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Technical product documentation (TPD) — Classification of requirements —

Part 2: Classification based on severity and susceptibility

Documentation technique de produits (TPD) — Classification des exigences —

Partie 2: Classification en fonction de la gravité et de la susceptibilité

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 6, *Mechanical engineering documentation*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/SS F01, *Technical drawings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 24096 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document addresses the classification of requirements. It provides a framework for building a system to enable the classification of requirements and an indication of the classification in the functional specification, FUN-SPEC, to support communication of the consequences of nonconformity to functional requirements. FUN-SPEC (see ISO/TS 21619) is a part of the technical product documentation (TPD). Other approaches than classification of requirements can be state of the art in achieving the objective of securing the end product.

This document has been developed mainly to be implemented within industry, e.g. the automotive and aerospace industries. However, it can also be used in other engineering fields.

Classification of requirements is a tool by which subsequent parties and stakeholders can be informed of the severity of consequences of nonconformity of requirements. This facilitates the guiding of production and quality assurance resources (e.g. purchasing, production planning, control, revision). The classification system relies on established procedures, regulatory framework and contractual agreements for implementation and follow up as present in all modern industry.

There are several examples of industrial stakeholders that deploy their own or partially self-developed system and methodology for classification of requirements. There has previously not been any ISO document that pragmatically describes “what is” and “how to create” a classification system. This series bridges the identified gap and meets the need to describe how to introduce and work with a classification system in an industrial and design context.

Knowledge of the consequences of nonconformity with requirements, and actions taken to resolve the source of the deviation from the given requirements, will have a positive effect on product quality, user safety and economy of the product. Production and inspection resources can then be used where they are most needed.

Annex A gives classification examples with severity and susceptibility.

Annex B gives guidance on susceptibility.

Technical product documentation (TPD) — Classification of requirements —

Part 2:
Classification based on severity and susceptibility

1 Scope

This document specifies a method for the classification of requirements based on severity and susceptibility. The classification method requires a system in line with the framework described in ISO 24096-1 to form a complete system.

This document:

— gives guidance on the needed elements for a consistent evaluation of the severity over time, and supports a company business model and its brand image;

— gives background to why additional parameters alongside severity are useful as a base for classification;

— adds susceptibility as a viable parameter along with severity;

— gives guidance on the methodology for classification requirements using severity and susceptibility.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8015:2011, *Geometrical product specifications (GPS) — Fundamentals — Concepts, principles and rules*

ISO 10209, *Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation*

ISO 24096-1, *Technical product documentation (TPD) — Classification of requirements – Part 1: Framework*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8015:2011, ISO 10209, ISO 24096-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
susceptibility
degree to which a function is affected by nonconformity of a requirement

Note 1 to entry: While a high susceptibility gives a large effect, a low susceptibility gives a lower effect for the same deviation, see Figures B.1 and B.2.

3.2
severity list
normative assessments of severity within each company or organization

4 Basic rules

Severity of a potential consequence at nonconformity shall be used as a parameter when classifying requirements. However, equating classification with severity can lead to an overload of classification indications in the TPD. A classification must therefore encompass more than the severity. In this document, susceptibility to deviation is used in addition to severity to balance classification, see Clause 5 and Annex A.

All requirements in the product documentation shall be fulfilled in accordance with ISO 8015:2011, 4.3 and 4.4.

NOTE 1 The classification can be compared with risk assessment where risk is evaluated by combining severity and probability, see Figure 1 and ISO 12100:2010, 5.5.2.1.

Severity is the gravity of possible consequence of nonconformity.

NOTE 2 Severity is defined in ISO 24096-1:2024, 3.4.

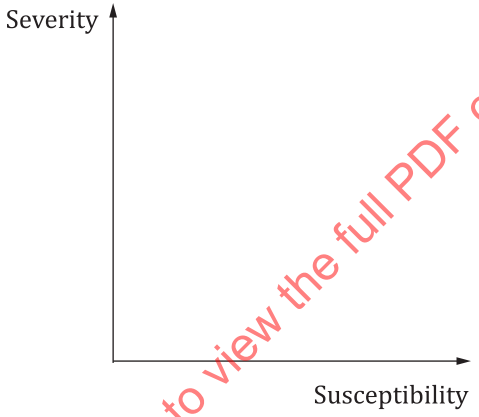


Figure 1 — Example of a template diagram for classification evaluation

Severity of nonconformity with a requirement and susceptibility to deviation are mandatory parameters in a classification system to be assessed in the classification of a requirement.

Due to the variety of already existing solutions, this document is supporting material which can help individual organizations when deciding on their own classification system and how to use it in the TPD. Referencing this document in the TPD creates awareness that a classification system for the consequences of nonconformity has been used, and that the classification system used has been developed following the rules and information laid out in this document. The details of the classification itself and the symbology to indicate the classes, however, are not given in this document but in the organization-specific system which shall be referenced in the TPD. In this way, it is possible to use any of the already existing explicit solutions or develop a new one, perhaps by modifying an existing one.

5 Classification with severity and susceptibility

5.1 The three steps

5.1.1 General

Classification with severity and susceptibility is made in three main steps. Severity and susceptibility are treated as separate parameters which together determine the final classification of requirements.

The three steps are described in 5.1.2 to 5.1.4 and aspects of them are described in detail in 5.2 to 5.5.

