

# BKN Multi-frequency Eddy Current Sorting System

## User's Manual



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## 1. Operating environment requirements

Operating system: Windows 7 or windows 10 required.

Support software: Excel spreadsheet must be installed in the system, with version of Office2010 and above (used to generate test report).

## 2. Scope of application and objects

Multi frequency eddy current testing and sorting instrument is applicable to all conductive or magnetic materials, i.e. all metals.

Standard parts, bearing parts, forgings, steel castings, bolts, transmission elements, buckle parts, steel balls and other mechanical parts' heat treatment and material mixture, hardness and material mixture, material mixture, heat treatment, hardness and structure, rapid detection and sorting of purity and core strength and other hardness, rapid sorting of materials and defect inspection.

Product is widely used in aerospace, military, automotive, power, railway, metallurgical machinery and other industries.

## 3. Operating instructions

### 3.1 Step 1: decompress the software package

Software package decompression: use the decompression software to open the "BKN multi-frequency eddy current sorting system software V1.0.rar", decompress it to the computer hard disk directory; it is recommended to decompress it to the D: \ directory, the software includes the USB driver installation package, operating environment Installation package and BKN multi-frequency eddy current sorting system software package.

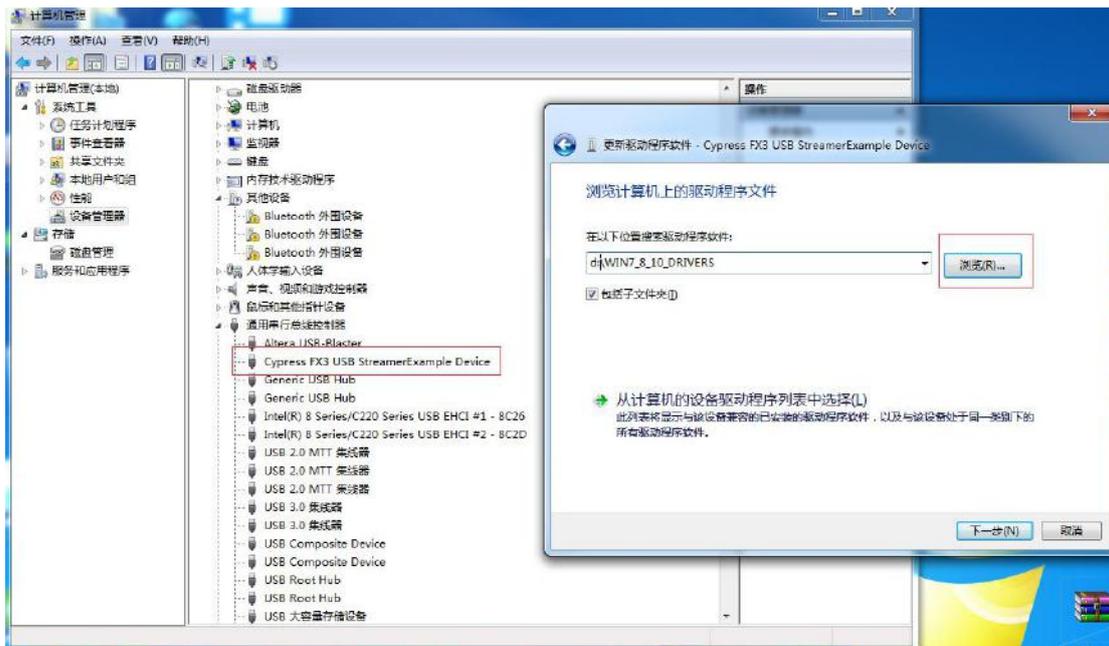


### 3.2 Step 2 is to install the operation environment

(1) Install the operating environment software package, double-click d:/vc2015/vc\_redist.x86, the following interface pops up, and follow the software installation wizard to complete the installation.

