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Valve position

The valve position of processing valves (e.g. live steam admission in steam turbines), mostly in percent of valve lift expressed as 0% closed and 100% fully open, is often needed for the evaluation of vibration values. The forces acting on the rotor can change as a function of the number of open valves and their position.

Variable

Basically, just a changeable value in contrast to a constant which always retains its fixed value. In programs, variables designate quantities with changeable values that can be entered by the user, among others, during the course of a program.

Variance

In statistics, the square of the scatter (standard deviation); arithmetic average of the quadratic deviations from the average value of a series of samples or measurements.

Variation coefficient

The standard deviation divided by the arithmetic average.

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Vector

Vector is what one calls, in a complex calculation, the depiction of a sinusoidally changing quantity like alternating voltage, alternating current, harmonic vibrations, etc.

See also Amplitude, complex

Vector diagram

By vector diagram is meant the display of the relationships of several quantities portrayable as vectors to each other or the display of the change of vector over time, as a function of operational parameters of the rate of rotation. The curve that describes the point of the vector is called the locus.

Vector graphics

See also pixel graphics

Vector measuring device

For balancing a device that shows the unbalance as an unbalance vector, usually by means of a point or lines.

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V

Verein Deutscher Ingenieure

Abbreviation: VDI
An association founded in 1856 with headquarters in Dusseldorf to advance scientific and technical work and to provide continuing education of its members.

VGA

Abbreviation for <**v**ideo **g**raphics **a**dapter>

Designates an analogue graphics standard that can display 256 colours on a monitor. In addition, it provides a mode of operation for 16 colours simultaneously at a resolution of $640x480$ pixels. Thus, every character on the screen is displayed within a $9x16$ point grid which corresponds to an easily readable display.

Vibrations, absolute

Among these are understood to be the absolute movements of an object relative to a certain point of reference in space. Velocity and acceleration sensors measure absolute vibrations (e.g. bearing pedestal, housing and foundation vibrations).

Vibration acceleration

This is with mechanical vibrations the acceleration a with which a measuring point moves around its rest position. The unit of measurement is m/s^2 ($9.81\frac{m}{s^2} = 1g$).
With harmonic vibrations having a rotational frequency ω, resp. the frequency f, the V. can be calculated from the vibration velocity v to $a = v\omega = 2\pi f v$, and from the vibration displacement s to $a = s\omega^2 (2\pi f)^2 s$.

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For harmonic vibrations the V. leads the velocity by 90° and the displacement by 180°. V. is measured using acceleration sensors (accelerometers).

See also acceleration sensor

Vibration analysis technique

By V. information contained in vibration signals, which describes the condition of machines and machine parts, can be acquired and represented in authoritative forms.

The following methods belong to this category of analysis:

- Fourier Transformation
- Cepstrum analysis
- Hilbert Transformation
- Wavelet Transformation

Vibration anti-node; anti-nodal point; maximum amplitude point

If an alternating quantity, for instance an alternating voltage or a mechanical vibration, is represented as a function of a space coordinate by a standing wave, there are then fixed locations at which the amplitude of the voltage or vibration is largest, and other fixed locations at which it is smallest (in a border case, zero). One calls the locations with the largest amplitude or voltage the anti-nodes and the locations with the smallest amplitude the nodes.

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Note: With the installation and mounting of vibration sensors, in particular of non-contacting shaft vibration sensors, particular care is to be taken that the installation locations do not coincide with the nodes of the vibrations to be measured.

Vibrations, asynchronous

Vibration components with frequencies, which are unequal to the shaft rotational frequency or any of its integer harmonics.
Sometimes also used for the characterisation of vibration components with frequencies which are not a multiple of, or can be wholly divisible by, the rotational frequency.

See also Vibrations, synchronous

Vibrations, blade-excited

Possible vibration component in the vibration signal which can be excited in bladed machines (turbines, compressors, pumps, exhaust fans etc.). The basic frequency (called blade-pass frequency; also rotational noise) of this vibration component is given by the product of the number of blades and the rotational frequency. Higher harmonics of this basic frequency can also be excited. The 2^{nd} harmonic often has significant importance. In machines with a number of bladed stages, more vibration components, each with their respective basic frequency corresponding to the number of blades in each stage, and higher harmonics of these basic frequencies, can occur.