5.1.2 Evaluation of severity

By starting with severity, a screening is achieved. First, it reduces the relevant number of components that can have requirements worthy of classification higher than baseline, see ISO 41014:2020, 3.5.1. Second, it reduces the number of requirements on which the susceptibility needs to be evaluated. Evaluation and grading of the severity should use a severity list for consistency.

In step 1, the evaluation of severity consists of answering three questions:

— 1.1 What are the functions of the design solution?

  — Describe, in detail, what it shall do. List all functions.

— 1.2 What are the effects on the product and for the customer in case of a function deviation?

  — List the effects of function deviation. Remember to include all side effects.

— 1.3 What type of severity heading is each effect associated with?

  — Match each effect to its relevant severity rating. The highest recommended rating is found in the severity list.

This is a bottom-up approach to determine severity, see Annex A for two applied examples.

NOTE When the severity is determined with a top-down analysis, it modifies the analysis to a degree. If the top-down analysis is performed correctly, it identifies the maximum severity for the analysed component. The classification does not still continue directly to step 2, since different deviations can give different severity and be linked to different requirements.

5.1.3 Evaluation of susceptibility

In step 2, the evaluation of susceptibility consists of answering two questions:

— 2.1 Which requirements affect the function at a nonconformity (most)?

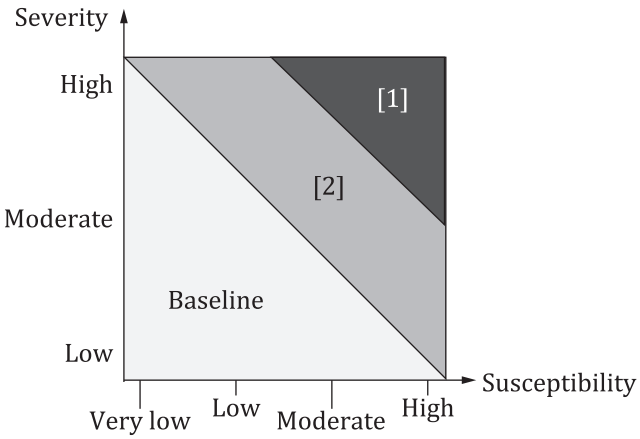
  — List (the most influential) requirements to affect the function.

— 2.2 How closely outside the requirements will the function start to deteriorate?

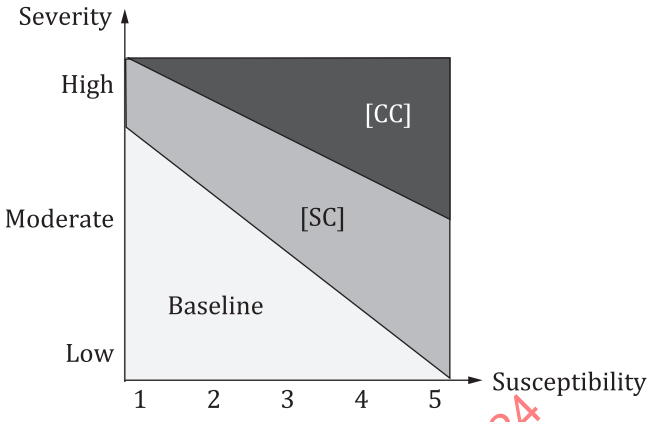
  — Evaluate the susceptibility of each listed requirement.

5.1.4 Weighing severity and susceptibility together

In step 3, the results from step 1 and step 2 are combined. The combination of severity and susceptibility yields the classification for each requirement. A simple diagram, as exemplified in Figure 2, can be used.



a) Uniform distribution of severity – susceptibility relation



b) Non-uniform distribution of severity – susceptibility relation

Key

[CC] critical characteristics

[SC] significant characteristics

NOTE [1], [2] and baseline, and [SC], [CC] and baseline are classes used in two different example systems.

Figure 2 — Examples of diagrams weighing severity and susceptibility together for final classification

5.2 Severity and severity lists

5.2.1 General

Severity is the first parameter to assess. To assess it, a firm understanding of the function of the design is required. To get a consistent assessment of severity, a normative table is needed: this is called the "severity list". This should be a list of affected areas with its maximum potential severity rating. This reduces the risk for arbitrary and personal views and assessments. The grading of the severity preferably has the same number of steps as the final classification for easy evaluation. The severity list is built up in two steps, see 5.2.2 and 5.2.3.

5.2.2 Severity description

Step 1.1 is determining how different effects are viewed, see Table 1.

Table 1 — Example of severity description in three levels

Level	Description
High severity level	At nonconformity to requirements, there is a risk for function deviation resulting in: — personal injury; — considerable damage which can cause unpredictable and unforeseeable stop and inability to complete intended task; — financial damage; — environmental impact.
Moderate severity level	At nonconformity to requirements, there is a risk for function deviation resulting in: — loss of product function; — inability to continue production; — necessity of immediate repair.
Normal severity level (Baseline)	At nonconformity to requirements, there is no risk for the effects listed above. Little or no effect on important characteristics for the customer.

5.2.3 Severity list

Step 1.2 is determining which effects different areas can have and the severity level to which each effect correlates. Starting with a coarse survey to identify the main parameters, see Table 2, is often useful.

Table 2 — Example of a severity list

Important customer requirement and/or product requirements	Severity
Safety effect	High severity level
Financial effect	High severity level
Environmental effect	High severity level
Comfort effect	Moderate severity level
Company or product image	High severity level

The severity list is a breakdown evaluation of customer demands, development targets, product requirements, and organization business model and philosophy.

