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Quality Management in the Automotive Industry

Definition of Failure Cause Categories for 8D Reporting V1.0

Guidelines for using the failure cause categories

1st edition, June 2017

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Verband der Automobilindustrie e.V. (VDA)

ISSN 0943-9412
Online-Download-Dokument
Release: June 2017

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Non-binding VDA recommendation of standards

The German Association of the Automotive Industry (VDA) recommends that its members apply the following recommendation of standards for the implementation and maintenance of QM systems.

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Translations

This publication will also be issued in other languages. The current status must be requested from VDA QMC.

We thank the organizations involved and their employees for their contributions to the preparation of this guideline.
The following companies have been involved in creating this publication:

AUDI AG

BMW AG

Continental Automotive GmbH

Daimler AG

GM Europe

Knorr-Bremse

Magna International Europe AG

Robert Bosch GMBH

Schaeffler Technologies AG & Co. KG

Volkswagen AG

Webasto Roof & Components SE

ZF Friedrichshafen AG

Specialist and administrative support:
TU Berlin, Quality Strategy and Quality Competence Department
VDA QMC

Berlin, 2017

Verband der Automobilindustrie e. V. (VDA)

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Note:

The definition of failure cause categories for 8D reporting are available to download from the following URL:

http://vda-qmc.de/publikationen/formulare/

1 Motivation and premises

In the event of a complaint, the standardized 8D process in accordance with VDA volume 4 is used to coordinate the failure correction between the supplier and customer. 8D stands for the eight disciplines (process steps) that must be carried out when processing a complaint in order to identify the underlying problem and to avoid a recurrence. These are:

D1: Team
D2: Problem description
D3: Immediate measure(s)
D4: Failure cause(s)
D5: Planned corrective measure(s)
D6: Implemented corrective measure(s)
D7: Prevent a repeat of the failure
D8: Acknowledge the team's success

The problem solving process according to 8D is part of the complaint process and aims to provide quality assurance. 8D reporting standardizes the procedure and supports consistent documentation of the individual steps in the solution. The type of complaints, those responsible and the measures to rectify the defect are established in the 8D report. The approach is fact-oriented and requires product and system failures to be traced back to their causes and for them to be permanently rectified. "D4 – identifying failure causes" is particularly important for this. This requires all failure causes that explain the problem to be investigated systematically.

A systematic analysis of this failure cause is the basis for identifying and implementing a sustainable quality assurance strategy according to the Plan-Do-Check-Act cycle. By categorizing failure causes, the user (customer and supplier) is able to apply 8D reporting as a tool for assessing (Plan-Do-Check-Act) the quality situation. Standardized failure cause categories also reduce the complexity for the supplier due to uniform classification across all customers and support the efficient processing of 8D reports. The group-wide overview that does not relate to specific suppliers and projects allows 8D reports to be utilized to present the main areas of failure causes. Using this database, appropriate measures can be found for quick and sustainable quality improvement.

The following application possibilities are just a few examples:

- Performance indicator: Trend (daily, weekly, monthly) of failure cause categories
  Possible measures: Effective use of resources (personnel, budget), further development of supplier requirements

- Performance indicator: Gradient of the trend curve of failure cause categories
  Possible measure: Early indicator due to group-wide analysis of the failure cause categories → Installation of central problem solving teams for failure causes that affect several projects.

2 Abbreviations and terms

Term	Definition	Source
Failure	Non-conformity → Failure to fulfill a requirement.	DIN EN ISO 9000
Failure cause	The failure cause is a cause that is (jointly) responsible for the failure.	VDA volume – Standard Process for Handling Customer Complaints
Failure cause categories	Structured reduction of complexity by grouping the failure causes. The failure cause categories only represent the root cause to a limited extent.	VDA AK 8D
Failure cause location	Specification of the location of the failure cause, e.g. position in the value chain; production step	No source available
Root cause(s)	Root cause(s) are causes that cannot be traced back any further after questions such as "Why did this failure occur/what caused this unexpected situation?" have been asked multiple times; can also be understood as the "origin" of a failure.	VDA volume – Standard Process for Handling Customer Complaints
QDX	Electronic exchange of information/ data regarding the complaint process via a standardized XML interface in accordance with the QDX format issued by the VDA QMC (**Q**uality **D**ata e**X**change).	VDA volume 7 – Quality Data eXchange (QDX)

3 Guidelines

3.1 Using the failure cause categories

When creating the 8D report, the supplier assigns a corresponding category to each verified failure cause.

