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Cable noise

Sometimes with high output impedances, in particular with piezoelectric acceleration adapters without integrated charge amplifier/impedance converter, this leads to problems with spurious signals, which are caused in the cable connection between receivers and preamplifiers of the measuring instrument. The interference voltages can result from earth loops, tribo-electric effects or electromagnetic stray effects.

Calibrate

1) Examine and verify measuring instruments and determined containers by the assize authorities on the basis of the calibration laws of 11.7.1969. The calibration obligation concerns, among other things, measuring instruments. The Federal Standards Laboratory in Braunschweig has a set of its own competencies, which are to serve for the protection of the uniformity of the legal measurement as upper federal authority in the division of the Federal Minister for economics.
2) In the general linguistic usage of the technology this also often goes beyond official calibration in the sense of adjusting and calibrating (*adjustment; calibration*) or for both activities together.

Calibration

Determination of the relationship between measured value, or expected value, of the output quantity and the corresponding true, or correct, value as input quantity of the available measured variable for a concerned measuring instrument, under given conditions.

Calibration curve

A curve which illustrates the deviation in the actual display of a sensor and/or a measuring instrument from the desired display.

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Calibration weight; trial weight

With balancing of rotors, especially field balancing, a weight of known quantity is attached to a suitable position on the rotor to measure the change which is brings to the rotational-frequency vibrations. With this method the sensitivity of the rotor system to unbalance is determined (a known weight is added and the effect is measured).

Carrier

Name for the specific carrier frequency in modems, on which the data are modulated depending upon the transmission standard. Some procedures work with several carrier frequencies. Under normal conditions the answering modem (answer operation) offers a selection of carriers, beginning with the optimum transmission standard. The calling modem answers to the carrier which it supports.

Carrier frequency bridge

An electrical instrument that converts measurements picked up from such passive transducers as strain gauges or capacitive and inductive sensors into electrical voltages. In the process, the transducer is connected to a bridge branch of a supplied bridge circuit (usually Wheatstone bridge) with a carrier frequency. The exit voltage of the bridge circuit is amplified and rectified. In the process, an electrical voltage proportional to the measurement results; it can be displayed or processed further.

Carrier recovery

Process of recovering the original carrier from a modulated signal.

Carrier vibration

Carrier

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Cascade diagram; cascade plot

C. presents itself for the simple comparison of several frequency analyses. This concerns a three-dimensional, representational form of spectra, in particular those which descriptively illustrate the change as a function of a further parameter, e.g. number of revolutions, load, temperature, time etc.

Note: C. has special significance for a clear representation of the vibration characteristics of machines during run-up or coast-down (speed transient operation).

Case expansion

The expansion of a machine casing in the axial direction in relation to a fixed reference point (foundation). The measurement (measurement principle) is carried out using a measurement probe (inductive type) at the loose bearing end. Expansion and shrinking is traced back to thermal changes during the run-up or coast-down procedures. Monitoring of expansion is a standard component of a monitoring system for turbo-machinery.

Cathode

Negative pole of an electric current source; from a negative electrode. The opposite is the anode.

Centering error

See Coupling error

Central memory (storage)

Storage to which the execution unit, control unit and as applicable, input and output devices have immediate access.

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Central processing unit

A functional unit inside a digital computer system that includes processors, I/O devices (as applicable, input devices, output devices) and main memory.

Centre frequency

The frequency, which corresponds to the arithmetic mean in a bandpass filter with constant absolute bandwidth, and to the geometric mean of the lower and upper filter limits (limit frequencies) in a bandpass filter with constant percentile bandwidth.

Centre of gravity

The point in a body, through which the resultant of the weight forces of its mass elements acts, actually for all orientation directions of the body in relation to a homogeneous gravitational field.

Centre of gravity eccentricity

In a rigid rotor, the displacement of its centre of gravity axis from the shaft axis.