The severity list contains the highest recommended classification for a failure effect. The severity lists can be unique for each product section and should reflect the organization business model, including aspects as image, model for profitability and customers' expectations.

The severity lists can need to be company internal documents (confidential) as they reflect business trade-offs, strategies and considerations.

5.3 Function as the route to severity

5.3.1 Function description

The function description shall express what the design "does", not what it "is". By clarifying all functions, they can all be evaluated and secured. This constitutes step 1.1 in 5.2.2.

5.3.2 Effects of deviating functions

Based on the function description, the effects of deviating or failing functions can be deduced and described. This corresponds to the sum of all failure effects for the classified item in a design failure mode and effects analysis (FMEA), see IEC 60812:2018. It is important to find all the ultimate effects everywhere to ensure

that the worst effects are always detected even when they affect other systems or cause a chain of events. This constitutes step 1.2.

5.3.3 Final severity

The described effect can be associated to different categories or headings in appropriate severity list. This gives the final severity. This constitutes step 1.3.

5.4 Susceptibility and the requirement pyramid

Before evaluating the susceptibility, the requirements with the largest impact on the function shall be identified.

The requirements to be secured are usually customer requirements such as those related to the economy, safety and environment. They are usually difficult to measure in production and are therefore not suitable for production follow up and quality control. Customer requirements on the product are met through product requirements (including regulatory requirements).

Parameter requirements are the easiest to measure, making them suitable for classification. Product or customer requirements, such as life, fuel consumption or driver's comfort, are however influenced by a large number of parameter requirements in combination with elevated class. The requirement level for the classification is therefore a subject for careful consideration. The classification should be made at the level which best ensures that important customer requirements are met, see Figure 3.

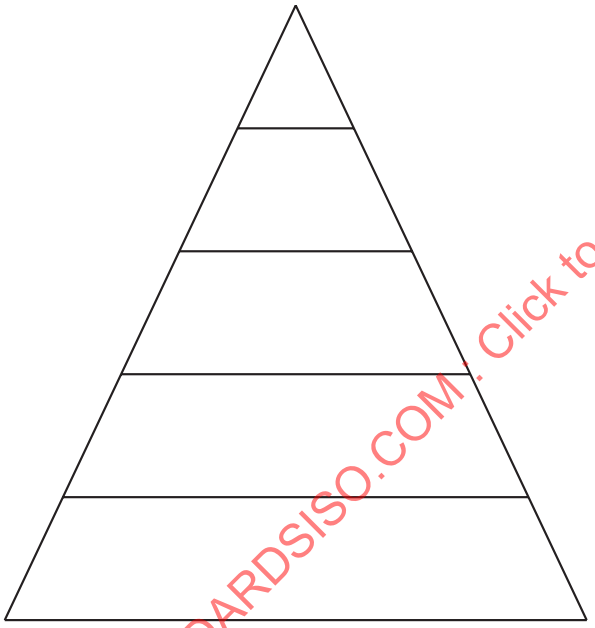


Figure 3 — Requirement pyramid

By evaluating which requirements have the largest impact on the function, those relevant for classification are detected. This constitutes step 2.1 in 5.1.3.

During the severity evaluation, the design solutions are only of interest as functional black boxes, while during the susceptibility evaluation each requirement is analysed. It then can become evident that the existing set of requirements is insufficient or incomplete, and additional requirements are needed.

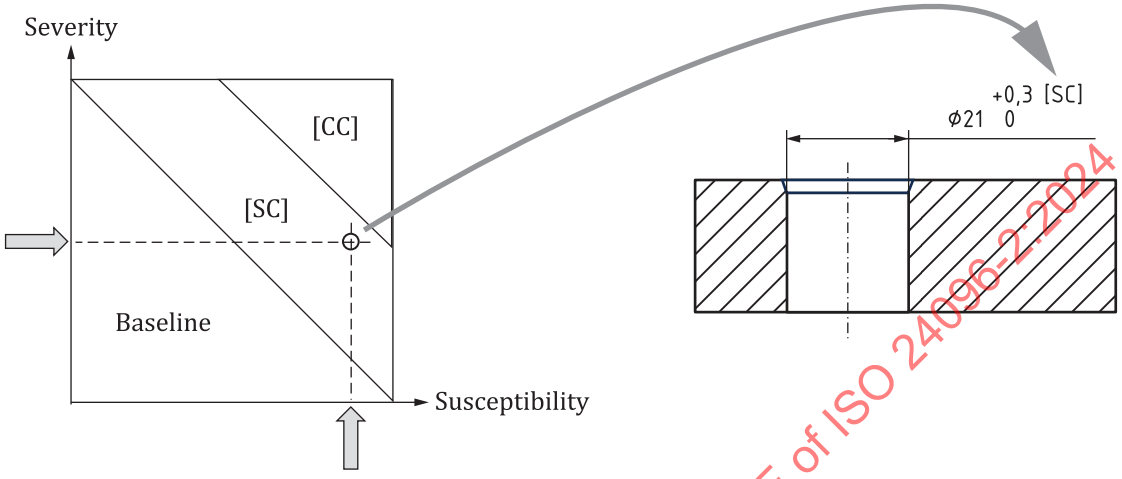
An assessment of the susceptibility is performed on the chosen requirements, i.e. an assessment of how far outside the requirements the function starts to deteriorate unacceptably. This constitutes step 2.2 in 5.1.3.

NOTE Technical calculations such as finite element analysis, or tolerance chain calculation can be of assistance in the assessment of susceptibility.