Vibrations, coupled

See Vibration

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Vibration damper

A device for decreasing the vibration magnitude by the attenuation of vibration energy by dry friction, flow losses in liquids and gases (shock absorbers) and electromagnetic effects (eddy currents).

Vibration diagnostic monitoring

See Monitoring, vibration diagnostic

Vibration displacement

In the case of mechanical vibrations this is the excursion s of a measurement point from its position of rest. The measurement unit is μm ($1 \mu m = 10^{-6}$). In the case of harmonic vibration with a circular frequency w or frequency f, the displacement can be calculated from the vibration velocity v to $s = v/w = v/2\pi f$ and from the vibration acceleration a to $s = a/w^2 = a(2\pi f)^2$.

See also Vibration displacement sensor

Vibration displacement of shaft vibrations

The vibration displacement of shaft vibrations $s_1(t)$ and $s_2(t)$ are the mean values of the overlaid fast variable portions of the displacement quantities. The procedures described by the time functions are called shaft vibrations.

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Vibration excursions

The vibration excursions with shaft vibrations S_{pp1} and S_{pp2} result from the extreme values of the vibration displacements as follows:

$$S_{pp1} = S_{o1} + |S_{u1}|$$

$$S_{pp2} = S_{o2} + |S_{u2}|$$

Note: Only in exceptional cases of sinusoidal vibration displacements, thus circular-shaped or elliptical shaft motions is the following valid:

$$S_{o1} = |S_{u1}| = 0.5S_{pp1}$$

$$S_{o2} = |S_{u2}| = 0.5S_{pp2}$$

Vibration, forced

Vibration, or oscillation, caused by an external effect.

Note: An externally initiated oscillating force moves a mass system into vibration, normally with the frequency at which the force acts on the mass system.

Vibration, free; Oscillation, free

Vibration, or oscillation, which remains after removal of the external excitation.

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Vibrations, generally periodic

An event at which the vibrating quantity x has a periodic time course corresponding to

$$x(t) = x(t + nT)$$

(n = whole number, T = time period), is called a periodic vibration (see DIN 5483).

Note: Usually general periodic V. is meant, if one speaks absolutely of vibration. Often every non-periodic event, at which the vibrating value alternately increases and decreases is also regarded as vibration. It is therefore appropriate to understand the term still further (oscillation of limited duration).

Vibration impulse

See sinus vibration impulse

Vibration, impulsive

If the duration of an oscillation, i.e. the duration during which the momentary values of the quantity x exceed a certain threshold value, is small in relation to a characteristic duration, e.g. the observation duration, the vibration is called an impulse type vibration, or briefly an impulse.

Note 1: Designations for different impulse-type events are fixed in DIN 5483.

Note 2: A one-sided impulse is called an impact.

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Vibration magnitude

The result of vibration measurements (characteristic value of a measurement variable) is called the vibration magnitude at the particular measuring location in the particular measuring direction.

Vibration measurement system

See measurement system

Vibration measuring equipment

See measuring equipment

Vibration meter

An instrument for the measurement of the alternating (vibration) displacement, alternating (vibration) velocity or alternating (vibration) acceleration of a vibrating body. A vibration meter is a measurement system for mechanical vibrations, which fulfils specific requirements (e.g. according to DIN 45669 part 1 [71], DIN 45671 part 1 (72) or DIN V ENV 28041 [60]).

Vibration modes, coupled

Vibration modes which are not independent of one another, but which affect each other by the transmission of energy between themselves.

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Vibration mode; Mode

Characteristic appearance which an oscillating system assumes, in which all particles vibrate simply harmoniously with the same frequency.

Note: In a system with many degrees of freedom, two or more vibration modes can occur at the same time.

Vibration monitoring systems

V. are sub-divided into systems for:

- Permanent monitoring (online)
- Intermittent monitoring
  - stationary intermittent monitoring (online)
  - mobile intermittent monitoring (offline)

The question whether a stationary measurement system is to monitor permanently or intermittently, depends upon the importance of the safe mode of operation of the machine for the environment and the process as well as on the cost/use relationship.

Vibration monitoring system, stationary (permanently installed)

See permanent monitoring system

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Vibration nodes; vibration nodal points

A vibration node is the opposite of the vibration anti-node.

Vibration, non-harmonic

See Vibration

Vibrations, non-linear

Vibration events whose theoretical treatment leads to non-linear differential equation systems. Although this applies to a large extent to all physical problems, the contributions which are due to the non-linear members can often be neglected. With many real events the non-linearity is however substantial.