Centre of gravity eccentricity, local

For axially thin, perpendicularly dissected rotor elements, the distance between the shaft axis and centre of gravity of each individual element.

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Centre of gravity method

For broad spectral structures (based on the resolution of frequency), whose values in addition are subjected to statistical fluctuations, frequently supply no representative result for the evaluation of the highest point for the monitoring of peak position and - height. Here methods are necessary which include a larger number of spectral values. Fit routines, at which the best adaptation of the parameters of an analytic expression to the measuring points is calculated, are time-consuming and fail if the analytical default is unfavourably selected.

In this case the C. can be used with the frequency range of interest, which is lying under the area of the spectral curve, thought of as a homogeneous occupied mass, whose centre of gravity is used as the peak position and whose total mass (= area) is used as the peak height.

This method is suitable to determine changes in the spectrum with unchanged spectral regions; their quantitative evaluation demands auxiliary calculations. As a disadvantage it is to be mentioned that the values determined according to the centre of gravity method with unchanged peak depend on the borders of the considered frequency interval.
See also Parabola method

Centrifugal pumps

- for bearing vibrations [113]

Centrifuges

The assessment of vibrations in centrifuges can be done according to [113; 115].

In general the machines in the machine group T and [115] resp. in the group <flexible supports> are arranged in the group of [113]. Because of the special conditions of operation the classification of the centrifuges from group B presents difficulties.

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During continuous monitoring the centrifuge must be automatically switched off upon reaching a limit value. Data for this are in the prescription for the prevention of accidents for centrifuges [104]. [113] also gives advice about the limit values for alarm and shutdown.

Centronics interface

Normalized parallel interface with eight data lines and two control lines. This is often used for the connection between a computer and a printer. Since there was in former times no standard for the transmission of computer data to a printer, the company Centronics seized the initiative with its large market influence and created the C. which was then taken over also by other manufacturers. The characters conveyed from the computer to the printer are transmitted bit-parallel to 8 parallel lines. Since one character consists in the ASCII code of 8 Bits, a whole character is thus always conveyed simultaneously by the computer into the printer. In contrast to this, with serial interfaces the individual bits are transferred one after another on a line. Advantage of parallel transfer: Because 8 Bits are always simultaneously transferred the transfer of data is considerably faster than serial transfer. However greater material cost is required.

Cepstrum

The C. is a reverse-transformation (inverse Fourier transformation) of the logarithmic power spectrum of a vibration signal in the time domain. Periodically appearing lines (frequency families of harmonics and signal components which are multiplicatively linked) in a spectrum (frequency domain) are displayed as a single characteristic value, the so-called “quefrency“.

A family of harmonics appears in the C. as a single line and is called a “rahmonic“. Its frequency value (dimension of time in ms) corresponds to the reciprocal frequency distance of the harmonics. For sideband identification in complex spectra (especially when there are many overlapping sideband families), it is an advantage that each sideband family is displayed by only one line (rahmonic) in the C.

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The main advantages of the C. are:

- Data reduction to less of the significant lines
- Identification of regular-occurring structures in spectra
- The transmission path has no effect on the appearance of the C.

In certain cases (e.g. with frequency modulation) also higher rahmonics can occur, which indicates non-existent sub-harmonics in the spectrum. Generally because of this it is thus sufficient to regard those fundamental rahmonics which are not in a quefrency-multiple relationship with each other. They contain significant information about the respective harmonics or sideband families.

Cepstrum analysis

The C. belongs to the further developed techniques of Fourier analysis. The result of the analysis is the Cepstrum.

Character

One element (as type) from an agreed finite number of objects (character set) to display information; also every copy (as specimen) of such an element.

Note: Characters do not mean the same thing as symbols. Characters are only reproduced through letters, combinations of holes or pulsed repetition. Example: the three-figure word SEE is made up of two characters (as type); the character E occurs twice (as specimen).