5.5 Weighing together

Finally, a weighing together of the severity and the susceptibility shall be performed. This is executed for all selected requirements, e.g. with the aid of a diagram such as illustrated in Figure 4. The result is the actual classification. This constitutes step 3 in 5.1.4.

The classification shall then, if higher than baseline, be marked next to the requirement to which it relates in the TPD.



Key

[CC] critical characteristics

[SC] significant characteristics

NOTE [SC], [CC] and baseline are classes used in this example system.

Figure 4 — Example of final classification and indication in TPD

Annex A
(informative)

Classification examples with severity and susceptibility

A.1 General

Components designed by two different fictional companies with their specific business models are used as examples in this annex. Classification using severity and susceptibility follows the methodology described in Clause 5. It is preceded by the creation of a severity list to achieve consistency in the evaluation, in case one suitable does not already exist.

A.2 Classic sports car replica, classification of a supporting arm

A.2.1 Background

The first example is a fictional company producing replicas of sports cars. The vehicles must provide a sufficient safety level and comply with local laws and regulations.

The customers want a sterling driving experience while being fully aware of the limits and deficiencies resulting from an old technical design. The cost incurred by fuel consumption, maintenance, etc. is accepted since these, by nature, are hobby vehicles.

They are, for instance, able to handle fire, which does not immediately cause personal injury, on their own, thanks to the available fire extinguisher in the car.

After defining the severity description, a severity list, see Table A.1, is made based on the levels low, moderate and high.

Table A.1 — Severity list for sports car replica

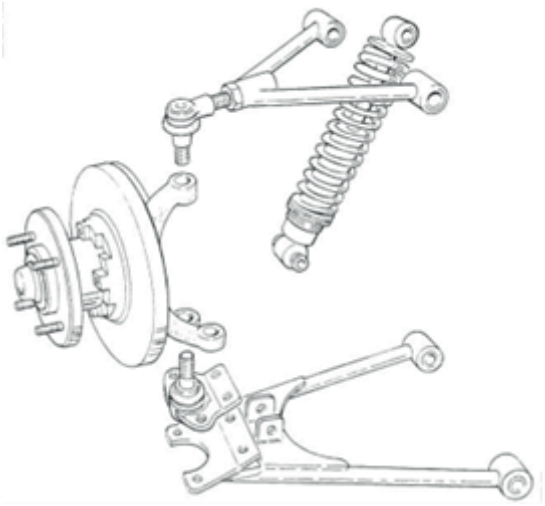
Customer/product impact	Severity
Safety	
Personal injury	High
Risk for fire	Moderate
Traffic safety	High
Legal requirement	High
Environmental	
Emissions (exhaust)	Moderate
Leakage/coolant media, oil	Moderate
Noise	Low
Performance	
Propulsion (optimized, harmonic, synchronized)	High
Torque curve/response	Moderate
Weight	Moderate
Road holding	Moderate
Strength	High
Driver's comfort	
Driveability	High

Table A.1 *(continued)*

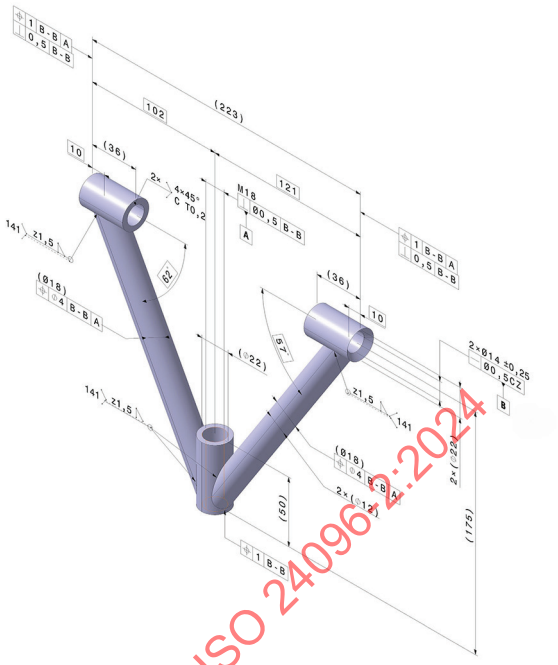
Customer/product impact	Severity
Manoeuvring force	Moderate
Driver's comfort	Moderate
Vibration	Moderate
Economy	
Fuel consumption	Moderate
Life	Low
Maintenance cost	Moderate
Repair cost	Moderate
Appearance/aesthetic	
Appearance/lacquer, gap	Moderate
Surface roughness and shape	Moderate