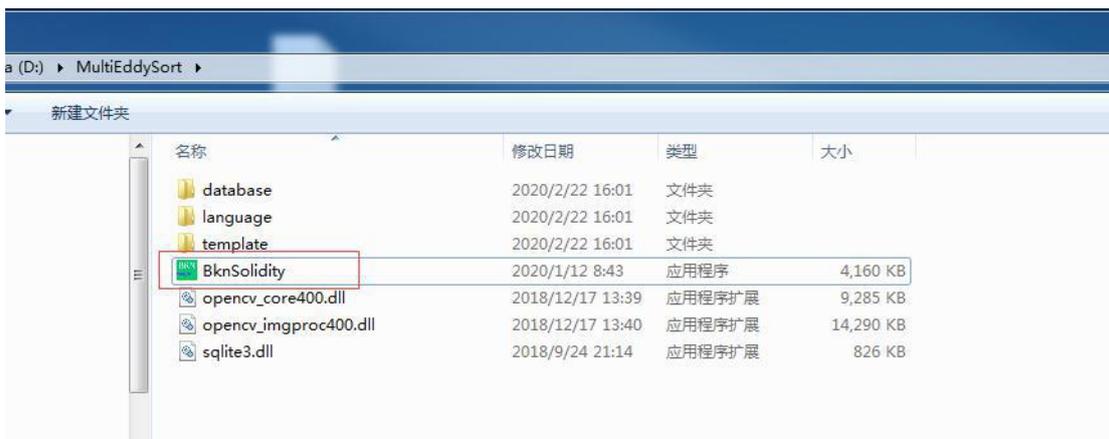


(2) Install the USB driver software package, connect the computer and the instrument with a USB cable, turn on the instrument power, and the new hardware that can be detected on the computer requires the driver to be installed. Open the device manager, select the USB device to be installed, click to update the driver software, select the folder where the driver is stored and complete the installation according to the software installation wizard guidelines, as shown below:



### 3.3 Step 3: start the system

- (1) Start the sorter: connect the probe, USB cable and IO cable, turn on the power switch of the sorter, and start the detection equipment;
- (2) Software system startup: Open the "BKN multi-frequency eddy current sorting system software V1.0" directory that has just been decompressed, find "d: / MultiEddySort / BknSolidity.exe" (it is recommended to shortcut this file to the desktop), double-click It opens the user operation interface of the BKN multi-frequency eddy current separator system. The directory structure where the software is located is shown in the following figure:



- (3) Introduction to the first interface: the top toolbar is the main menu of the software, the right toolbar is the function keys of the software, the middle area is the detection display area of the software, and the bottom area is the counting area of the workpiece

detection. For details, see the subsequent chapters. The user operation interface of the BKN multi-frequency eddy current sorting system is as follows:



### 3.4 Step 4, reference data

Before the system works or when the workpiece is changed to a different model or batch, calibration is required, that is, to detect and save the good workpiece. Generally, it is required to save 10 to 20 workpiece detection values, and use this as a standard to determine the early warning of each frequency region. As shown below:



(1) The specific operation process is described as follows: As shown in the figure above, first click the "reference data" button to make the software work on the "reference data" detection main interface, click the 2. "start" button to put the instrument in the detection state, click 3 2. "Delete reference data" button to clear the previous reference data. If it is accumulated based on the previous reference data, do not click this button. Click 4. "Trigger reference data recording" button, the software system will automatically add the detected workpiece. For reference data, the system dynamically calculates each frequency threshold line. After the reference data is added, click 5, "Stop Reference Data Recording", and the system saves the reference data to the database.

(2) Reference data review and removal operations, when it is necessary to traverse the reference data or remove one of the reference data, you can do the following operations: as shown in the figure below, first click the "Stop" button, the instrument is in the stop detection state, At this time, the "Move Left", "Move Right" and "Remove Reference Data" buttons can be operated; click the 2, "Move Left" or 3, "Move Right" buttons. 4, arrow position and 5, red circle position in the figure will change, and their position is the currently selected reference data. If you click 6, remove reference data, the reference data will be removed, the threshold lines of eight frequencies will be recalculated, and the dynamic real-time change will occur.



(3) Reference data enlargement and reduction operations, if you need to view the distribution of reference data, you can click 1, "single frequency display" button in the figure below, the interface switches to 2, "single frequency threshold map" interface, you can click 3, Check the threshold graph of the corresponding frequency for each frequency in the "frequency switching selection" bar. Click 4, "enlarge" or 5, "reduce" to enlarge or reduce the display of threshold map in equal proportion, and click 6, each button in the instruction to traverse the reference data.