Character parallel

See Bit parallel

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Character serial

See Bit serial

Character set

1) As character set is meant the quantity of useful characters in a system. The question of character set presents a difficult problem in the practice of computer processing of technical and/or foreign language texts, since the corresponding code systems cannot directly display the different special characters (foreign characters, special technical characters). It is possible, by combining permissible characters (prototypes) that, by transfer to a correspondingly large character set, reproduce the original characters.
2) In pattern recognition, the quantity of classes to be distinguished. The recognition performance of automatic recognition systems is very strongly dependent on the scope and composition of the character set.

Character string

A character string is a linear list whose elements are characters.

Characteristic curve linearization

According to the construction, the resonant frequency of electro-dynamic velocity sensors commonly lies in the region of 8 Hz to 15 Hz. By employing a circuit for electronic linearization of the frequency response (amplitude and phase response) it is possible to also measure absolute bearing/casing vibrations far below the resonant frequency of the sensor (e.g. from 1 Hz) with relatively high accuracy.

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Characteristic curve; response curve

1) General: The graphic illustration of the functional dependence between two or more parameters. If several characteristics, i.e. an entire company of characteristics, arise in the case of this illustration as a result of the variation of a parameter, then one speaks of a family of characteristics.
2) Measuring technique: Graphic illustration of a measured sensor signal or an instrument display as a result of a known input signal.

See also Calibrate

Characteristic quantity

Quantitatively indicated characteristic of a transfer element (measuring instrument, controlling equipment, etc.), by which one characterizes its spheres of activity. The C. of a measuring instrument e.g. describes its instrumentation characteristics. The value of a C. is a characteristic value. Static C.n refers to characteristics in the in-swung condition. Through the dynamic C. on the other hand, the performance of a transfer element over time is described.

Check sum

The result of a special arithmetic operation, which is performed with a block of data. It serves for checking the correctness of the data, in particular during the data communication.

Circuit flow diagram; Circuit diagram; inexact: Circuit

A connection diagram, which describes as an electrical circuit, e.g. the function mode of electronic equipment, devices or functional units, resolved according to electrical paths. Contains all elements, connections, connecting conductors etc. of the circuit. This serves e.g. for an explanation of the circuit, for recognizing switching sequences and signal paths. The C. can contain further data concerning

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supply voltages, signals, impulse-shapes, etc. In the C. one uses circuit symbols for the symbolic representation of the individual constructional elements.

Circuit technology

The joining together of electronic elements in a functional group, called a circuit.

The substantial basis for the entire electronics forms the C. According to the type of signal being processed one also differentiates between analogue circuits and digital circuits. In analogue circuits, analogue, i.e. time-continuous, signals are processed. A typical example of an analogue circuit is the amplifier.

In digital circuits, digital, i.e. time-discrete, signals (usually binary signals) are processed.

Circular wait; deadlock

Occurs as a condition whereby two processes mutually wait for one process to continue. Then execution of further processes comes to a halt. Deadlocks can be detected by monitoring waiting times (timeout).

Client

A computer in a network which is dependent on the resources of the server. With the help of service requirements the C. can access objects (“data“) of the server. The service is provided by the server.

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Client-Server system

A network architecture, in which several computers (Clients) are able to access a computer (server), or more exactly its resources (arithmetic performance), mass storage, software, communication services, etc. Clients usually represent the user side, server the system side.

Clock

1) A pulse generator for synchronising operations.
2) A circuit that provides a periodic clocking signal.

Coaxial cable

The most frequently assigned cable with circular cross section for data communication of high frequency signals. It consists of a core, which is usually of copper, an insulating layer of plastic, a shield of braided wires and a sheath. This kind of the shield protects against interference from external voltage and magnetic fields. C. is supplied in different versions, according to the characteristic impedance (e.g. 50, 60, or 75 ohms). It is being replaced more frequently by optical fibre which guarantees increased data security during transmission and has practically no losses due to heat development.