A.2.2 Function of the upper arm

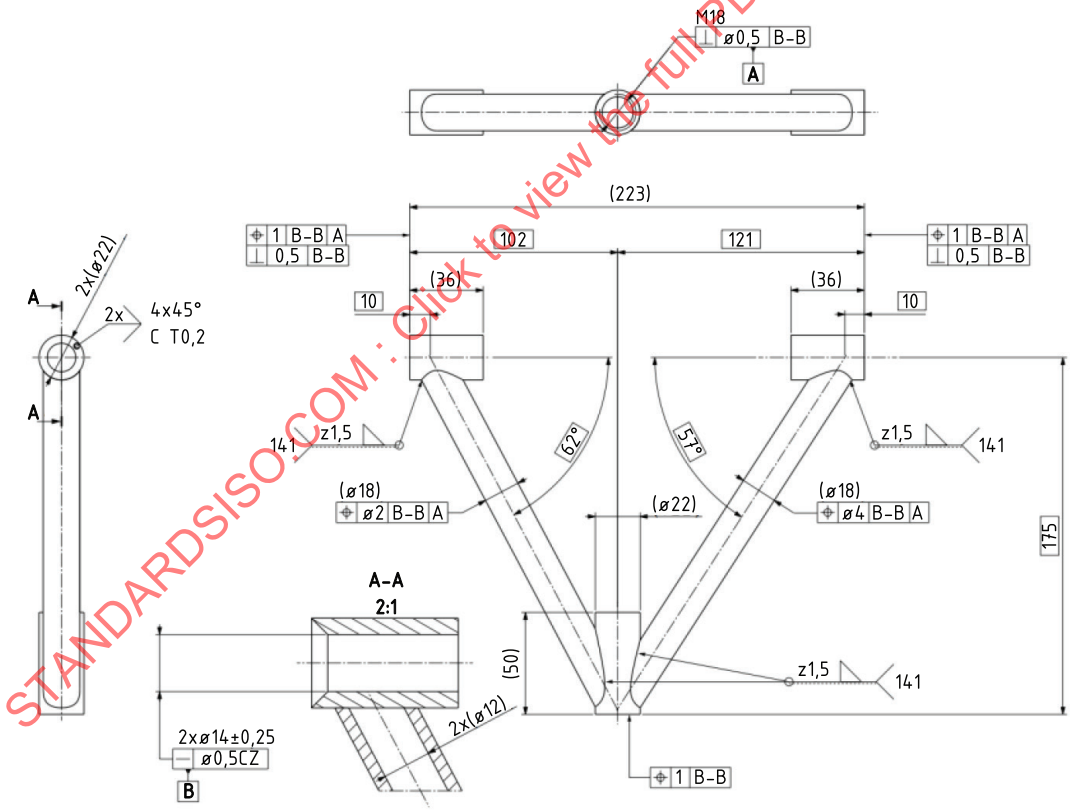
The upper arm in the front suspension is a powder-coated welded component. It carries the spindle in a threaded section and connects in the opposite ends to the chassis via rubber inserts covering bolts in tabs on the chassis. As part of the suspension, the component is optimized to minimize weight, see Figure A.1.



a) Exploded view of front suspension



b) 3D annotated model of suspension arm



c) Drawing of suspension arm

Figure A.1 — Upper arm in front suspension

A.2.3 Evaluation of severity

Evaluation of the severity associated with the upper arm begins by asking the questions described in 5.1.2:

— 1.1 What are the functions of the design solution?

— 1.2 What are the effects on the product and for the customer in case of a function deviation?

The result is shown in Table A.2.

The evaluation then continues by matching each effect with its severity rating according to the severity list, refer to question 1.3 in 5.1.2:

— 1.3 What type of severity heading should each of the effects be associated with?

The result is shown in Table A.3.

Table A.2 — Function and effect

Effect no.	Functions (step 1.1)	Effects at nonconformity or function loss (step 1.2)
1	Retain the upper part of the spindle	Wheel will topple over, risk for personal injury
2	Transfer forces from spindle to chassis	Reduced driveability
	Transfer forces at acceleration and brake	
3	Enable suspension movement	Reduced brake capacity
4	Isolate road vibrations	Increased vibrations
5	Form centre axle for steering the wheel and regulation of camber	Increased tyre and insert wear
6	Provide sporty and reliable impression	Unsightly, amateurish impression, lowered trust, and confidence

Table A.3 — Matching of effect and severity

Effect no.	Customer/product impact (severity list, step 1.3)	Severity (step 1.3)
1	Personal injury	High
2	Driveability	High
3	Traffic safety	High
4	Driver's comfort/vibration	Moderate
5	Maintenance cost	Moderate
6	Appearance/lacquer, gap/surface roughness and shape	Moderate

A.2.4 Evaluation of susceptibility

Evaluation of the susceptibility is done by asking the questions described in 5.1.3:

— 2.1, Which requirements affect the function at a nonconformity (most)?

— 2.2, How closely outside the requirements will the function start to deteriorate?

The classification system in this example uses a scale of susceptibility between 1 and 5 where 1 is lowest. The result is shown in Table A.4.

Table A.4 — Matching effect and susceptibility

Effect no.	Functions (step 1.1)	Requirements (step 2.1)	Susceptibility (step 2.2)
1	Retain the upper part of the spindle	All weld requirements at spindle	5
2	Transfer forces from spindle to chassis	All weld requirements at chassis attachment	4
	Transfer forces at acceleration and brake	Pipe dimension, diameter and material thickness	2
3	Enable suspension movement	Pipe inner dimension and rubber insert material thickness	3
4	Isolate road vibrations	Rubber insert material thickness	2
5	Form centre axle for steering the wheel and regulation of camber	Concentricity	4
		Perpendicularity	3
		Distance, spindle to chassis	2
6	Provide sporty and reliable impression	Powder coating finish	4
		Weld finish	2

The susceptibility is concerned with how close outside the requirements the function deteriorates unacceptably. This involves reasoning about design optimization and characteristics, size of expected production variation based on product manufacturing, etc. Table A.5 shows the considerations and thought process in the rating.