Describing the failure cause fully and in detail by assigning it to a failure cause category is not the objective and is generally not possible due to the complexity of the failure cause and the limited number of failure cause categories. On the contrary, assigning a failure cause to a failure cause category is about finding a thematic approximation ("best fit"). For more information on this, also see VDA volume 4 (Quality Assurance in the Process Landscape – General, Risk Analysis, Methods, Process Models → 8D methods).

The selection of the failure cause category takes place on three levels from the point of view of the supplier:

Level 1

The failure cause of a product under complaint can be assigned to a phase of the corresponding product lifecycle. Failures can therefore be caused during "development", during "production", e.g. due to defective production processes, or during "logistics processes" for the customer. If a failure cause that is the responsibility of the supplier cannot be determined after completing failure analysis, the failure cause category "Failure cause unfamiliar or unknown" must be selected.

Level 2

In the second level, details about the selected lifecycle phase are given. E.g. a failure cause in "Development" must be assigned to one of the successive phases ("specification, product concept, product development, process development and verification and validation").

Level 3

In the third level, further details are given about the selected lifecycle phase up to the level of the process being carried out.

The "Miscellaneous" failure cause category should only be selected if it is not possible to assign the failure cause to a corresponding process (see change management).

The failure cause must lead back to an underlying defective process in all phases. Selecting the failure cause category is therefore always connected with selecting the causative process. It is helpful to use the preposition "due to" when selecting the appropriate category. E.g. "hole occurred due to the welding process (Production → Joining)" or "delay occurred due to the specification of the production sequence" (Development → Process development)".

3.2 Change management of the failure cause categories

The failure cause categories and these guidelines are continually being developed as part of a change management process by the VDA working group 8D "Definition of failure cause categories in 8D reporting". Change requests can be submitted using the following e-mail address: rootcausecat-change-mgmt@vda-qmc.de Please provide a description of the scope of the change, a justification, and a contact person for queries. Change requests are read and analyzed in terms of content by the working group. Feedback on new coverage and changes will be sent to all those who make requests.

3.3 Assignment of the failure cause categories (QDX)

From the perspective of the customer, the failure cause location is assigned at the level of the supplier or sub-supplier. See figure 1. For this purpose, additional information which will make it possible to identify the errors of the sub-supplier is required in the 8D report (e.g. QDX 2.1 data field: AdditionalConcernedManufacturerPartys → Concerned).

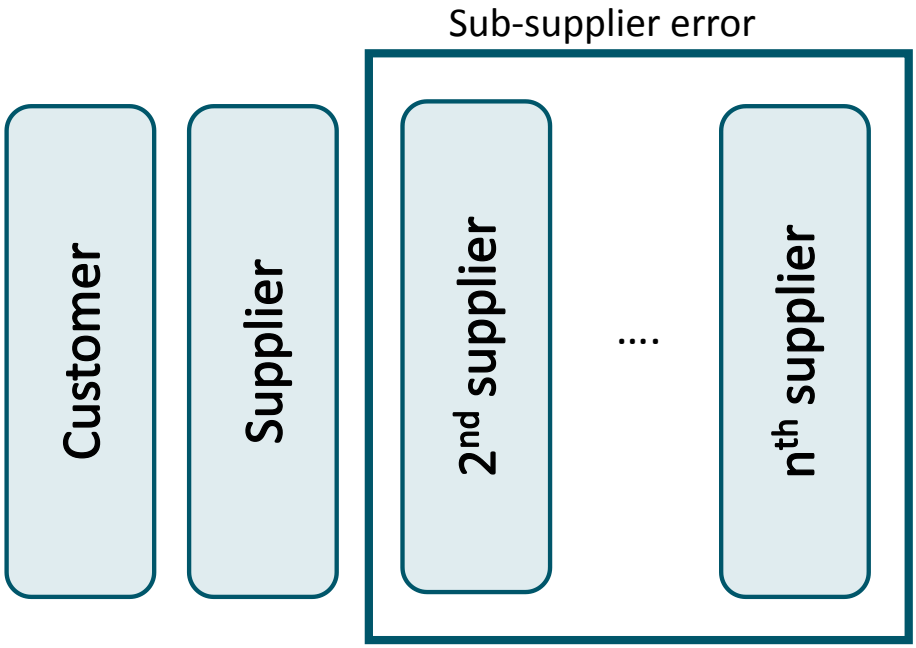

Fig. 1: Assigning failure cause location in the supplier chain

A more detailed classification of the failure cause location for sub-suppliers is not provided in a standardized and therefore analyzable form in the current complaint system.

