can program the crosshead speed or conduct cyclical testing, testing at constant force, testing at constant deformation, etc.
  
  - Frame capacity  50 kN
  
  - Frame stiffness ~2,000 N/μm

- **Force measurement system**
  
  - Measuring the load by precision load cell (low profile tension and compression) 3 mV/V
  
  - Overload capability : 120% of load cells without damage
  
  - Data acquisition rate 400 Hz
● Measuring extension

Stroke readings, as well as minimum test speed of 0.005 mm/min, for the high performance and most accurate results
- Position detection: Rotary encoder 1000 plus
- Encoder Amplifier and counter card: 24 bit
- Data sampling rate: 400 Hz
- Position resolution: 0.001 mm
3 Appearance

Figure 1 shows Appearance of machine (Front side)
Figure 2 shows Appearance of machine (back side)
4 Installation

4.1 Precautions for Installation

- This equipment is designed and manufactured to operate properly only in use of rated voltage. Refer to specification section of this manual for rated voltage before installation.
- Use AC power cable that comes with (or installed to) the product.
- Do not touch the Power Cord wet handed.
- Avoid locations where the equipment is exposed to direct sunshine.
- Do not place the equipment in a corrosive atmosphere.
- Do not use the equipment in a flammable atmosphere.
- Do not use the equipment where ventilation is poor.
- Do not locate the equipment in a dusty location.
- Do not use in an unstable place that are subject to vibrations.
- Avoid locations of high humidity.
- Avoid locations where the equipment is exposed to high temperature.
- Recommended temperature range: 20°C to 30°C
- Operation temperature range: 10°C to 40°C
- Relative humidity ranged 20 to 80%
- Avoid locations of altitude higher than 2,000m.
- Use the equipment indoors only.
- Secure adequate space around the power plug.
- Vibration frequency is less than 10 Hz and vibration less than 0.005 mm.
- Must be in areas where no electromagnetic interference.

4.2 How to install

- Use with a minimum distance all around of 30 cm from walls of other items.
- Machines must be placed on a flat surface that is strong enough. And adjust the machine to the vertical.
- Connect the power cord to an outlet with earthling point.
- In case of connecting to an outlet without earthling point, connect lead wire to the earth after connecting grounding adapter.
4.3 How to ground Earth wire

⚠️ WARNING

- Earth wire must be grounded to prevent any electrical accidents.
- Improper or no grounding may cause electrical shock.
- Grounding terminal is included in the power plug.
- Therefore, there is no need to earth if plug in connected to a consent with grounding terminal.
- If grounding terminal with consent is not available, install adapter to plug to ground earth wire from green terminal or install earth wire to the grounding terminal of the equipment.
5 Name & functions

5.1 Name of part

Figure 3 shows the major parts of the test.

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>No.</th>
<th>Part name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td>6</td>
<td>Compression plate set</td>
</tr>
<tr>
<td>2</td>
<td>Universal Joint</td>
<td>7</td>
<td>3-point set</td>
</tr>
<tr>
<td>3</td>
<td>Tension grip (Upper)</td>
<td>8</td>
<td>Extensometer (Strain gauge)</td>
</tr>
<tr>
<td>4</td>
<td>Tension grip (Lower)</td>
<td>9</td>
<td>Extensometer (Rotary type)</td>
</tr>
<tr>
<td>5</td>
<td>Lower joint</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4 shows the image on the back-machine.

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Upper limit switch knobs</td>
</tr>
<tr>
<td>11</td>
<td>Emergency switch(R)</td>
</tr>
<tr>
<td>12</td>
<td>Lower limit switch knobs</td>
</tr>
<tr>
<td>13</td>
<td>Control panel</td>
</tr>
<tr>
<td>14</td>
<td>Start lamp</td>
</tr>
<tr>
<td>15</td>
<td>Emergency switch(L)</td>
</tr>
<tr>
<td>16</td>
<td>Power lamp</td>
</tr>
<tr>
<td>17</td>
<td>Control panel connector</td>
</tr>
<tr>
<td>18</td>
<td>Com. Port 232(load cell)</td>
</tr>
<tr>
<td>19</td>
<td>Com. Port 232(encoder)</td>
</tr>
<tr>
<td>20</td>
<td>Com. Port 232(strain gauge extensometer)</td>
</tr>
<tr>
<td>21</td>
<td>Com. Port 232(long range extensometer)</td>
</tr>
<tr>
<td>22</td>
<td>Breaker</td>
</tr>
<tr>
<td>23</td>
<td>Power connector</td>
</tr>
</tbody>
</table>