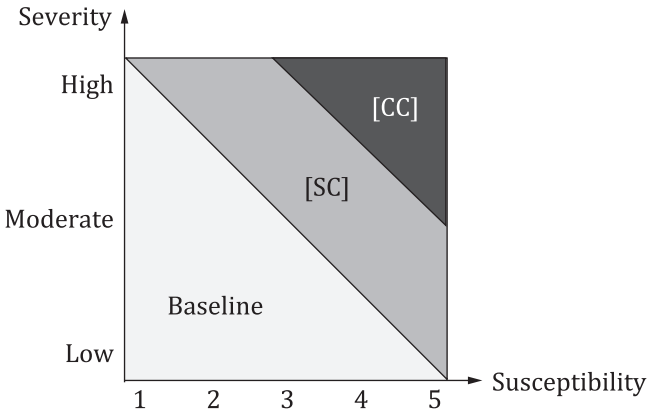
Table A.5 — Comments and reasoning to susceptibility

Effect no.	Requirements	Susceptibility	Comment/reasoning
1	All weld requirements at spindle	5	These welds are exposed to the highest loads so even a small deviation can cause failure.
2	All weld requirements at chassis attachment	4	These welds are exposed to high loads but not as high as those above.
	Pipe dimension, diameter and material thickness	2	The dimensional deviation that can occur on these are so small that the potential influence is small.
3	Pipe inner dimension and rubber insert material thickness	3	The dimensional deviations have some effect as the insert becomes boxed in.
4	Rubber insert material thickness	2	The dimensional deviations have a small effect on the dampening ability of the insert.
5	Concentricity	4	If the concentricity is poor, the contact will only be on the insert edge (and at worst on the connecting pipe).
	Perpendicularity	3	The threaded part misalignment will cause different longitudinal positions for different spindle adjustments, which can cause increased tyre wear, if large.
	Distance, spindle to chassis	2	The threaded part is positioned so far from the chassis side that spindle adjustment is possible. It requires a large deviation to make this adjustment impossible.
6	Powder coating finish	4	The powder coating is highly visible so deviations (pores, etc.) will signal poor quality and result in reduced safety confidence.
	Weld finish	2	The welds will be covered by the powder coating so the finish will be hidden (functional quality/safety is assessed in effect no. 1).

A.2.5 Weighing severity and susceptibility together

Weigh severity and susceptibility together, step 3, for each requirement to set the classification.

Match the requirements to their severity and susceptibility, see Table A.6. The combination of severity and susceptibility will yield the classification for each requirement. A simple diagram, Figure A.2, has been used in this example. TPD of the upper arm in front suspension (see Figure A.1) with requirement classification is shown in Figure A.3.



Key

[CC] critical characteristics

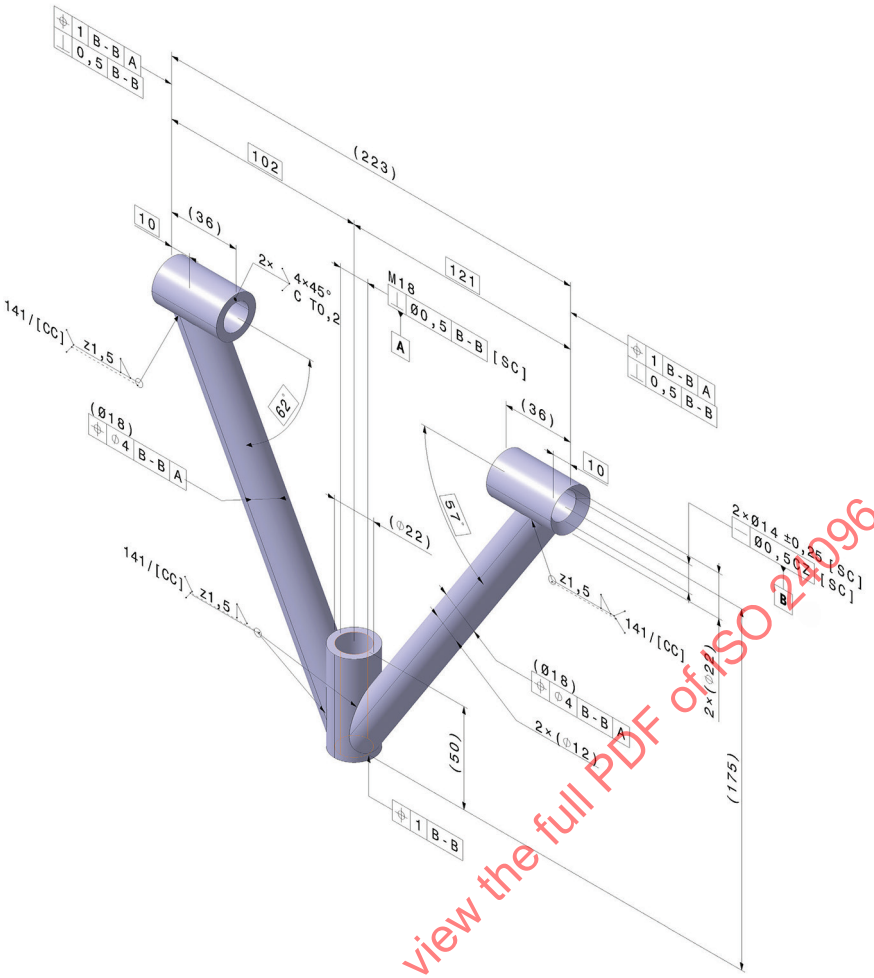
[SC] significant characteristics

NOTE [SC], [CC] and baseline are classes used in this example system.