Compensation effect; transient effect

A procedure at the change of the condition of a system. C. is the transition from one transient (stationary) condition (initial condition) to another transient condition (final state). The duration of the C. is theoretically infinitely long, but in a practical sense ends shortly after the shifting process.
The C. shows up in the course of time in a net value of a variable (current, voltage, amongst other things).

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Complete failure

Failure that affects all of a unit's functions.

Note: A complete failure, that is at the same time a sudden failure, is also called a <catastrophic failure> in English.

Complete measurement result

Measurement result, complete

Compliance

The inverse of rigidity, or stiffness.

Component correction

Unbalance correction in a correction plane through addition or removal of mass in at least two predefined and adjacent angular positions in the same plane.

Component measuring device

An instrument for measurement and display of unbalance vectors as components in the selected coordinate system.

Compression principle

See acceleration sensor

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Compressor plant

- for shaft vibrations [90; 108]
- for bearing vibrations [113; 114], without limit values [103; 105: 115]

Compressor sets

Machines are designated as compressor sets that consist of one or more axial or radial compressors and are driven by steam or gas turbines or electric motors. The drive and compressor can be rigid, coupled elastically or through transmissions and stands on block foundations or on elastically supported machine supports. The machines can have slide or roller bearings.

Condition-based maintenance

For condition-based maintenance, measurements that provide feedback on the mechanical condition of the machine are collected continuously during operation and evaluated. If the trend of the measurement data is followed during the period of operation, changes (as a rule, deterioration) in the mechanical condition of the machine can be detected.

An overhaul is only then undertaken if measurements show that the condition of the machine is beginning to deteriorate. Mechanical vibrations have proven to be an especially accurate and sensitive indicator for the mechanical condition of a machine because:

- Every machine with moving masses causes vibrations
- Vibrations are primarily caused by small errors and imperfections
- An increase in the level of vibration at constant operating and load conditions points to a deterioration in condition
- Through targeted vibration measurements, one is able to recognize particular defects already at an early stage during which continued operation is still completely permissible
- Through vibration analysis, it is often possible to diagnose a defect already during the early stages of operation.

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Connection technique

A comprehensive concept for all techniques that join together devices and components in a functional system.

Consistency

A multiplicity of communications that contain no logical contradiction, is called consistent. In classical predicate logic, consistency of a multiplicity of statements is tantamount to saying that it can be granted – that is, that a model exists in which all formulae (simultaneously, concurrently) are true.

The opposite is inconsistency.

Consistency; integrity

In predicate logic, a multiplicity of communications is called consistent, if it is impossible to maintain statement A and at the same time, the opposite of A.

See also Consistency

Constant time-independent phenomenon

A phenomenon whose value at any point, $x = X$ is constant over time.

Examples: Constant temperature, constant velocity, constant power, constant (electrical) potential, constant current, steady component of shaft vibration signals.

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Consumable component; non-repairable item

A replacement part (cf. DIN 24420-1), that is unambiguously assigned to one or more facilities, is not used independently in this sense, is used for and kept ready for purposes of maintenance, and whose repair is not, as a rule, economical.

Continuous monitoring systems; online monitoring systems

Continuous monitoring captures the parameters for evaluation the condition of a machine (vibrations, strain, etc.) constantly and without temporal delays. Therefore, short term alarms are also possible; constant trend developments and as necessary, intermittently occurring changes in condition are both captured in equal measure.

Continuous monitoring, online monitoring

The individual measurements during continuous monitoring have to be made at sufficiently brief intervals in order to lead quickly enough to reliable proof of a potential change in conditions that could cause damage. Apart from very unusual cases, reaction times of from 1 to 3 seconds are generally acceptable for continuous monitoring.

Continuous triggering

See Free-running triggering

Controlled initial unbalance

An initial unbalance that, by balancing the components and/or careful design, manufacture and mounting of the rotor, can be held within narrow bounds.

