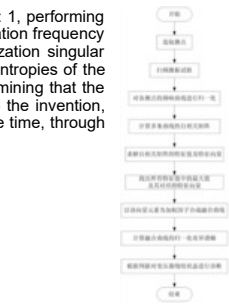
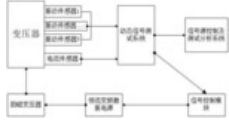
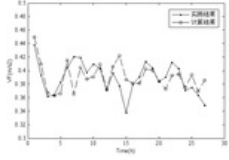
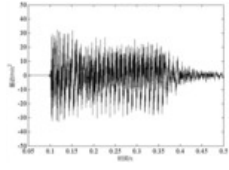
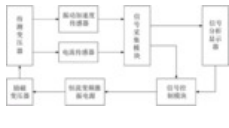
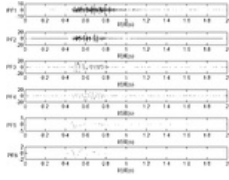


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#	Title	Publication number	Publ. date	Applicant/Assignee
1.	Transformer winding work state detection method based on normalization singular spectrum entropies	CN105093059	2015-11-25	SHANGHAI JIAO TONG UNIVERSITY YNZP
The invention discloses a transformer winding work state detection method based on normalization singular spectrum entropies. The method comprises the following steps: 1, performing frequency sweep excitation testing on transformer windings to obtain vibration frequency response curves of the transformer windings; 2, performing curve fusion on the vibration frequency response curves of transformer windings of M test points to obtain a vibration frequency response fusion curve of the transformer windings; 3, calculating the normalization singular spectrum entropies of the vibration frequency response fusion curves of the transformer windings; and 4, according to the change of the normalization singular spectrum entropies of the vibration frequency response fusion curves, determining the states of the windings: when the change of the normalization singular spectrum entropies exceeds 10%, determining that the windings of transformers are changed, wherein at the moment, maintenance processing needs to be performed timely so that severe faults can be avoided. According to the invention, diagnosis of the states of the transformer windings can be realized, and the change condition of the transformer windings is efficiently and flexibly detected; and at the same time, through fusion of the vibration frequency response curves of different test points, influences exerted by measuring errors on determining results are reduced to the minimum.				
2.	Method and system for detecting abnormal signal of digital oscilloscope based on singular spectrum entropy	CN106645856	2017-05-10	UNIVERSITY OF ELECTRONIC SCIENCE & TECHNOLOGY OF CHINA
The invention discloses a method and a system for detecting an abnormal signal of a digital oscilloscope based on singular spectrum entropy. The method comprises the following steps of: calculating the sampling signals of the front a frames of waveform data acquired by sampling, thereby acquiring corresponding singular spectrum entropy; averaging and then taking as a comparison threshold value of the singular spectrum entropy; calculating the singular spectrum entropy of the (a+1)th frame and later frame of waveform data; and if the value of the singular spectrum entropy is more than the comparison threshold value of the singular spectrum entropy, judging the present waveform data as an abnormal signal, storing and displaying, and if not, taking no measures. According to the method and system disclosed by the invention, the singular spectrum entropy is taken as a signal feature, so that the detection for the abnormal signal is realized.				
3.	A voltage transformer winding state detection method and an apparatus thereof	CN105699838	2016-06-22	SHANGHAI JIAO TONG UNIVERSITY YNZP
The embodiment of the invention discloses a voltage transformer winding state detection method and an apparatus thereof. A present vibration frequency response curve of each measuring point can be accurately obtained through carrying out frequency sweep exciting tests on a voltage transformer winding, and converted into a mode of matrix; data of all the frequency points is taken into consideration so as to raise the precision of detection; and minimal deformation of the voltage transformer winding can be reflected in the present vibration frequency response curve, so that very high sensitivity is gained; normalization processing is further carried out on the vibration frequency response matrix to realize data nondimensionalization and raise the calculating efficiency; then a historical vibration frequency response matrix is decomposed into a non-negative matrix with a certain degree of sparseness; the proportion of basis vectors in overall data is raised, so that prominent features are represented by vectors of extremely few dimensions; and finally, through calculating a mean value and a control limit of statistics, whether abnormalities such as deformation occurs to the voltage transformer winding is determined quantitatively, thereby realizing extremely high precision.				
4.	Method for diagnosing power transformer winding working condition	CN103116111	2013-05-22	EAST CHINA ELECTRIC POWER RESEARCH INSTITUTE SHANGHAI JIAO TONG UNIVERSITY SHANGHAI MUNICIPAL ELECTRIC POWER STATE GRID CORPORATION OF CHINA (SGCC)
The invention relates to a method for diagnosing power transformer winding working condition. The method includes the following steps: (1) inputting a signal Vi to a vibration generator to conduct vibration excitation to a power transformer winding, and collecting and recording a vibration signal Voi of each measuring point according to N vibration acceleration sensors on the surface of the power transformer winding; (2), respectively conducting Fourier transform to the input signal Vi and the vibration signal Voi of each measuring point, and then obtaining a vibration frequency response curve H(omega) of the power transformer winding; (3) conducting the Fourier transform to the vibration frequency response curve H(omega) and then obtaining a free vibration signal H(t) of the power transformer winding; (4) decomposing the free vibration signal H(t) into a plurality of natural mode functions; (5) conducting Hilbert transform to all natural mode functions which are obtained by decomposing; (6) constructing an analytic signal; (7) obtaining a kth natural frequency of the power transformer winding; (8) conducting discrimination to the power transformer winding working condition according to the changing of the natural frequency. Compared with the prior art, the method has the advantages of being precise in diagnosis, convenient to operate, safe and the like.				