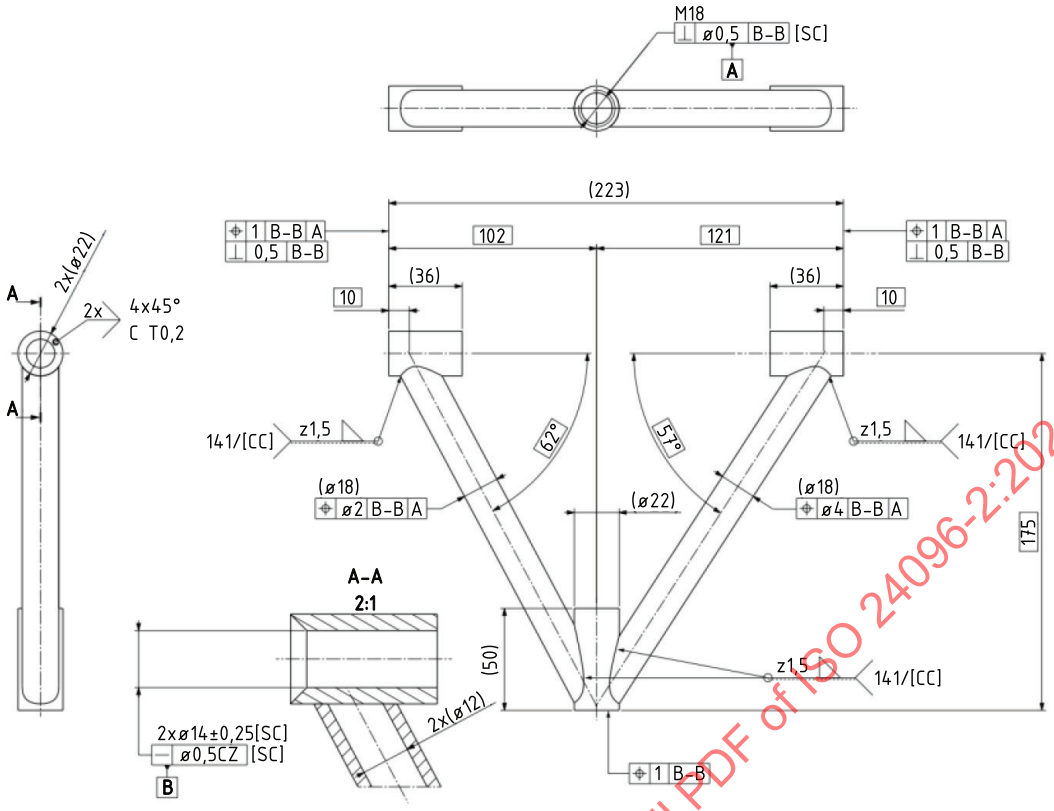
Figure A.2 — Diagram weighing severity and susceptibility together for final classification

Table A.6 — Matching of effect and susceptibility

Effect no.	Requirements (2.2)	Severity (1.3)	Susceptibility (2.2)	Classification (3)
1	All weld requirements at spindle	High	5	[CC]
2	All weld requirements at chassis attachment	High	4	[CC]
	Pipe dimension, diameter and material thickness	High	2	[SC]
3	Pipe inner dimension and rubber insert material thickness	High	3	[SC]
4	Rubber insert material thickness	Moderate	2	Baseline
5	Concentricity	Moderate	4	[SC]
	Perpendicularity		3	[SC]
	Distance, spindle to chassis		2	Baseline
6	Powder coating finish	Moderate	4	[SC]
	Weld finish		2	Baseline



a) 3D annotated model of suspension arm



b) Drawing of suspension arm

Figure A.3 — TPD of upper arm in front suspension with requirement classification

A.3 Thermos mug

A.3.1 Background

This fictional company produces kitchen items of all sorts that do not require electricity. The customer base is quality aware, but the brand is not high status driven. The company profile is reflected in its severity rating list by an acceptance of some degree of visual variation and flaws but not deviation in function. The products encompass kitchen-associated utensils both for use at home as well as outdoor activities. Examples are mixing bowls, whisks, pots and pans. The thermos mug in this example is in one of their product series, see Figure A.4. The severity list is in part derived from their customers' expected requirements and sets the highest severity level for deviations in different areas, see Table A.7. Considerations influencing the severity rating include:

— food safety regulations will affect aspects related to poisoning and cleaning;

— deviations that can cause minor cuts, burns or biological activity, where the assumption is that the user has not followed instructions, heeded warnings or been carelessly negligent, and is therefore co-responsible for the damage;

— major damage or injury has probably been caused by direct product flaws (product variation);