Figure 5 shows the signal connector.
Figure 6. show the device connected signal

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>No.</th>
<th>Part name</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Load cell connector</td>
<td>30</td>
<td>Analog signal±0-10 VDC</td>
</tr>
<tr>
<td>25</td>
<td>Control panel connector</td>
<td>31</td>
<td>Data acquisition (Load cell)</td>
</tr>
<tr>
<td>26</td>
<td>Signal monitor</td>
<td>32</td>
<td>Data acquisition (Extensometer)</td>
</tr>
<tr>
<td>27</td>
<td>Extensometer signal input</td>
<td>33</td>
<td>Extensometer port</td>
</tr>
<tr>
<td>28</td>
<td>Load signal port</td>
<td>34</td>
<td>Control Panel Card</td>
</tr>
<tr>
<td>29</td>
<td>Encoder signal port</td>
<td>35</td>
<td>Data acquisition (Encoder)</td>
</tr>
</tbody>
</table>
Figure 7 show the moving system.

Figure 8 shows images of machine components.

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>No.</th>
<th>Part name</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Servo Motor</td>
<td>45</td>
<td>Universal joint nut</td>
</tr>
<tr>
<td>37</td>
<td>Timing belt</td>
<td>46</td>
<td>Universal joint</td>
</tr>
<tr>
<td>38</td>
<td>Disc Couplings</td>
<td>47</td>
<td>Joint nut</td>
</tr>
<tr>
<td>39</td>
<td>Low voltage supply</td>
<td>48</td>
<td>Grip body</td>
</tr>
<tr>
<td>40</td>
<td>Worm Gear</td>
<td>49</td>
<td>Teeth fixing plate</td>
</tr>
<tr>
<td>41</td>
<td>Rotary Shaft</td>
<td>50</td>
<td>Grip teeth</td>
</tr>
<tr>
<td>42</td>
<td>Servo driver</td>
<td>51</td>
<td>Lower joint</td>
</tr>
<tr>
<td>43</td>
<td>Load cell fixing nut</td>
<td>52</td>
<td>Pin</td>
</tr>
<tr>
<td>44</td>
<td>Tension joint</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 9 shows the bending test equipment.

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Compression joint</td>
</tr>
<tr>
<td>54</td>
<td>Screw</td>
</tr>
<tr>
<td>55</td>
<td>Bending Roller</td>
</tr>
<tr>
<td>56</td>
<td>Lock nut</td>
</tr>
<tr>
<td>57</td>
<td>Bending span adjust</td>
</tr>
<tr>
<td>58</td>
<td>Bending jig</td>
</tr>
<tr>
<td>59</td>
<td>Stud</td>
</tr>
<tr>
<td>60</td>
<td>Bending support</td>
</tr>
</tbody>
</table>
The assembly for tensile testing.

1. Load cell installation, and then compete with Crosshead nut is tightened all the positions (*).
2. Assembly tension joint (2), Load cell with inserted through the crosshead and competition nut (1) is tightened.
3. Retaining Upper joint fixing nut (3) to the tension joint (2).
4. Insert the Universal joint (4) with tension joint (2).
5. Insert pin (7)
6. Insert the tension grip (5) with universal joint (4).
7. Insert pin (5)
8. Adjust fixing nut to grips with the universal joint tightly.
9. Holding the lower grips to perform in the same way.

Note (*).
1 for clamping Load Cell. shall not be paid while the electricity or machine is in a state breaker off only.

The assembly for bending test.

1. Load cell installation, and then compete with Crosshead nut is tightened all the positions (*).
2. Assembly compression joint (2) with inserted through the Crosshead and competition nut (1) is tightened.
3. Insert bending (4) to Universal joint (2).
4. Retaining screw (3) to the compression joint (2)
5. Installed 3-point bending device on the table
6. Adjust the cradle, Bending span desired size or the standard
7. Retaining nut bending span adjust. tighten.
The assembly for the compression test.

1. Load cell installation, and then compete with crosshead nut is tightened all the positions (*)

2. Assembly compression joint (2) to Load cell with inserted through the crosshead and competition nut (1) is tightened

3. Insert compression plate (4) to Universal joint (2).

4. Retaining screw (3) to the compression joint (2)

5. Install pads on the table of the machine.

Figure 12 shows the compression test assembly.
5.2 How to operate

- Check rated voltage of the equipment as well as check the specification. (AC220V, 50Hz)
  - In case of using 110V, use a boosting transformer with enough capacity.
  - Be sure to use AVR (Automatic Voltage Regulator) in the place with unstable voltage.
- Connect the power plug to the power outlet.
  Use POWER CORD with enough capacity.
- Check if E.L.B. (Electric Leakage Breaker) is working properly.
  Turn on the E.L.B, press red button on the E.L.B., then it should be turned OFF.
  If E.L.B is switched off by pressing green button, then it is working properly.