### 3.5 Step 5: type batch

Click the "type batch" display setting button in the upper left corner of the main menu to open the new batch number interface, as shown in the following figure:



When the software is started, the system generates a batch number by default. When the software is not closed or the batch number is not newly created, the test data

during the period is associated with this batch number. Number associated. New batch number process: Click 1, select a workpiece type in the workpiece type list, click 2. "New batch number", 3. Display the new batch number and batch in the "type batch" in the upper left corner of the main menu Number composition: type \_ year, month, day, hour and minute.

### 3.6 Step 6: MFET detection

After calibration, workpiece detection can be performed. The operation interface of workpiece detection is as follows. The first one is displayed in the form of bar graph, and the detection results and list are integrated into one interface. If there are multiple channels, they can be displayed at the same time. The second interface is suitable for viewing the single channel detection, and more data details can be displayed.

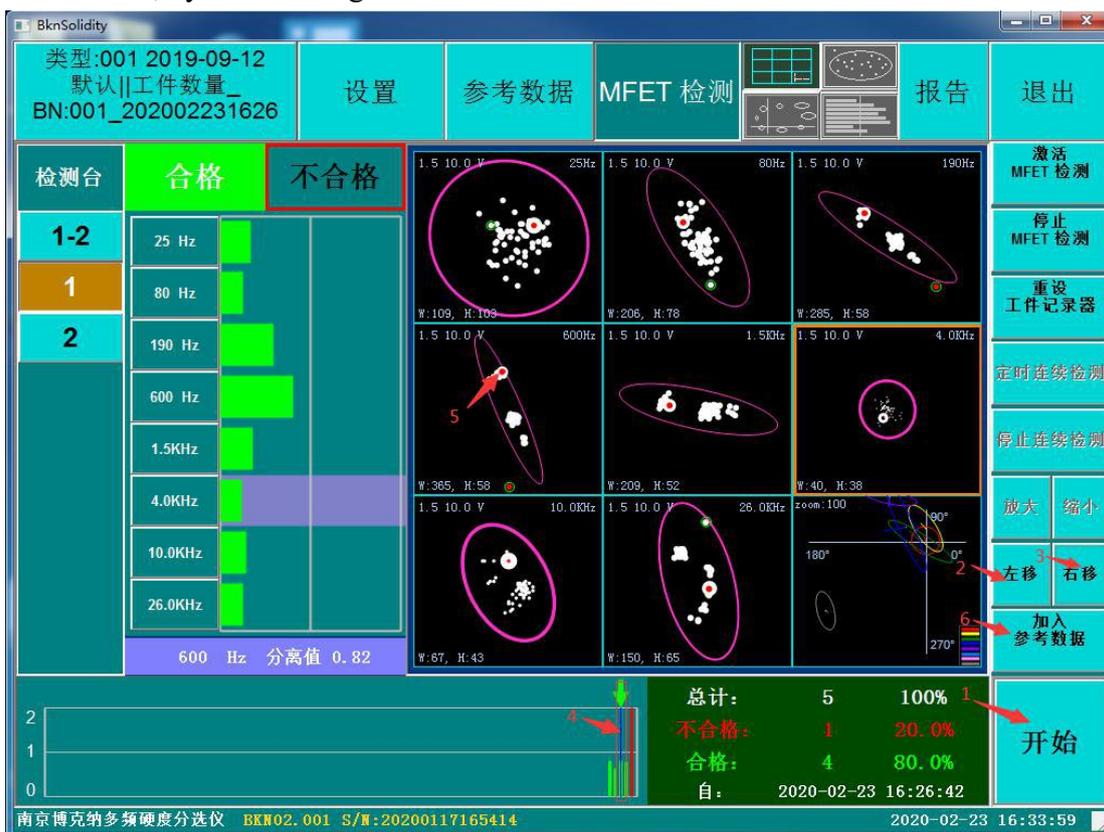




(1) The specific operation process is described as follows: As shown in the figure above, first click the "MFET detection" button to make the software work in the main interface of "MFET detection" detection, click 2. Start button to put the instrument in the detection state, click 3 2. "Reset Workpiece Recorder" button to clear the previous test records. If it is accumulated on the basis of the previous test parts, do not click this button. Click 4. "Activate MFET Test" button, the software system will automatically change each part Analyze and calculate the frequency threshold lines of the frequency detection data and reference data, and give OK and NG judgments, output the results through IO to control the PLC operation, click 5, "Stop MFET detection", the system saves the detection data of the workpiece To the database for later data statistics and analysis.

