

VOITH STANDARD (VS)



Technical drawings – Indication of special inspections in drawings - Part 2 : VT

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Abstract:

This standard is used for the definition of quality inspections to ensure and implement the Voith product standard.

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## Revisions

The following changes have been made compared to **VS 1631-2:2014-04**:

- a) *Complete transfer of VN 1631-2:2014-04 to VS 1631-2.*
- b) *Editorial revision; adaptation to new chapter structure and layout.*
- c) *Chapter 3 has been supplemented and chapter 3.1 was added.*
- d) *Chapter 4 Terms and abbreviations have been added.*
- e) *Chapter 5 has been revised and supplemented.*
- f) *Chapter 6 has been revised and modelled on DIN 30-10.*
- g) *Chapter 7 has been revised and supplemented.*
- h) *Chapter 8 Normative references has been expanded.*

## Previous editions

**VN 1631-2: 2014-04**

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# 1 Scope

*This standard applies to the Voith Group Division Turbo and, if contractually agreed, to its subcontractors. Usually, this standard is also valid for the companies of the Voith Group Division Turbo, unless otherwise contractually regulated. Applies to US group companies only if accepted by their respective responsible board of directors.*

# 2 Area of application

This **standard** is used for the specification of documentation requirements in drawings to ensure the Voith product standard. Additional customer requirements that go beyond the Voith Turbo standard are handled on an order-related basis.

*If documentation requirements are taken from existing drawings, these must be checked by the designer and amended if necessary.*

*The specification of SC by the customer does not release the supplier from his responsibility to deliver products that conform to the drawing.*

# 3 Purpose

*This standard specifies the method of entry and labelling of "special characteristics" (SC) and their documentation requirements in the drawings. It also regulates the responsibility for assigning documentation symbols.*

*The designer uses it to characterize all SCs that must be checked during the manufacture of construction parts and the results of which must be documented. SCs are characteristics that do not have adequate design and process robustness, compliance with which is difficult in production and which, if not complied with, lead to a functional, legal and/or safety risk. Documentation requirements must also be entered if they are expressly requested by the legislator, classification societies, purchasers or customers.*

*Due to different conditions in the Voith divisions as well as in the respective locations worldwide, this Voith standard defines the regulations that must be complied with as a minimum standard worldwide. If country-specific regulations require additional requirements above the minimum standard described here, these must also be complied with.*

## 3.1 National and international standards and regulations

*The application of standards and regulations declared binding by law is mandatory. For undated references, the latest version shall apply.*

*The minimum standard for Voith is described in this standard.*

## 4 Terms and abbreviations

Table 1: Terms and abbreviations

VS	Voith Standard
SC	Special characteristics
P-FMEA	Process - Failure Mode and Effect Analysis
MFU	Machine capability test
PFU	Process capability analysis
SC	Special Characteristics
DS	legal or safety-related requirement
DZ	Legal and regulatory requirements relevant to authorisation
EOP	End of Production
QCP	Quality Control Plan
SPC	Statistical process control
C <sub>m</sub>	Machine capability
C <sub>mk</sub>	Short-term capability
C <sub>p</sub>	Process capability
C <sub>pK</sub>	Long-term capability

## 5 Documentation requirements

### 5.1 Parts requiring documentation

Parts requiring documentation are all parts whose failure could result in significant damage to property/personal injury (danger to life). Additional tests and careful documentation of the test results are required. The same applies to characteristics that are subject to certification and/or if the function depends on compliance with these dimensions. These must be labelled in the drawing. (see Figures 1 and Table 2)

- SC = SC (Special Characteristics) - essential functional requirements such as
  - 4 F: Fit, Form, Function, perFormance
  - Tolerances etc.
- DS = SC - legal or safety-relevant requirements  
Safety requirement/product safety/safety-relevant consequences, with immediate danger to life and limb. The causal progression between characteristic and consequences must be foreseeable and must not be beyond all probability.

#### Examples

Brake system (e.g. seal), steering or wheel suspension (e.g. torques), restraint system (e.g. contacting), lighting /e.g.