Vibrations, non-synchronous

See Vibrations, asynchronous

Vibration; Oscillation

A physical phenomenon, characterized by one or more alternately rising and falling variables.

V. is described as the temporal change of a variable in a physical system, whereby the value of the variable decreases and increases with constant change; in the extended sense a periodic change in status.

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V. arises in a mechanical or electrical system when upon disturbances of the equilibrium, forces which seek to re-establish the equilibrium become effective.

The momentary removal from the rest position (deviation from the temporal average value of the variable) is called ‚elongation', the greatest possible elongation 'vibration magnitude' with harmonic V. amplitude. V. with continuous vibration amplitude are called undamped V.; others with decreasing vibration amplitude are called damped V. damping). In the case of strong damping V. becomes aperiodic, whereby vibration amplitude fades exponentially away. The damping can be so strong that the system returns to the rest position after the deflection without overshooting (an aperiodic creep case).
The instantaneous V. condition is called V. phase. Successive V. phases of points lying next to each other can lead to the formation of translational waves.

The number of V. in the time unit is called frequency.
V. nodes in standing shafts are those locations at which the V. is at rest, in contrast to the V. anti-nodes, which correspond to the locations of largest amplitude.
If the resetting force is proportional to the respective elongation, the system implements harmonic V., which is described mathematically by a pure sine function (sine V.). If the resetting force is not linearly dependent upon the elongation, non-harmonic V. are obtained. The latter are displayed by a fundamental V. and a series of overtone V. (partial V.), which are distinguished by their smaller amplitudes and by their frequencies from those which amount to the $2X, 3X, 4X$, etc. of the frequency of the fundamental V. (harmonic analysis).
Non-harmonic V. are e.g. relaxation vibrations. Contrary to free V., which the system executes with a one-time, brief excitation, with a periodic excitation one speaks of forced V. If the frequency of a partial V. of the excited V. coincides with the frequency of the natural vibration of the system, then the amplitude of the corresponding partial V. takes on a maximum value (resonance). If several systems which can oscillate are linked with one another so that energy will be transferred from one to the other, then coupled V. is obtained. Every generally non-harmonic V. can be extracted by means of Fourier analysis into harmonic V. (fundamental vibration and overtones).

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Vibration period

The vibration period is the time used for a full oscillation. The vibration period is identical to the period duration.

Vibration, periodic

A periodic event. With periodic vibrations, the identical signal form is repeated at specific time intervals. They are composed of a DC component x_0 and several sinus oscillations with the frequencies

f_k, the amplitudes $\hat{x}_k$ and the phase angles φ_k (with $k = 1, 2, \ldots n$):

$$x(t) = x_0 \hat{x}_1 \sin(2\pi f_1 + \varphi_1) + \hat{x}_1 \sin(2\pi f_2 t + \varphi_2) + \cdots + \hat{x}_n \sin(2\pi f_n t + \varphi_n)$$

The frequencies stand in an integral relationship to each other. The spectra of periodic V. are always discrete line spectra.

Vibration, quasi-sinusoidal

An oscillation is called a sine-related or quasi-sinusoidal V., if, the amplitude, compared with the period duration of a single vibration, slowly changes and/or if the phase angle within one period only deviates very little from the linear increase with time.

Note: The appropriate designations here are specified in DIN 5483. Regarding sine-related V. with decaying amplitude - also briefly called decaying oscillation - is also to be found in DIN 1311 part 2. A sinus-related event.

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Vibration restricted period

An oscillation, with which the quantity x exhibits various values from zero only in a limited time interval $t_0 < t < T_1$, is called the V. restricted period.

Note: Since not only procedures which everyone would call oscillation, e.g. decaying vibrations in accordance with their assigned spectral function which can be composed of an infinite number of component vibrations (Fourier integral), but also procedures to which nobody would like to grant the name "oscillation", the boundary for the term "oscillation" is indistinct. It is recommended then to speak of oscillation only if the procedure has at least two extreme values. It is not recommended to generally understand the concept of oscillation so that it contains all non-periodic procedures and thus with the term the "procedure" would absolutely collapse.

Vibration, self-induced; self-excited

Constant vibration, or oscillation, which is produced in a system by a supply of energy other than oscillation energy.

Vibration sensor

A V. is that part of a vibration measurement system which clearly assigns usually an electrical V. output value to a mechanical vibration value (see input value).