5.	Transformer winding operating state diagnosis method	CN103176104	2013-06-26	SHANGHAI JIAO TONG UNIVERSITY SHANGHAI MUNICIPAL ELECTRIC POWER
The invention discloses a transformer winding operating state diagnosis method. The method includes following steps: collecting vibration signals of each testing point of a transformer winding; performing Fourier transformation to the vibration signals to obtain a vibration frequency response curve of the transformer winding; performing inverse Fourier transformation to obtain a free vibration signal of the transformer winding; decomposing the free vibration signal into a plurality of intrinsic mode function components; performing Hilbert transformation to obtain Hilbert transformation values of the intrinsic mode function components; constructing analytic functions corresponding to each intrinsic mode function component and corresponding Hilbert transformation value, and calculating slope of a phase function corresponding to each analytic function, wherein the slopes are intrinsic frequencies of each order of the transformer winding; and judging the state of the transformer winding according to changing of the intrinsic frequencies. By the transformer winding operating state diagnosis method, the operating state of the transformer winding can be accurately and efficiently judged, problems can be found conveniently and timely to maintain a transformer.				
6.	Vibration signal pattern spectrum-based method for diagnosing winding conditions under sudden short circuit of transformer	CN105182172	2015-12-23	ELECTRIC POWER RESEARCH INSTITUTE SHANGHAI JIAO TONG UNIVERSITY
The invention discloses a vibration signal pattern spectrum-based method for diagnosing winding conditions under sudden short circuit of a transformer. The method includes the following steps that: (1) real-time short circuit monitoring is performed on the transformer, and a section of continuous vibration signals of the box wall of the transformer are acquired when sudden short circuit occurs on the transformer; the steady state vibration signal pattern spectrum entropy of vibration signals which are acquired when short circuit occurs on the transformer every time is calculated through methods mentioned from step (2) to step (6); and (7) the winding conditions are judged according to the pattern spectrum entropy of the steady state vibration signals xs(t): when the change Delta H of the pattern spectrum entropy satisfies an expression described in the descriptions in the invention, it is judged that the winding of the transformer becomes loose or is deformed when Y-th short circuit occurs on the transformer. The method of the invention is accurate and efficient.				



7.	Transformer winding vibration manipulation test system	CN205300880	2016-06-08	YNZP	
The utility model provides a transformer winding vibration manipulation test system, the utility model discloses place at least one vibrational acceleration sensor on the transformer tank wall to detect the vibration signal of transformer, connect the three phase current signal that the transformer is used for detecting the transformer with a current sensor, adopt a dynamic signal test system respectively with vibrational acceleration sensor, current sensor connect, in order to receive vibration signal and current signal that the vibrational acceleration sensor current mutual-inductor transmits respectively, and it is right vibration signal and current signal carry out filtering respectively and enlarge, etc. The beneficial effects of the utility model are that: the accuracy that detects and validity all have apparent improvement, transformer winding vibration manipulation detecting system maneuverability strong, easy to carry out, the operating personnel of being convenient for discover in time that transformer running state's is unusual to can overhaul the transformer according to abnormal conditions in time, greatly reduced the trouble spoilage of transformer, prolonged life -span of transformer simultaneously.					
8.	Online transformer winding work state monitoring method	CN102998545	2013-03-27		ELECTRIC POWER RESEARCH INSTITUTE OF STATE GRID HENAN ELECTRIC POWER SHANGHAI JIAO TONG UNIVERSITY
The invention discloses an online transformer winding work state monitoring method. The online transformer winding work state monitoring method includes steps of acquiring transformer box wall vibration signals, three-phase voltage signals of the transformer and three-phase current signals, correspondingly calculating three power factors according to the three-phase voltage signals and the three-phase current signals of the transformer; building a transformer box wall vibration model on the basis of generalized autoregression neural network; comparing amplitude of 100Hz component of the transformer box wall vibration signals with expected output quantity of the transformer box wall vibration model, judging that running state of a transformer winding is normal if the relative error is smaller than a threshold value; and judging that the transformer winding is loose or deformed when the relative error is larger than the threshold value. The online transformer winding work state monitoring method can effectively					
9.	Method for diagnosing winding state of transformer under sudden short circuit	CN105203914	2015-12-30		ELECTRIC POWER RESEARCH INSTITUTE SHANGHAI JIAO TONG UNIVERSITY
The invention discloses a method for diagnosing the winding state of a transformer under sudden short circuit, which comprises the steps of (1) carrying out real-time short circuit monitoring on the transformer, acquiring continuous vibration signals of the wall of a transformer box every time when sudden short circuit is detected to occur in the transformer, and calculating energy distribution of a Hilbert energy spectrum of the vibration signals acquired every time when sudden short circuits occurs in the transformer through a method described in steps (2)-(5); and (6) judging the winding state of the transformer according to energy distribution Md of the Hilbert energy spectra H2(omega, t) of the vibration signals x0(t) acquired in two adjacent times when sudden short circuit occurs in the transformer, and determining that looseness or deformation occurs in the winding of the transformer when variations of the energy distribution Md of the Hilbert energy spectrum H2(omega, t) of the vibration signals acquired in the last time when sudden short circuit occurs in the transformer exceeds more than two times of the previous energy distribution. According to the method disclosed by the invention, the operating state of the transformer winding can be judged accurately and efficiently.					