(2) Inspection data review operation, when you need to traverse the inspection data of the workpiece or add one of the workpiece data to the reference data, you can operate as follows: As shown in the figure below, first click the "Stop" button, the instrument is in stop Detection status, at this time, the "Move Left", "Move Right" and "Add Reference Data" buttons can be operated; Click the 2, "Move Left" or 3, "Move Right" button, the position of the arrow in the figure 4, the red circle The position will change, and their position is the currently selected workpiece detection data. If you click the "Add Reference Data" button, the detection data of this workpiece will be added to the reference data, and the eight frequency threshold lines will be reset.

Calculation, dynamic changes in real time.

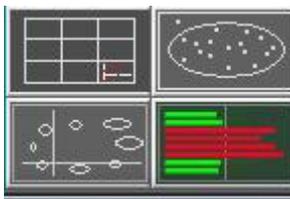


(3) Workpiece detection data enlarge and reduce operation. If you need to view the distribution of workpiece detection data, you can click the 1 "single frequency display" button in the figure below to switch to the 2 "single frequency threshold map" interface, and you can view the threshold map of corresponding frequency by clicking the 3 "frequency switch selection" bar. Click 4, "enlarge" or 5, "reduce" to enlarge or reduce the display of threshold map in equal proportion, and click 6, each button in the instruction to traverse the workpiece detection data.

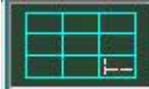


### 3.7 Step 7, graphics switching

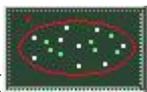
There are four buttons in the main menu which are respectively used to display the detection data of workpiece from four frequency threshold graph, single frequency threshold graph, global threshold graph and bar graph when "reference data" and "mfet detection" are detected.

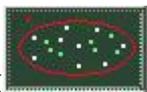


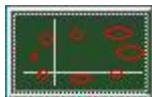
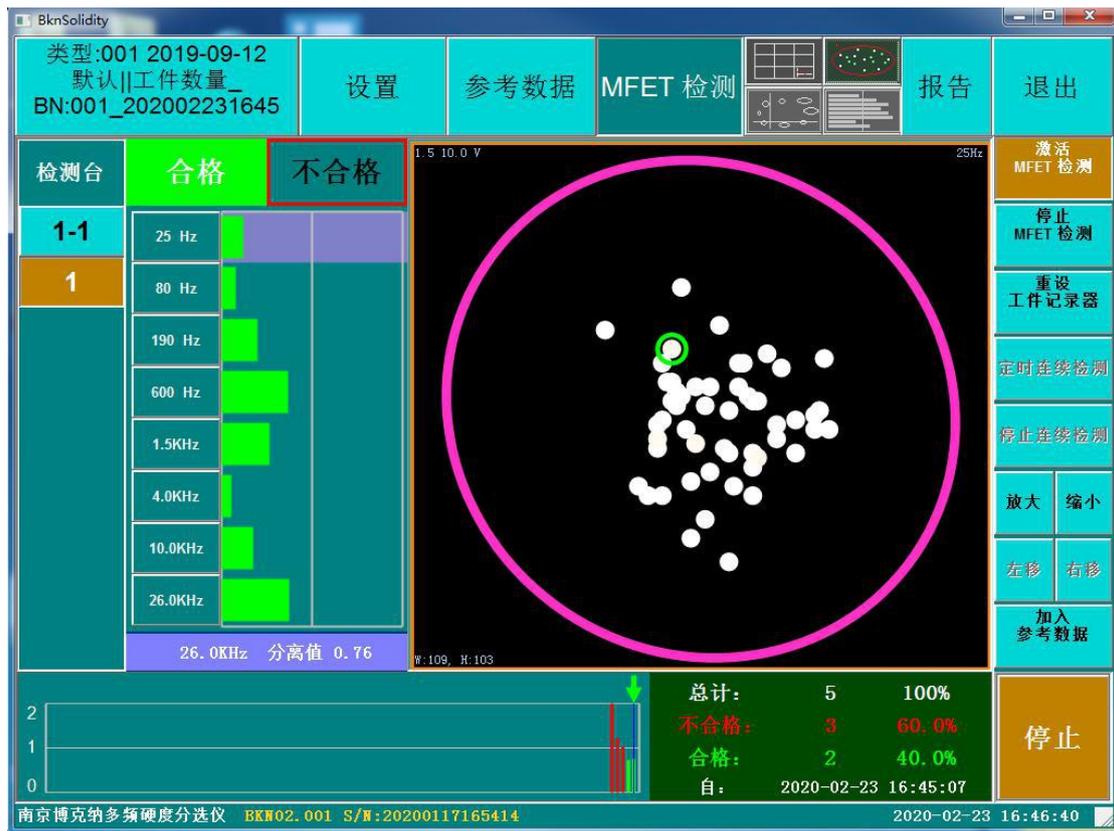
buttons in the main menu which display the detection data of different angles such as eight graph, single frequency threshold graph and bar graph when