Note 1: If the V. is spatially separate from the remaining measuring system, the connecting cable for the determination of the transmission coefficient of the V. is included.

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Although a V. always acquires all vibration values which in principle equivalently describe a movement, V. are, according to their function, according to the reference value of the transmission coefficient or according to the manufacturer's data, differentiated with respect to acceleration sensors, velocity sensors and displacement sensors, in addition angular acceleration sensors, angular velocity sensors and (rotational) angle sensors.

Note 2: Internationally the English word <pickup> is common for V. The earlier more frequently used word <transmitter> is to be avoided.

The use of the word <transducer> should be limited to such relationships with which the energy conversion connected with signal transmission is fundamental.

The word sensor can be applied also to V., e.g. acceleration sensor.

See also sensor, reciprocal; absolute sensor, relative sensor

Vibration sensor, connection data

The connection data of a vibration sensor are all data which are needed for the connection of the sensor to devices, e.g. range of values of the output voltage, source impedance, current productivity, permissible load impedance, if necessary also requirements of electric current and voltage, separate or common cable for power supply and signal transmission.

Vibration sensor, coupling

The coupling – mostly mechanical – creates the connection between vibration sensor and the measurement object in order that the measurement variable can be supplied to the sensor. The coupling can contribute toward the measurement deviation and uncertainty, e.g. through elastic deformation of the coupling surface and relative movement (especially resonance) between the sensor and the measurement object.

Vibration sensor, critical load

The critical load for a vibration sensor is the maximum value of the inputs, to which the sensor may be exposed without lasting change or temporal after-effect.

Note: The critical load can be different for a stationary and a percussion-type load.

Vibration sensor, directional factor

The directional factor of a vibration sensor in a certain direction right-angled to the measuring direction is the relationship of the transmission coefficient in this certain direction to the transmission coefficient in the measuring direction.

Note: The directional factor indicated in percentage terms is also called the cross-axis sensitivity. The direction of minimum cross-axis sensitivity should be marked by the manufacturer at the sensor.

Vibration sensor, environmental influences

The environmental influences generally entail deviations. These measurement deviations are caused by environmental parameters, e.g. temperature, temperature jumps, dampness, pressure, ionizing radiation, magnetic fields, electrical fields, electromagnetic waves.

Note: Environmental influences can result in particular changes (reversible or permanent) to the transmission coefficients or the emergence of disturbance signals.

Vibration sensor, frequency response

The frequency response of a vibration sensor is the transmission coefficient as a function of the frequency relative to the transmission coefficient at a given reference frequency.

Vibration sensor, input quantity

The input of a vibration sensor is a mechanical vibration quantity in its course over time at the location of the vibration sensor.

Vibration sensor, measurement axis

The measurement axis of a rotation sensor is a constructionally specified direction, which coincides, within certain tolerances, with the direction of maximum output quantity when excited with a single-axis torsional vibration.

Note: Multiple-rotation sensors have several measurement axes which are generally at right-angles to each other.

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Vibration sensor, measurement direction

The measurement direction of a translation sensor is a constructionally specified direction (e.g. symmetry axis), for which the technical data are determined.

Note: Multiple sensors have several measurement directions, which are generally right-angled to each other.

Vibration sensor, measurement location

The measurement location of a vibration sensor is the orientation of the measuring direction and/or the measurement location relative to the direction of acceleration due to gravity.

Note: Some sensors are suitable only for horizontal or vertical measuring location.

Vibration sensor, natural frequency

The natural frequency of a vibration sensor is the frequency, with which the seismic mass as a whole in a completely damped and externally blocked sensor will freely vibrate after an impact. The lowest natural frequency of a vibration sensor is also called the basic natural frequency or characteristic frequency.

Vibration sensor, output quantity

The output quantity of a vibration sensor is in general an electrical quantity. The time function of the output quantity is called the output signal of the sensor. The type of output quantity depends upon the conversion principle and the construction of the vibration sensor. It is often an electrical charge or an electrical voltage.

Vibration sensor, overall mass

The overall mass of a vibration sensor is that of its mass without measuring cable, but including the cable plug.

Note: The overall mass is relevant for the reaction of the sensor to the vibration which can be measured. Depending upon the frequency and mounting, if necessary, also the mass of the cable becomes proportionately effective.

Vibration sensor, resonance frequency

The resonance of a vibration sensor is the frequency, with which the vibratory system of the sensor comes into resonance, if it is excited at this frequency.