- DZ = SC - authorisation-relevant, legal and regulatory requirements at the time the product is placed on the market

#### Examples:

Exhaust emissions law (e.g. CO<sub>2</sub>), electromagnetic compatibility, crash resistance, flame retardancy (e.g. combustion rate)

### 5.2 Determination SC

The engineering department (experience with the product/component) is responsible for determining and applying the assessment. The team for the assessment is made up of at least two designers. Other crossfunctional employees can also support the team.

Results from previous projects or similar product lines, as well as findings from field and product observations, can be an input variable for the definition of SCs. SCs are also determined by customer requirements (must be explicitly mentioned in the project planning documents or specifications).

These are worked out internally through product and process development and change management. The design engineer uses it to characterise all SCs that must be checked and the results documented during the manufacture of design parts.

### 5.3 Proof of capability for SC in accordance with the VDA

Proof of machine capability testing (MFU) and process capability testing (PFU) must be provided for all SCs, at the latest with the initial sampling.

#### Requirements of the capability indices:

##### For SC characteristic:

Machine capability / short-term capability  $C_m/C_{mk} \geq 1.67$

Process capability / long-term capability  $C_p/C_{pK} \geq 1.33$

##### For DS and DZ characteristics:

Machine capability / short-term capability  $C_m/C_{mk} \geq 2.0$

Process capability / long-term capability  $C_p/C_{pK} \geq 1.67$

For this purpose, the methods of statistical process control (SPC) must be applied, taking into account the production processes and required quantities.

Proof of machine capability/short-term capability Cm/Cmk is already provided as part of the initial sampling. Proof of process/long-term capability Cp/CpK is provided continuously and must be analyzed at regular intervals. The numerical values are defined by Voith Turbo.

The manufacturer must demonstrate the capabilities of the processes at regular intervals.

If the products are manufactured in a process that is not sufficiently capable with regard to these characteristics, a 100% test must be carried out until the manufacturing process is optimized and the required CpK values are achieved.

### 5.4 Period of use and archiving of documents

The following archiving period is specified for quality requirement documents and quality records with reference to the SC (cf. VDA SC):

**-SC:** Archiving period  $\geq 10$  years after EOP (End of Production)

**-DS/DZ:** Archiving period  $\geq 30$  years after EOP (End of Production)

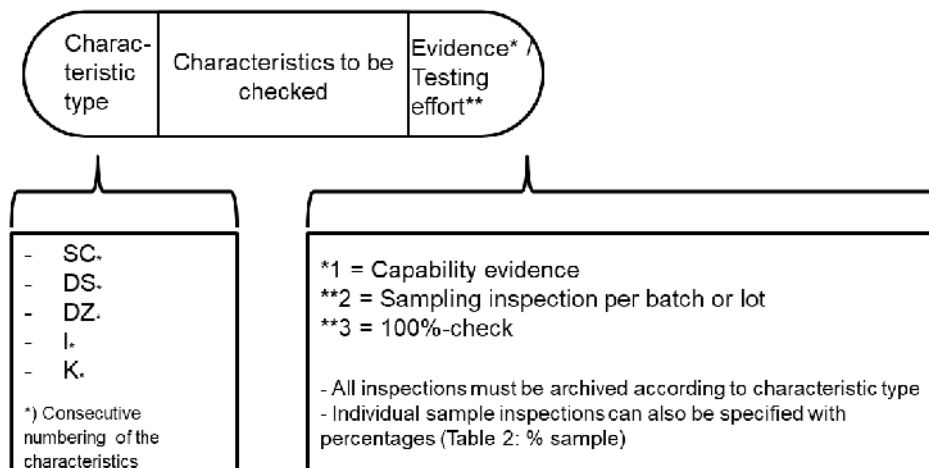
## 6 Signature entry of the documentation requirements

The design of the drawing entry is described in accordance with DIN 30-10, chapter 4.1.3.

### 6.1 Labelling SC in drawings

The labelling of SCs on a drawing is illustrated in the following figure. The interdisciplinary team decides which type of characteristic is involved. This is recorded on the left-hand side of the zeppelin dimension. The dimension to be checked is in the center. The references must also be recorded here (shape and position). The type of test or whether proof of ability is to be provided is recorded on the right-hand side of the zeppelin measure. Here too, the team decides what it is.