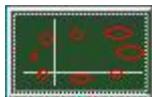
Click  button, The software system interface switches to the eight frequency threshold graph display interface, and the display information of each threshold graph includes the width and height of the external rectangle of tolerance, drive, frequency and threshold ellipse, calibration reference data points (in mfet detection, you can set whether the reference data points are displayed through the "Settings -> global parameters -> display reference data" switch), workpiece detection data points (display the latest settings For the number of points, the display number is set by "Settings -> global parameters -> number of data". The detection data of the workpiece is within the threshold line, i.e. OK piece, displayed as white

point, and outside the threshold line, i.e. ng piece, displayed as red point. As shown in the figure below:



Click  button, The software system interface switches to the single frequency threshold graph display interface, and the display information includes tolerance, drive, frequency, width and height of the external rectangle of the threshold ellipse, calibration reference data points, workpiece detection data points. You can zoom the threshold graph to view the data through the "zoom in" and "zoom out" buttons, and select to view the frequency data through the left frequency button. As shown in the figure below:



Click  button, the interface of the software system switches to the display interface of the global threshold graph. The display information includes the actual position of the eight frequencies in the whole value range of the instrument (the center of the ellipse, the size of the ellipse, the deflection angle of the ellipse), the legend of the threshold line, the coordinate axis and the connection between the current detection point and the center of each corresponding frequency. As shown in the figure below:



Click  button, The software system interface switches to the bar graph display interface, and the display information includes the detection time, tolerance and frequency, threshold graph, normalized bar graph (green in the tolerance area, red outside the tolerance area and the value is less than or equal to 2, dark red if the value is greater than 2), separation value of each frequency detection data, and the tolerance and frequency value corresponding to the maximum separation value. As shown in the figure below:



### 3.8 Step 8, report

Click the "report" button in the main menu to open the data view and report dialog box as shown in the figure below. The software supports two data query methods: "query by batch number" and "query by time". After the data is queried, click "generate report". The system will automatically generate the excel document of the report. The document storage path is set -> global parameters -> report path Select "and the report template is as follows:



### 多频硬度检测报告

操作人员		生产批次	001_202002231003
开始时间	2020-02-23 10:04:44	结束时间	2020-02-23 10:12:43
总数量	26	检出数量	3
检测参数	公差: 1.5, 驱动: 10.0 V, 频率范围: 25 Hz - 26.0KHz		
序号	检测时间	硬度检测结果	
		测量值	OK/NG
001	2020-02-23 10:12:43	0.59	OK
002	2020-02-23 10:12:41	0.50	OK
003	2020-02-23 10:12:39	0.60	OK
004	2020-02-23 10:12:37	0.60	OK
005	2020-02-23 10:12:35	0.55	OK
006	2020-02-23 10:12:33	0.84	OK
007	2020-02-23 10:12:31	0.64	OK
008	2020-02-23 10:12:29	0.70	OK
009	2020-02-23 10:12:27	0.55	OK
010	2020-02-23 10:12:25	0.68	OK
011	2020-02-23 10:12:23	0.79	OK
012	2020-02-23 10:12:21	0.73	OK
013	2020-02-23 10:12:19	0.74	OK
014	2020-02-23 10:12:17	0.83	OK
015	2020-02-23 10:12:15	1.08	NG
016	2020-02-23 10:12:13	0.81	OK
017	2020-02-23 10:12:11	0.59	OK
018	2020-02-23 10:12:09	0.88	OK
019	2020-02-23 10:12:07	1.00	OK
020	2020-02-23 10:12:05	0.70	OK
021	2020-02-23 10:12:03	0.71	OK
022	2020-02-23 10:12:01	0.83	OK
023	2020-02-23 10:11:59	0.69	OK

## 4. Software system settings

### 4.1. Workpiece type

Click "Settings-> Workpiece Type-> Add New Workpiece Type", or select a workpiece type in the list of workpiece types, and click "Delete Selected Workpiece Type" to delete the selected workpiece type. Modify, as shown below:



### 4.2 Style setting

The style setting is used by the equipment manufacturer or under the guidance of the manufacturer's technical personnel. The user is not allowed to modify the configuration in daily work. The default color is set to template 1. The operation interface is as follows:



### 4.3 Global parameters

Global parameter settings include overall settings, screen display settings, PCB switch settings, data settings, report saving path settings and switch selection. In the overall setting, other parameters except language selection are not allowed to change; the screen display setting is set as required, and the screen separation rate is 1024 \* 768 by default. The system adapts to the actual screen, whether to lock the screen and restart the software, and the lock icon appears in the upper left corner of the software



, At this time, you cannot enter the setting interface, only



perform workpiece detection. Click the lock icon Password input box. The default password is 1234. After unlocking, you can set the system; Click "Menu Configuration", a menu configuration dialog box will pop up. The menu configuration is used by the equipment manufacturer or under the guidance of the manufacturer's technical personnel. The user is not allowed to modify this configuration in daily work; the PCB switch setting defaults to "open CH1, zoom in 1", Depending on the probe, it may be necessary to use the "open CH1, zoom in 4 times" option, other options are for developers to debug the device; data settings can

change the way the workpiece detection data is displayed in various graphics; switch selection Debug device for developers. As shown below:



#### 4.4 Frequency setting

Frequency setting includes tolerance factor, drive, frequency and time (number of waveforms). Tolerance factor and drive can be set in batch or separately. Click tolerance factor or drive to open the keypad for batch setting. Click the specific edit box to open the keypad for content setting of corresponding parameters. The system provides four groups of default configurations. Click "select default configuration" to open the default configuration selection dialog box. Select one group and click "OK". The parameters under frequency setting will be updated to the corresponding default configuration. Similarly, you can modify the default configuration. After changing the frequency configuration, you need to click "set current configuration" to download the modified parameters to In the instrument. The operation interface is as follows:



#### 4.5 Detection and assembly

The function of inspection and assembly is mainly used for debugging equipment of manufacturers, which needs data support. Its operation interface is as follows:



#### 4.5 Input and output

The input and output settings include the settings of synchronization signal delay, output NG, OK alarm delay and hold. Other options are reserved. After setting each parameter, it can be saved separately and downloaded to the instrument, or all can be downloaded. The interface is as follows:



## 5, Instrument connection instructions

BKN multi frequency eddy current sorting system is composed of instrument and computer. Data communication is conducted through USB2.0 interface. The interface panel of the instrument is shown as follows:



1. Turn the power switch to the left to turn on the power, and to the middle or right to turn off the power;
2. Power socket, positive and negative 24V DC special power supply, provided by the manufacturer;
3. USB2.0 socket for data communication between instrument and computer;
4. IO interface, input synchronous signal, output OK signal and NG signal;
5. Probe interface, through the probe line to realize the connection between the probe and the instrument.