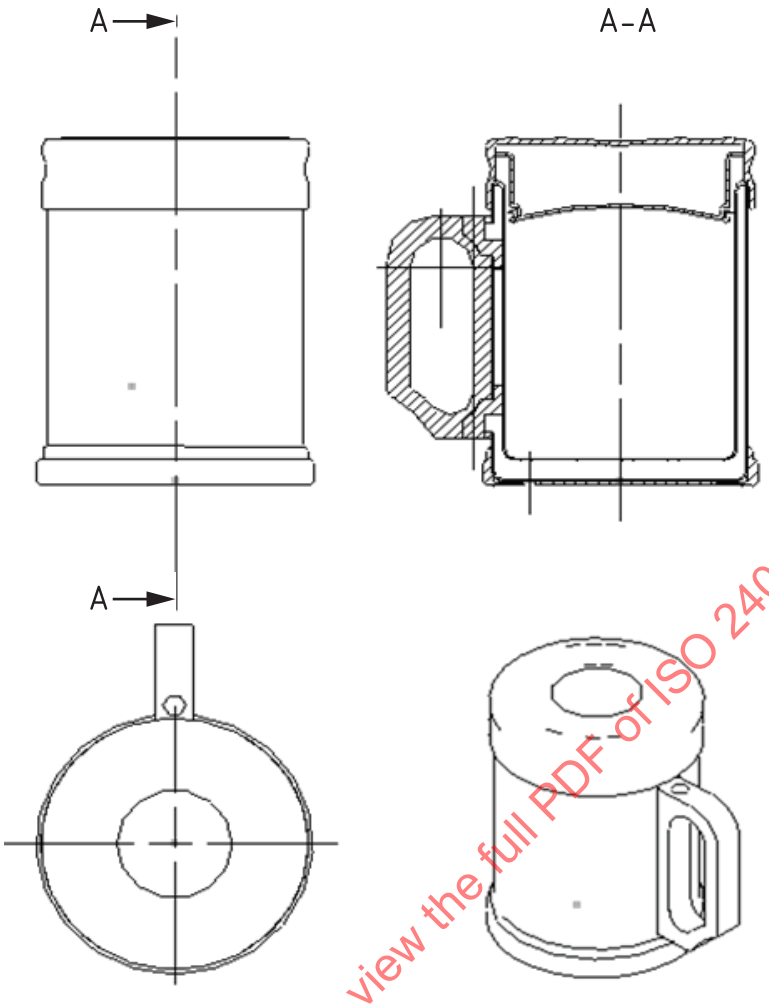
NOTE Considering the company profile and marketing, esthetical and ergonomic aspects are important so as to not be perceived as a low-price/low-quality brand.

— heat conductivity is important in three areas: products with thermos effect, handles (low conductivity), and pots and pans (high conductivity);

— the noise level (unexpected in a company not selling products with engines) needs to be considered so that, for instance, mixing bowls do not have unsuitable natural frequencies making them ring too much when used with an electrical whisk.

Table A.7 — Severity list for thermos mug

Customer/product impact	Severity
Injury	
Severe cut or crush injury	High
Minor cut	Moderate
Severe burn	High
Minor burn	Moderate
Poisoning due to biological activity (bacteria, mould, etc.)	Moderate
Poisoning other	High
Function loss or reduction	
Heat conductivity	Moderate
Ergonomic, easy to hold	High
Leakage	High
Cleaning	High
Aesthetic	
Discoloured/unevenly coloured surface	High
Shape accuracy/surface smoothness	High
Surface roughness/weld spray	Moderate
Gloss and sheen	Moderate
Gap	Moderate
Visual harmony	Moderate
Environment	
Recycling	Low
Noise level	Moderate



NOTE The thermos mug comprises two shaped (deep drawn) metal cups welded together, handle, lid and outer bottom as high-friction base in polymer material.

Figure A.4 — Drawing of thermos mug with comprising components

A.3.2 Classification of the thermos mug

A.3.2.1 General

A requirements classification of the thermos mug chosen as example is done using the methods described in this document.

This company uses a classification system with two levels above baseline, denoted class 1 and class 2, see Table A.8.

Table A.8 — Example of classification system definitions

Class	Potential effect of nonconformity from a requirement
1	Damage to life or limb Costly unpredictable stop of function or business Environmental damage
2	Loss of product function Large disturbance of production Imminent repair needed

A.3.2.2 Step 1, evaluation of severity

Step 1.1 in assessing the severity of deviations is to ascertain the function of the item analysed. A review of the thermos mug shows that it:

a) holds fluid, not allowing external leakage (when the lid is on);

b) provides a steady and comfortable grip;

c) provides a comfortable surface for lip contact;

d) maintains the drink at a given temperature interval for sufficient time;

e) visually gives confidence in the product;

f) neither causes nor contributes to poisoning or causing an allergic reaction.

Step 1.2 in assessing the severity is to ascertain the effect at a deviation from the function. Based on the above described function, the effects, at deviation, on the product and for customers areas listed in Table A.9.

Table A.9 — Effects at noncompliance with requirement

Effect no.	Effect
1	Scalded user/customer
2	Leakage of fluid, spill
3	User/customer injured by cut
4	Warm fluid cools too fast and vice versa
5	Perceived as dirty, grime collecting
6	Poisonous

Step 1.3 in assessing the severity is to match the effect with the severity level in the severity list. The resulting rating is described in Table A.10.

Table A.10 — Severity assessment and rating for a thermos mug

Effect no.	Effect	Heading from severity list	Severity
1	Scalded user/customer	Minor burn	Moderate
2	Leakage of fluid, spill	Leakage	High
		Ergonomic, easy to hold	High
3	User/customer injured by cut	Minor cut	Moderate
4	Warm fluid cools too fast and vice versa	Heat conductivity	Moderate
5	Perceived as dirty, grime collecting	Discoloured/unevenly coloured surface (including gap or corner)	High
6	Poisonous	Poisoning other	High

A.3.2.3 Step 2, evaluation of susceptibility

Step 2.1 for assessing the susceptibility is to list the requirements in the product documentation that can affect the product functions or requirements at a deviation. At this stage, deficiencies in requirements are sometimes revealed. For requirements affecting the function at deviation, see Table A.11.

Step 2.2 for assessing the susceptibility is to investigate the deterioration of function at deviation. The deterioration is in this example rated in four grades: very low, low, moderate or high, see Table A.11.