Figures 1: Example of labelling the SC in drawings



Examples of further labelling for the dimensions to be tested can also be found in Table 2. The drawing entry must be labelled as follows, depending on the characteristic:

Table 2: Examples of SC drawing entry

SC	DS	DZ	% sample
<b>Description Example SC:</b>	<b>Description Example DS:</b>	<b>Description Ex. DZ:</b>	<b>Description %-SP:</b>
SC with the consecutive numbering (1) (functionally relevant), characteristic to be tested (see above) and a proof of capability ( $C_{pK}$ & $C_{mK}$ )	Safety-relevant/ Legally relevant characteristic with consecutive numbering (2), characteristic to be inspected (see above) and a proof of capability ( $C_{pK}$ & $C_{mK}$ ) + random sample inspection	Certification-relevant characteristic with consecutive numbering (3), characteristic to be inspected (see above) and a 100% inspection	SC with consecutive numbering (4) (functionally relevant), characteristic to be inspected (see above) and a random sample inspection of 10% of the delivery, batch or lot

## 6.2 Component testing / verification procedure

The component test always characterizes a test with a clear assignment between documentation and component, including assemblies. This can be done by permanently labelling the material with serial numbers or other suitable labelling, which creates an assignment of the documentation to the tested material. The labelling point on the component must be entered in the drawing.

This does not apply if a proof of capability (according to chapter 5.2) is required for the component test. Proof of how the capability is achieved must nevertheless be provided.

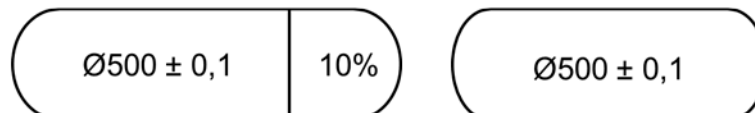
## 6.3 Undefined labelling of SC (regulation for drawing status before VS 1631-2:2023)

If a test dimension (e.g. record dimension) is shown on the drawing without special labelling, i.e. without SC, DS or DZ, it is to be regarded as labelled "SC". The old stock on drawings, such as in Figures 2 is now automatically recognized as dimensions requiring documentation. The obligation to provide proof or the inspection effort for the characteristics remains in place (often labelled in a different way as described in this standard). If no obligation to provide proof / no inspection effort is stored, this must be done via a QCP, for example.

If the drawing is changed, the labelling must be carried out in accordance with VS 1631-2!

Examples of characteristics without special labelling:

Figures 2: Example of obsolete dimensions



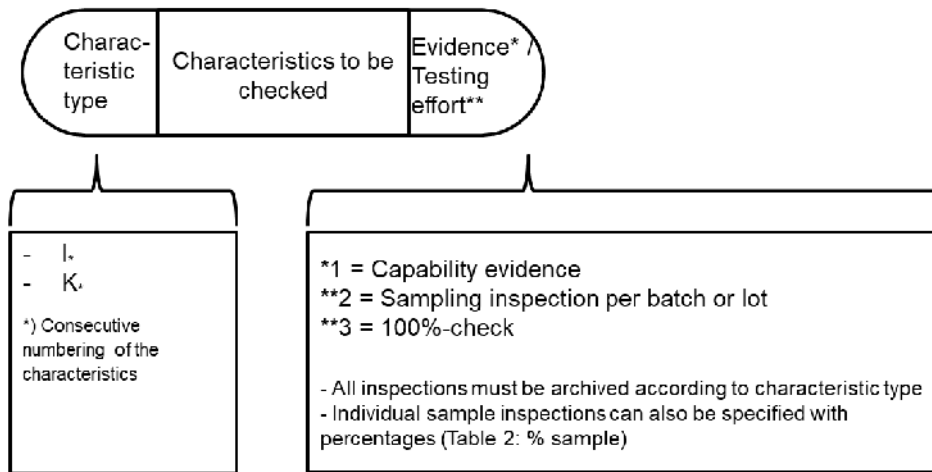


### 6.4 Labelling SC with internal protocol dimension and protocol dimension for customer documentation

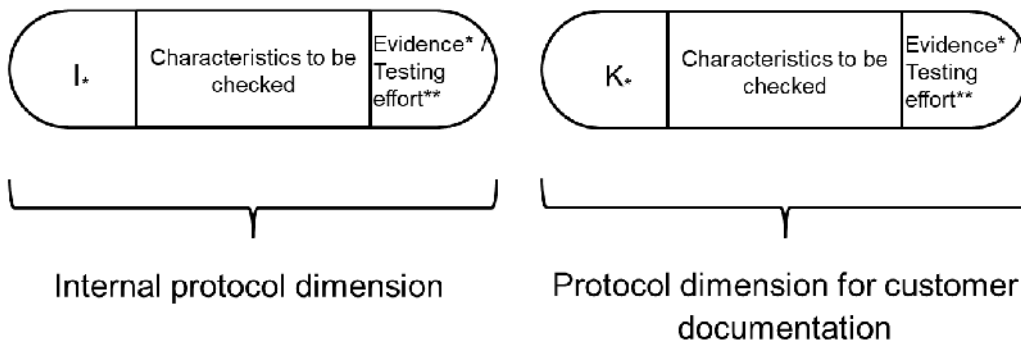
The paragraph contains the usual log dimensions for internal and external documentation.

Internal log dimensions and customer log dimensions are entered in the "a" field, as shown in Figures 4. A characteristic labelled "I" or "K" is considered to be at least an SC characteristic. The inspection effort is limited to 3 = 100% inspection.

Figures 3: Labelling of the SC in drawing concerning VTBS



Figures 4: Internal protocol dimension / customer protocol dimension



## 7 Labelling

Components according to chapter 6.1 are permanently labelled with punch numbers, by engraving or with other marking options. The location and type of "direct labelling" on the product must be specified in the technical drawing. The parts can also be marked with a permanent felt-tip pen (short-term), with an acid stamp or with a coat of paint.

### 7.1 Labelling of components for random samples

The sample components must be labelled with consecutive numbers.

The assignment between the documentation of the sample and the component is as described in chapter 6.1 must be observed.

### 7.2 Standardized labelling SC in other documents

It must also be clearly and uniformly labelled in the subsequent documents SC:

- Production control plan,
- P-FMEA (K column),
- work plans,
- Test plans and
- in work instructions, if applicable


Furthermore, the following applies in particular to prototype parts (unless otherwise agreed with the customer):

For the first delivery, the supplier must deliver at least one part complete and for all other parts at least the SC must be measured and numbered / documented.

### 7.3 Labelling of the drawing symbols SC

The drawing symbol is added to the drawing as a legend as soon as the drawing part has at least one SC.

Figures 5: Example of SC drawing symbolism

		<b>BESONDERE MERKMALE</b> <b>SPECIAL CHARACTERISTICS</b> nach / according VS 1631-2
a:	SC      Besondere Merkmale / Special Characteristics DS      Sicherheitskritisch / Relevant to safety DZ      Zertifizierungsrelevant / Relevant to certification I        Protokollmaß intern / Protocol dimension internal K        Protokollmaß für Kundendokumentation / Protocol measure for customer documentation	
b:	1    Fähigkeitsnachweis / Capability evidence 2    Stichprobenprüfung je Charge bzw. Los, Einzelwerte sind zu archivieren / Sampling inspection per batch or lot, single values have to be archived 3    100 %-Prüfung / 100 %-check	

## 8 Normative references

The following documents are referred to in the text in such a way that some parts of them or their entire content constitute requirements of this document. In the case of dated references, only the referred edition applies. In the case of undated references, the last edition of the referenced document (including any amendments) shall apply.

Table 3: Normative references

Document	Title
DIN 30-10	Technical product documentation- simplified drawing - Part 10: Simplified indications and collective indication, execution
VDA Volume SC 2	VDA volume: Special characteristics (2020-04) Joint Quality Management in the Supply Chain – A process description covering Special Characteristics (SC)

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