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Conventional true value

The known value for purposes of comparison, whose deviation from the true value is seen as negligible for purposes of comparison.

Conversion time

The time that an analog-to-digital converter needs to completely transform an analog value. Often when giving the conversion time, the time needed for the converter to reset to its starting conditions is not taken into account. For that reason, the actual conversion rate is often lower than the reciprocal of the conversion time.

Converter

A functional unit to change the display of information.

Note: Examples are analog-to-digital and digital-to-analog converters.

Corbit
Abbr. for <**C**ascade **orbit**>

The kinetic shaft path (orbit) is the orbit of the shaft centre which is measured in the bearing plane and/or bearing proximity using two non-contacting displacement sensors shifted from one another in the same plane by $90°$. A “Corbit“ is understood to be the cascade diagram of the orbit, whereby the rotor speed is displayed in the Z-axis. The selective Corbit has significant importance, e.g. for the fundamental and the double rotating-frequency signal components, with the additional indication of a marking for the phase angle $\varphi = 0°$ and an indication of the kinetic shaft orbit’s direction of rotation. While the Bodé diagram represents the vibration response in only one measuring direction, the selective Corbit by contrast very descriptively displays, for one plane of measurement, the occurrence of resonances and the associated spatial deflection of the shaft as a function of the rotational speed.

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The form of the Corbit clearly illustrates the isotropic and/or anisotropic behaviour of the bearing and rotor concerned as well as the spatial speed-dependent main vibration direction.

Correction

<correction>

Eliminate the well-known systematic measurement deviation contained in the unreported result of measurement.

Counterweight

A mass which is attached at a desired position to a body being balanced, in order to reduce a computationally determined unbalance.
Such counterweights can be used, in order to bring an asymmetric body, e.g. a crankshaft, into dynamic equilibrium, or decrease the bending moments in a body.

Counting

Determination of the value of the measurement, “Number of elements in a group”.

Coupled vibration forms (modes)

Vibration modes, coupled

Coupled vibrations

See vibration

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Crest factor

For a vibration time-signal, the relationship between the vibration variables peak value and RMS value.

Crest factor; peak factor

Relationship between the peak value (highest value) of an alternating variable (vibration) and the RMS value. The C. is dependent upon the vibration form, e.g. a sinus-shaped form: Factor $\sqrt{2}$, square-wave form: Factor 1.

Cut-off frequencies; corner frequencies

The frequencies of a transfer element, with which its transmission characteristics change around a certain value against a reference value. Such transfer elements can be e.g. elements, amplifiers, filters, receivers and transducers.

If the input and output quantities of the transfer element are of the same value, one determines C. in such a way, as it is usually agreed, that the transfer performance has dropped to half and/or the transfer voltage has dropped to $1/\sqrt{2}$-times the part in relation to the band centre. This corresponds to a change in the attenuation measure of 3 decibel (dB). With a fall-off at an increasing frequency, (e.g. with a lowpass filter) one speaks of upper C., f_u, and in the converse case (e.g. with a highpass filter) of lower C., f_u. A frequency band has therefore an upper and a lower C. and C. depend, for active elements, not only on their characteristics, but also on the circuitry. Especially the C. are the frequencies, with which certain parameters, e.g. the amount of short-circuit current transfer ratio, take on characteristic values in comparison with frequency-independent values.

Cut-off frequency

Limit frequency

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Cycle time

For a functional unit, the time span between the start of two consecutive, similar, cyclically recurring events (see also DIN 44476-3).

cycle-peak value

See Peak value

Cyclic redundancy check

See Redundancy check, cyclic

Cyclic signals

See Signals, cyclic

Cyclic time grid

Time grid, consisting of periodically repeated cycles, of which each is a consequence of time intervals.

Note: The individual time intervals that comprise a single cycle, must not all have the same duration but in the ideal situation, all cycles are identical.

Cyclic timing signal

Periodic clocking signal