10.	A voltage transformer winding working state detection method and system	CN105699839	2016-06-22		SHANGHAI JIAO TONG UNIVERSITY YNZP
The embodiment of the invention discloses a voltage transformer winding working state detection method and system. A present vibration frequency response curve of each measuring point can be accurately obtained through carrying out frequency sweep exciting tests on a voltage transformer winding, and can be converted into a mode of matrix; data of all the frequency points is taken into consideration so as to raise the precision of detection; and minimal deformation of the voltage transformer winding can be reflected in the present vibration frequency response curve, so that very high sensitivity is gained; and normalization processing is further carried out on the vibration frequency response matrix to realize data nondimensionalization and raise the calculating efficiency; then eigenvalue decomposition is carried out on a covariance matrix obtained through calculating of historical vibration frequency response curve matrixes to determine the number of principal components; principal component decomposition is carried out on the covariance matrix; afterwards, transformation is carried out on the present vibration frequency response curve matrix by column according to the matrix obtained through decomposition; and finally, through calculating a mean value and a control limit of statistics, whether abnormalities such as deformation occur to the voltage transformer winding is determined quantitatively, thereby realizing extremely high precision.					
11.	Transformer winding state detecting system	CN205642437	2016-10-12	YNZP	
The embodiment of the utility model discloses transformer winding state detecting system, including vibrational acceleration sensor, current sensor, signal acquisition module, signal control module, signal analysis display, constant current frequency conversion excitation power and excitation transformer. Compared with the prior art, through the vibration signal and the injection current signal of transformer winding high-pressure side that detects the transformer box wall, analysis and the vibration frequency response characteristic of judging transformer winding, detect the transformer winding state, sensitivity, trouble recall rate are high, just can improve the accuracy and the validity of detection, furthermore, the utility model provides a transformer winding state detecting system maneuverability is strong, and easy to carry out, the operating personnel of being convenient for in time discover the unusual of transformer running state, can overhaul the transformer according to abnormal conditions in time, trouble spoilage that can the greatly reduced transformer to the life-span of extension transformer.					
12.	Transformer winding state diagnosis method	CN103135035	2013-06-05		JIANGXI ELECTRIC POWER SCIENCE RESEARCH INSTITUTE SHANGHAI JIAO TONG UNIVERSITY STATE GRID CORPORATION OF CHINA (SGCC)
The invention discloses a transformer winding state diagnosis method. The transformer winding state diagnosis method comprises a first step of collecting vibration signals of a transformer box wall when a transformer is short-circuited; a second step of performing prolongation pretreatment on left end points and right end points of the vibration signals; a third step of decomposing the vibration signals undergone prolongation into a plurality of product function components; a fourth step of enabling all the product function components obtained by decomposition to undergo Hilbert transform, and obtaining a Hilbert spectrum of the vibration signals; a fifth step of obtaining a Hilbert marginal spectrum and Hilbert energy according to the Hilbert spectrum; and a sixth step of distinguishing a state of a transformer winding according to the Hilbert marginal spectrum and variations of the Hilbert energy.					
13.	Power transformer winding fault diagnosing method	CN102788931	2012-11-21	JIAOXING UNIVERSITY	
The invention provides a power transformer winding fault diagnosing method, by which winding deformation fault diagnosis is performed through combination of frequency response analysis (FRA) and empirical mode decomposition (EMD). According to the power transformer winding fault diagnosing method, on the basis of energy change information in each interval during a winding deformation fault as well as the adaptive decomposing capacity of the empirical mode decomposition (EMD), a fault energy characteristic quantity of a winding is extracted to establish a fault energy database; the fault energy characteristic quantity is compared with an energy curve of a transformer winding without a fault; the change trend of the characteristic energy shows the working state of the transformer; and the method is used for establishing a mapping relationship between an intrinsic mode function of the winding deformation and an intrinsic mode function of an FRA signal and establishing an integrated fault diagnosis analysis system based on characteristic energy information of the EMD. The integrated fault diagnosis analysis system can accurately know a basic rule of the change of the transformer winding deformation energy and provides a new research way for determining the type and the degree of a transformer fault and estimating the developmental trend of the fault.					