5.2.1 How to use control panel

- Connection to the computer system
  Connection between the computer and testing machine can connect with USB or RS 232.
- Turn ON the E.L.B. (Electric Leakage Breaker), and observe the power lamp in green
- Press Start to (Switch on) test available for work (Refer to Figure 9)
- Limit switches must be adjusted to a level appropriate to both the top and bottom for easy-to-use test. And to secure the highest level
  Worm Up for testing machine before use.
- Computer power On
- Press “Start” (Control Panel) and observed that the indicator lamp is green
- Press the UP-Down (Control Panel) to find the test stroke as need

![Control Panel](image)

Control Panel

- **Start**: Press Start to (Switch on) test available for work.
- **Stop**: Press Stop button to stop the test (Switch off)
- **Speed 1 Up**: Press Speed 1 Up Crosshead keys for moving up slowly.
- **Speed 2 UP**: Press Speed 2 UP Crosshead keypad to move up quickly.
- **Speed 1 Down**: Press Speed 1 Down Crosshead keypad to move down slowly.
- **Speed 2 Down**: Speed 2 Down Crosshead keypad to move down quickly.

Note (*) can control the movement of Crosshead through programs at the screen. Computer after pressing Start

Figure 13 shows Control Panel.
5.3 Test procedures.

1. Load cell installation by tightening all the screws.
2. Press Start at the Control panel.
3. Press Speed Up or Speed Down the aforesaid crosshead adjusted for equipment installation.
4. Preparation of test piece clamping kit Universal joint, Grip or Compression plate as illustrated in Figure 11-13.
5. Turn on the computer.
6. Into the test program. And set the parameters for the test.
7. Clamping specimen.
8. Press Speed Up or Speed Down the aforesaid Crosshead move into position to start the test.
9. Click Chart and Click Adjust Zero.

10. Click: Start to start the test.
11. Click: Stop if you want to stop the experiment. Before the fracture, or to the value specified in the test program.

Note.

1. Upon completion of the testing program, or stop by Click Stop should wait 10-20 seconds for processing.
2. Do not add to the command of non-interval processing. May cause the program to stop.
5.4 Practice after use.

1. When to stop testing or tests are done under the conditions set machine will stop working or go back to that position has been set (Return Position).
2. Press the switch to Speed Up or Speed Down crosshead set in the right position.
3. Press the Stop the Control panel.
4. Disconnect all devices (Universal joint, Compression joint or Grip) from the load cell on work completed.
5. Power Off
6. Check and clean equipment after use.
7. Cover test. With a cloth or rubber sheet to prevent dust and extend the life of the machine-testing

Note: Users should be trained sufficiently.
6 Maintenance and service.

6.1 In case of cleaning body of the equipment.
   - Disconnect the power plug from power outlet.
   - Clean the outside part of the machine with sponge or soft clothes getting wet by neutral cleaner.
   - Clean the accessories of the machine with sponge or soft clothes getting wet by water.
   - Clean with dry clothes.
   - Do not use organic solvent.
   - Do not use flammable or volatile chemicals such as benzene alcohol to clean.

6.2 Lubricant
   - Disconnect the power plug from power outlet.
   - Clean the ball screw of the equipment with sponge or soft clothes getting wet by neutral cleaner.
   - Check and clean. Wipe with oil to prevent rust.
   - Do not use flammable or volatile chemicals such as benzene, alcohol to clean.
   - Add oil (grease) at Ball Screw moderation and a reasonable time period.
   - Check disorders that may occur, such as heat, vibration noise before and after use.

6.3 Cleaning electric parts.
   - Clean with dry clothes.

6.4 When the equipment is not used for long time.
   - Remove power plug from power outlet.
   - Clean with soft clothes.
   - Pack the equipment in a appropriate way and store in a safe place for storage.
7 Trouble shooting

A In case machine fails to work at all :-

- Control unit switched off :-
  => Ensure unit is on.

- Power supply shortage :-
  => Refer to specification and check whether sufficient power is being supplied.
  => Is the breaker on the side of outer part open?

- Check if lamp is turned down.
  => Check unit in a power outlet that is known to work.
  If still does not work, contact your NRI agent/distributor & have it repaired.

B Is the equipment inclined?
install the equipment vertically all the time.