The electronic data exchange between the customer and the supplier as part of the complaint process is defined in VDA volume 7 "Quality Data eXchange (QDX)". The QDX format represents the failure cause categories from version 2.1 onwards using the following data fields:

Syntax
<FailurePreAnalysis>
<FailureCauseCode>010030012**</FailureCauseCode>**
// Failure cause category; 9-digit; alphanumeric;
<FailureCauseDescription>1.0**</ FailureCauseDescription >**
// Version of failure cause category;
</FailurePreAnalysis >

Example

D2. Problem description	Display only shows a white image
D4. Failure cause	ESD damage identified in the circuit area of a display; ESD circuit protection not present
D4. Failure cause category	Development → Product development → Circuit diagram
Failure cause category ID = FailureCauseCode	010030012

The procedure described relates to 8D reporting in accordance with VDA volume "Standard Process for Handling Customer Complaints".
Other international problem solution processes can be adapted.

4 Appendix

4.1 One-pager - VDA failure cause categories

Motivation

A systematic analysis of failure causes is the basis for identifying and implementing a sustainable quality assurance strategy according to the Plan-Do-Check-Act cycle. By categorizing failure causes, the user (customer and supplier) is able to apply 8D reporting as a tool for assessing (Plan-Do-Check-Act) the quality situation. Standardized failure cause categories also reduce the complexity for the supplier due to uniform classification across all customers and support the efficient processing of 8D reports. The group-wide overview that does not relate to specific suppliers and projects allows 8D reports to be utilized to present the main areas of failure causes. Using this database, appropriate measures can be found for quick and sustainable quality improvement.

Guidelines

- A corresponding failure cause category is assigned to each verified failure cause.
- Selecting the failure cause category takes place **on three levels from the point of view of the supplier**
- Assigning the failure cause to a failure cause category is the aim. However, due to the complexity of the failure causes and the restricted number of failure cause categories, this is not always clearly possible. On the contrary, assigning a failure cause to a failure cause category is about finding a thematic approximation ("best fit").
- The failure cause must lead back to an underlying defective process in all phases. Selecting the failure cause category is therefore always connected with selecting the causative process. It is helpful to use the preposition "**due to**" when selecting the appropriate category. For example, a welding spot is burnt-through **due to** the welding process (Production → Joining) or the mechanical stress occurred **due to** insufficient regulation of the screw sequence (Development → Process development).

Simplified examples

"Development" example	
D2. Problem description	Display only shows a white image
D4. Failure cause	ESD damage identified in the circuit area of a display; ESD circuit protection not present;
D4. Failure cause category	Development → Product development → Circuit diagram
"Production" example	
D2. Problem description	The leather on the trim panel has gathered up in the curved area.
D4. Failure cause	User error when manually cutting the leather
D4. Failure cause category	Production → Chipless cutting → Knife cutting process
"Logistics" example	
D2. Problem description	Unable to read data matrix code (DMC) on packaging. Reading the DMC gives different results for the customer and the supplier.
D4. Failure cause	Reading stations with different illumination and program settings
D4. Failure cause category	Logistics → Marking and labeling → Scanning process
"Failure cause unfamiliar or unknown" example	
D2. Problem description	Communication with control unit not possible.
D4. Failure cause	The control unit operated without error for all tests carried out. The failure in the complaint can no longer be reproduced.
D4. Failure cause category	Failure cause unfamiliar or unknown → OK according to diagnosis → According to standard test

Change request

Change requests can be submitted using the following e-mail address: rootcausecat-change-mgmt@vda-qmc.de.
Please provide a description of the scope of the change, a justification, and a contact person for queries.

4.2 Extract from failure cause categories

The following tables provide examples of the four areas "Development, Production, Logistics" and "Failure cause unfamiliar or unknown" (level 1) in accordance with the product lifecycle. This refers to extracts from Version 1.0. This list makes no claim to completeness.

Level 1	**Level 2**	**Level 3**	**Examples**
Development	Specification	Specification unclear	Requirements insufficient
Development	Product development	Circuit diagram	Pull-up resistance too low

Level 1	**Level 2**	**Level 3**	**Examples**
Production	Joining	Soldering process	Wave soldering process
Production	Testing	Electrical test	In-circuit test

Level 1	**Level 2**	**Level 3**	**Examples**
Logistics	Transport	Loading process	Box falls down
Logistics	Packaging	Packaging cleanliness	Contaminated

Level 1	**Level 2**	**Level 3**	**Examples**
Failure cause unfamiliar or unknown	Caused by customer	Damage or destruction	Mechanical damage
Failure cause unfamiliar or unknown	Failure cause cannot be determined	Failure cannot be reproduced	Failure could be detected once; failure disappeared

Quality Management in the Automotive Industry

The current version of published VDA volumes regarding quality management in the automotive industry (QAI) can be found at http://www.vda-qmc.de.

You can also place orders directly on this homepage.

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