Vibration sensor; temperature range, humidity range, pressure range

Working temperature range, - humidity range, and - pressure range are the ranges for the ambient temperature or temperature of the item under test, the air humidity and the pressure of the surrounding medium, for which the transmission coefficient of a certain, given reference value deviates by no more than a given amount or percentage.

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Vibration sensor, transmission coefficient or sensitivity

The transmission coefficient of a vibration sensor is the relationship of the output to the input.

It marks the transient characteristic of linear sensors and it contains amount and phase, which are usually combined into a complex number. Furthermore the indication of the frequency for which it was intended, or a frequency range for which it is to be valid, belongs, possibly with limiting deviations, to the transmission coefficient. Example: For a sinus vibration of a fixed frequency, the amount of the transmission coefficient is defined as the relationship of the amplitudes of output and input, and the phase (phase angle) is defined as difference of the zero-phase angles of output and input. For stationary sinusoidal events the output and the input are both to be used as rms or as peak values.

As output and inoput quantities, various quantities can be consulted for one and the same sensor, e.g. load transmission coefficient, while the input quantity is usually from the designation of the sensor. Both come also to the expression of the transmission coefficient, e.g. $pC\ (m/s2)$, $mV/mm/s$ or $mV/\mu m$ in the measurement unit of the sensor.

Note: Internationally the word <sensitivity> is used. Often the word "transmission factor" is used instead of “transmission coefficient“ (see DIN 1320 [53]).

Vibration severity

The largest, broadband measured vibration magnitude of the machine, under agreed upon support conditions and operational conditions, is called the V.

With most kinds of machine only one value of V. characterizes the vibration condition of the machine. However with some kinds of machines this procedure can be incorrect. The V. is then to be evaluated separately for some measuring points.

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Vibration speed

An alternative designation for the effective value of vibration velocity.

Vibration, steady-state

Vibration, or oscillation, which remains as existing without changing.

Vibrations, sub-harmonic

All components of a periodic vibration with frequencies that correspond to whole fractions of the fundamental frequency (e.g. with the shaft frequency as the fundamental frequency: $1/2n, 1/3n, 1/4n$, etc.

Vibrations, sub-synchronous

All vibration components with frequencies lower than the rotational frequency of the machine.

Vibrations, super-harmonic

All vibration components of a periodic vibration with frequencies that correspond to integer multiples of the fundamental frequency (e.g. with the rotational frequency as the fundamental frequency: $2n, 3n, 4n$, etc.

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Vibrations, super-synchronous

All vibration components with frequencies higher than the rotational frequency of the machine.

Vibration, synchronous

Vibration or oscillation component with a frequency equal to the shaft rotational frequency of a machine.

Vibration, transient; Oscillation, transient

Vibration or oscillation as a consequence of a changed external excitation. Temporary, free or excited vibrations of a system; in general in connection with momentary load or rotational speed changes.

Vibration velocity

This is with mechanical vibrations the velocity v with which a measuring point moves around its rest position. The unit of measurement is mm/s.

The V. leads the vibration displacement by $90°$. With harmonic vibrations having a rotational frequency ω, resp. the frequency f, the V. can be calculated from the vibration displacement s to $v = s\omega = 2\pi fs$ and from the vibration acceleration a to $s = a/\omega = a/2\pi f$.

See also velocity sensor

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Vibration velocity sensor

See velocity sensor

Viruses

Viruses are tiny programs in machine language, planted by a malevolent programmer that can destroy an entire database, during which they can also multiply (self-copy). Security-sensitive data are especially subject to this danger (against which there is no absolute protection).

Viscous damping

See damping, viscous

VMEbus

The VME bus (Synonyms are: IEEE 1014; IEC 821 BUS) is a parallel computer-independent bus that serves to connect plug-in modules with computer, memory, and peripheral units across a back panel wiring board. The most important features are:

- Data and address bus up to 32 bit breadth
- Multi-processor capability
- Multiplex-free (Multiplexer), asynchronous bus protocol to 24 MByte/s
- Additional serial bus
- Address modification possibilities
- Block transfer

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The VME bus specification was created in 1981, building upon the functional properties of the VERSA bus, a proprietary bus for the printed circuit board format customary in Europe. VME stands for the abbreviation for “VERSA module for Europe”. In the meantime, the VME bus has been standardised by IEG and IEEE.