C Load or stroke swing occurs during operation or motion is not uniform :-

  => Check whether high frequency welding machine, high frequency sewing machine or large capacity SCR controller generating strong high frequency noise is located near the equipment.
  If so, move the equipment to another location
  => Perform resetting or calibration process

D When load is not rise (or down) as accordingly :-

  => Check load cell Load Cell connector (In &Out) condition for possible physical damage
  => Check load cell condition for possible physical damage.

E Can not press start at the control panel

  => Make sure the machine is turned on.
  => Check the connecting cable.
  => Check the position of emergency switch.
  => Check position of the limit Switch.
  => Press stop and start again

F Noise and vibration disorders

  => Check the level of the ground paste machine.
  => Align the machine on flat ground does not shake.
  => Contact your NRI agent/distributor
G  graph is not smooth or suspend
   => Check the USB connection to computer
   => Check the connection cable (Load Cell Cable and Encode Cable).
   => Contact your NRI agent/distributor

H  Machine stopped during the experiment
   => Check the connecting cable.
   => Check setting Parameter (Load limit, Stroke limit).
   => Check position of the Limit Switch.
   => Press Stop and Start Again

I  In case general failure :-
   => Check unit in a power outlet that is known to work.
   If still does not work, contact your local NRI agent/distributor & have it repaired.
8. After-sales service.

8.1 Free repair

Faults which is responsible for manufacture in normal condition can be repaired with free for 1 (one) year from purchase date (only, load cell is zero year), and it is desirous to check following items when requesting or plan

- Part and condition generated fault
  
  (It is necessary to explain in detail within limit of possibility)

- Model name

- Serial Number

- Purchase date (year, month, date)

8.2 Onerous repair

In following case, it is required to repair with compensation in spite of guarantee period.

- Fault by user mistake, unsuitable repair or modification

- Fault by negligence for carrying and handling during use

- Fault due to natural disasters such as fire, flood disaster, political protest or employees and abnormal voltage

- Fault by using people who do not receive training from NRI distributor or agent

- Fault by using against direction for use.

- There is no scientific proof.

9.1 Technical Specification

**Universal Testing Machine : NRI-TS500 - 50**

**Machine Features**

- **System:** Computer control & Operating with the program by USB
- **Type:** Ball Screw type & located on the ground
- **Capacity:** 5,000 kgf (50 kN) (Tension-Compression)
- **Applications:** Metallic materials, Plastics, Textile, Fabric, Composite materials
- **Driver:** Screw type (Servo motor & Gear)
- **Servo motor:** 1.5kW / 3000 rpm
- **Ball Screw:** 32 x 10 mm.: Double Column
- **Rigid frame:** Frame stiffness ~1000 N/μm.
  
  Frame maximum load capacity 18,000 kgf (180kN)
- **Safety:** Limit switch for over stroke limit (upper & lower)
  
  Emergency stop switch
- **Power supply:** 220V/AC

**Force measurement system**

- **Precision Load cell:** 2mV/V or 3mV/V
- **Load Amplifier and reader card:** 24 bit
- **Load range:** 4 range or 4 load cells (as required)
- **Position detection:** Rotary encoder 1000 Plus
- **Encoder Amplifier and counter card:** 24 bit
- **Data sampling rate:** 400 Hz
- **Measurement range:** 0.01kN-50kN
- **Measurement Unit:** SI, Metric, English
- **Test speed:** < 0.5~1000 mm/min
- **Return position speed (max.):** 1000 mm/min
- **Tension-Compression range:** 1445 mm.
- **Space between column:** 500 mm.
- **Position resolution:** 0.001 mm.
- **Test force measurement:** 1/500000 of load cell rate capacity

**Software : NRI-Testing Machine V-3.9**

- **Tension test** (Single/Cycle)
  
  Test mode constant load control / Load set point
  
  Load set point (as required)
  
  Test mode constant speed/stroke control
  
  Stroke set point (as required)
  
  Test mode constant stress rate control
  
  Test mode constant strain rate control
  
  Test mode step control cycle
  
  step load control or stroke (as required)
  
  Peeling test (Fix / Sliding)
  
  Compression / Bending
  
  Plunger Test
  
  Flexural Bending Test
  
  Shear test
  
  Coefficient of Friction Tester (COF)/Bonding Test
  
  Spring Test
  
  Test method setting program no limit
  
  JIS k 6301, JIS Z 2241, TIS 683, etc. (As required)
  
  Report design Control panel, Start Up
  
  Start Down
  
  Positional jog Down Operate temperature 0-40° C
  
  Relate Humidity 20 ~ 80 %

**Graph**

- Stress – Strain
  
  Load – Stroke
  
  Stress – Time
  
  Stroke - Time
  
  Load - Time
  
  Load- Elongation / Auto range etc.

**Data Processing**

- Statistical, analytical data
  
  Data marking line
  
  Monitoring display
  
  Movement monitor
  
  Test force monitor
  
  Select sample type and dimension setting
  
  Data recalculation
  
  Report design (Select Data)
  
  Test parameter setting
  
  Test data export
  
  - word
  
  - Excel
  
  - Text file, PDF

**Others**

- Calibration Certificate
  
  Operation Manual Operating training & user guide
### 9.2 Component list

<table>
<thead>
<tr>
<th>Name of part</th>
<th>Specification</th>
<th>Model No</th>
<th>Maker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load cell</td>
<td>50 kN:3mV/V tension/compression</td>
<td>DSCK-5T</td>
<td>BONGSHIN</td>
</tr>
<tr>
<td>Servo motor</td>
<td>1.5 kW</td>
<td>TSB13152C</td>
<td>TECO</td>
</tr>
<tr>
<td>Servo drive</td>
<td>170-230VAC</td>
<td>TSTA-50D</td>
<td>TECO</td>
</tr>
<tr>
<td>Ball screw</td>
<td>32 x 10</td>
<td>SCR 03210</td>
<td>ABBA</td>
</tr>
<tr>
<td>Gear</td>
<td>1:30</td>
<td>NMRV 050</td>
<td>SUNTECH</td>
</tr>
<tr>
<td>Rotary encoder</td>
<td>1000 plus</td>
<td>I58-H-1000 ZU46RL2</td>
<td>LIKA</td>
</tr>
<tr>
<td>Breaker</td>
<td>240V 10A</td>
<td>BS 1110Y</td>
<td>Panasonic</td>
</tr>
<tr>
<td>Magnetic switch</td>
<td>220-240V 50Hz 20A</td>
<td>S-N11</td>
<td>MITUBISHI</td>
</tr>
<tr>
<td>Emergency stop switch</td>
<td>240V 10A</td>
<td>T2BKR-P</td>
<td>TEND</td>
</tr>
<tr>
<td>Encoder Amplifier and</td>
<td>24 bit</td>
<td>DAQ-E24</td>
<td>NRI</td>
</tr>
<tr>
<td>counter card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Amplifier reader card</td>
<td>24 bit</td>
<td>DAQ-L24</td>
<td>NRI</td>
</tr>
<tr>
<td>Extensometer card</td>
<td>24 bit</td>
<td>U6</td>
<td>LAB JACK</td>
</tr>
<tr>
<td>Power lamp</td>
<td>220 V, ≤ 20mA</td>
<td>5D22-R2DH-G</td>
<td>SALSER</td>
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<tr>
<td>Ball bearing</td>
<td>-</td>
<td>16005</td>
<td>SKF</td>
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<tr>
<td>Tapered roller bearing</td>
<td>-</td>
<td>33205Q</td>
<td>SKF</td>
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<tr>
<td>Torque limit</td>
<td>-</td>
<td>CPDT50-20-20</td>
<td>MISIMI</td>
</tr>
<tr>
<td>Timing belt</td>
<td>-</td>
<td>HTBN520-S5M</td>
<td>MISUMI</td>
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</table>
10. Certification.

10.1 ISO 9001 certificate
Product Warranty Certification

Thank you for purchasing a NRI product. Please take a moment to fill in the following and return it to Narin Instrument Co., Ltd. for product registration

- NRI products are warranted against defect in material and workmanship for a period of one (1) year after delivery to the first purchaser for use.

- This warranty does not apply to the damage resulting from misuse, alteration, transportation, abuse, accidents, natural disasters, tampering, servicing attempted movement of machine after the installation has completed, or performed by unauthorized service agency.

- Before use, read the manual thoroughly. Narin Instrument Co., Ltd. cannot be held responsible for the malfunctioning resulting from the use of the product other than specified in operation manual.

- Call or fax Customer Service for a Return Material Authorization (RMA) number before returning the product or any specific material.

- Put the RMA number on the shipping label, and a written detailed description of the problem.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Model No</th>
<th>Serial No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery Date</td>
<td>/ / (dd/mm/yy)</td>
<td>Warranty</td>
</tr>
</tbody>
</table>

Narin Instrument Co., Ltd. only warrants the safety and proper operation of product under the condition that:

- The product is properly and in accordance with the instructions stated in the operation manual.

- No modifications are made.

- Only original spare parts are used. The use of other parts carries unknown risks and will void unit's warranty.

- Installation or withdrawal of a testing program

- Is used by people who do not receive training from NRI distributor or agent

- The cover part of the machine has not been opened.

Signed by

.................................................................

(Chana Thinakul)

Managing Director
Appendix A