Volt

Abbreviation: V
Measurement unit for electrical potential.

Voltage; Potential difference

The difference of potential arising in an electrical field between two points P_1, and P_2 (unit: $Volt$). If the potential energy increases with the movement of a positive charge between the regarded points, then one speaks of an electrical prime voltage (source tension), inaccurately also called electromotive force (EMF). The prime voltage has by reason of definition the opposite sign. As opposed to this if the potential energy sinks, then one speaks briefly of a voltage drop or of a V.

Voltage drop

See Voltage

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Voltage strength

The maximum voltage to which an electronic element can be subjected, without a danger of destruction existing.

Voltage stabiliser

See voltage regulator

Voltmeter

Voltage measurement device

Voltage measurement

The measurement of electrical voltage. In electronics the measurement of the electrical voltage approximately within the range of 10^{-6} to $10^{4}\ V$ with frequencies from 0 to $10^{10}\ Hz$. A voltmeter is connected in parallel with the object over which the voltage is to be measured. So that attaching the voltmeter does not falsify the measured value, the internal resistance must be large in relation to the internal resistance of the circuit between the connection points.

Voltage level

Height (magnitude) $-+$ of the tension, measured in Volts

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Voltage level, absolute

Logarithmic relationship, generally expressed in decibel, of the RMS of the voltage of a signal at one point in a transmission channel to the RMS of a given reference voltage.

Voltage source

An active two-terminal network from an electrical primal voltage (tension) and an internal resistance. V. for DC voltage e.g. are secondary and primary elements.

Voltage regulator; Voltage stabiliser

An automatic controller in the power supply system which substantially reducs external influences such as supply voltage fluctuations, load and temperature changes on the delivered voltage. The output voltage is constantly compared with a desired value. Thereby the determined deviations are amplified.

The output voltage is adjusted in such a manner by management of a control member so that the deviation goes back to a minimum. Depending upon the kind of input voltage one differentiates a DC voltage and an alternating voltage automatic controller, while it is divided after the operational principle into constant V. and unstable V. The V. is frequently a direct component of the preparation circuit of the power supply system. If the actual value to desired value comparison is not done between output and reference voltage, but between output current proportional voltage drop at a measurement resistor and the reference voltage, one obtains an automatic current regulator.

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Voltage feedback effect

The influence of the output voltage of an electronic element on the input. The V. can lead to instabilities or, in addition, to amplification reduction and is therefore undesirable.

Voltage stabilising

The maintenance of a voltage for the supply of power to a functional unit or the like. A voltage regulator serves for maintenance of alternating (AC) voltages and a stabiliser circuit for DC voltages.

Voltage amplifier

See Amplifier

VDE

Abbreviation for the Association for Electrical, Electronic & Information Technologies (Germany)

VDI

Abbreviation for the Association of German Electrical Engineers

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V. Recommendations for Modems

The most important recommendations adopted by the CCITT are:

- V.21 for 300 bps full-duplex
- V.22 for 1200 bps full-duplex
- V.22bis for 2400 bps full-duplex
- V.23 for 1200/1200 half-duplex or 1200/75 full-duplex (Six respectively Datex-J)
- V.27 for 2400 bps or 4800 bps for faxing (Group 2)
- V.29 for 2400 bps, 4800 bps of 9600 bps for faxing (Group 3)
- V.32 for 9600 bps full-duplex
- V.32bis for 14400 bps full-duplex
- V.17 for 14000 bps for faxing.

The new standards, V.fast or V.fast Class offer transmission rates of up to 28,800 bps. V.fast will presumably be standardised as V.34.

V.42 is an error-correcting protocol and works like MNP3, but with data blocks that are only $128\ bytes$ in size. That is an advantage if errors occur because less data has to be transmitted anew. But for error-free connections, the cost of protocol information is higher.
V.42bis is the data compression protocol for V.42.

V.24-interface

A serial interface for connecting computers to peripheral devices. The V.24 interface is a European standard and consists of the serial RS-232-C interface of the American IEEE Association standard with some alterations. Because of this standardisation, data can be transferred from a computer via a cable to a printer, for example. That is how these two separate devices can communicate with one another.

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V.25bis Instruction Set for Modems

The instruction set developed by CCITT for controlling modems is primarily used for industrial tasks. Recommendations for modems.

V.32, V.32bis, V.42, V.42bis

V. Recommendations for modems

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