VDA QMC

German Association of the Automotive Industry
Quality Management Center

7

Quality Management
in the Automotive Industry

Exchanging quality data

QDX – Quality Data eXchange V2.2 and V3.0

3rd revised edition 2021

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Verband der Automobilindustrie e.V. (VDA)

QDX – Quality Data eXchange V2.2 and V3.0

Non-committal VDA recommendation regarding standards

The Verband der Automobilindustrie (Automotive Industry Association – VDA) proposes that its members apply the following recommendations regarding standards when establishing and maintaining QM systems.

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Translations

This document will also appear in other languages. Please contact the VDA-QMC for the latest position.

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Preface

The cross-operational function of quality management in our companies will have to achieve ever-greater effectiveness in order to satisfy market requirements in terms of automobiles and their components.

In addition to the technical expertise which is essential to ensure quality, current and accurate decision-making depends on quality data which are exchanged more rapidly than ever with the aid of data processing and transmission between customer and supplier.

To provide a uniform basis for this exchange of quality data and to increase efficiency, this present document sets out an exchange format based on XML (eXtensible Markup Language).

A VDA working group, composed of representatives of the automotive industry and companies specialising in information technology has described the processing of information in the field of quality data exchange.

The exchange format has been given the title of:

QDX (Quality Data eXchange)

This VDA publication represents an expansion of the existing VDA recommendations, in which quality processes supported by QDX and the documents generated (and used) thereby are described in detail.

This present VDA publication, therefore, has neither the objective nor any claim to provide further, redundant recommendations or requirements regarding processes; the contents themselves are presented only as recommendations. Whether, where and to what extent QDX is used in the automotive industry cannot be dictated by the VDA. That decision must always be taken by the two organisations wishing to exchange quality data directly between their respective IT systems.

1   Introduction

The internationalisation of companies and products in the automotive industry demands new and lower-cost forms of cooperation along the entire value-creation chain.

One answer by the manufacturers and large-scale suppliers is to introduce cost-reduction programmes. This implies the close integration of suppliers and, these days, supplier integration can no longer be achieved without IT support.

The field of quality management plays an increasingly important role, both in the creation of the product and in full production, in order to reduce the costs and investment reserves involved in complex product developments and extensive failures in the field. To provide cross-organisational support in this area, which is characterised by time and cost pressures, the VDA QMC has established a working group with the task of establishing a standard for an exchange format for quality data, which can be applied on a cross-organisational basis. Using a kind of "plug-and-play" interface between the IT systems of customers and suppliers, this standard supports the integration of processes and thereby permits transparency and shorter development times.

1.1   Benefits

In summary, the exchange of quality data with IT support offers the following benefits:

- Time-savings by the direct transmission of quality data into the partner system
- Accelerated flow of information with less paperwork
- Reduced duplication of work as a result of better availability of information
- Automatic acceptance of data for further processing

Further, optional opportunities for expansion include:

- Support of the workflows specified in the VDA volumes
- Acceptance of master data (e.g., addresses) from upstream systems
- Acceptance of quality data from upstream systems
- Transmission of quality data to downstream systems
- Compliance with product liability requirements by the long-term archiving of quality data

1.2   Overview

Using the QDX format individual quality document are exchanged electronically between customers and suppliers.

What is QDX?

- A standard for **describing** and **exchanging quality data between business partners in the automotive industry**
- It is issued by the Quality Management Center of the **VDA (Verband der Automobilindustrie** e.V.)
- It is based on **XML technology**
- It is **independent of manufacturers**

What is it not?

- It is not a **quality management system**
- It is not **software** for supporting **quality processes** (with commercial partners)
- It is not **software** for drawing up **quality documents** or for **data conversion**
- It is not an **alternative** or redundant duplication of existing **IT / CAQ systems**

Typically, in the course of the cooperation, a large number of Quality documents exchanged between suppliers of the automotive industry and their customers. Instead of entering the data multiple times into different IT systems, the content of the quality document in question can be further processed by the receiving system by importing this data directly into the receiving CAQ system (CAQ = Computer Aided Quality Assurance) via a QDX interface. The exchange format QDX can thus be described as a standardized interface for CAQ systems and, for example, can be integrated into an existing CAQ system. This process is known as quality data exchange.

The QDX format is not intended only for use by OEMs (original equipment manufacturers – i.e., the automobile makers) and Tier 1 and Tier 2 suppliers (the first and second supply levels in the supply chain) which have their own CAQ systems. The suppliers in lower levels of the supply chain should also be involved in the exchange process.

The introduction of QDX represents an important step on the path to standardised inter-company E-business. Companies which can generate or read documents on the basis of the QDX specification are therefore able to satisfy important requirements for further areas of E-business, such as (for example) the automated processing of quality data and other purposes.

1.3   The problem

The automotive industry is shaped by increasing global competitive pressures and the resulting programmes for cost reductions and increased productivity employed by the automobile makers (OEMs) and their suppliers (Tier 1 suppliers). These developments are accompanied by increasing market demands regarding the products and their variants. This involves ever-shorter product life cycles and, therefore, ever-shorter development times. These pressures on costs and time are felt along the entire supply chain.

The OEMs and large suppliers demand ever-closer integration of their suppliers at process and IT levels. Most of these sub-suppliers deliver to more than just one OEM or Tier 1 supplier and therefore find themselves

confronted by different requirements for different customers. These can be handled only by investment in increased resources.

However, this results in higher costs, which have to be passed on to the customers and this cannot be supported in the long term.
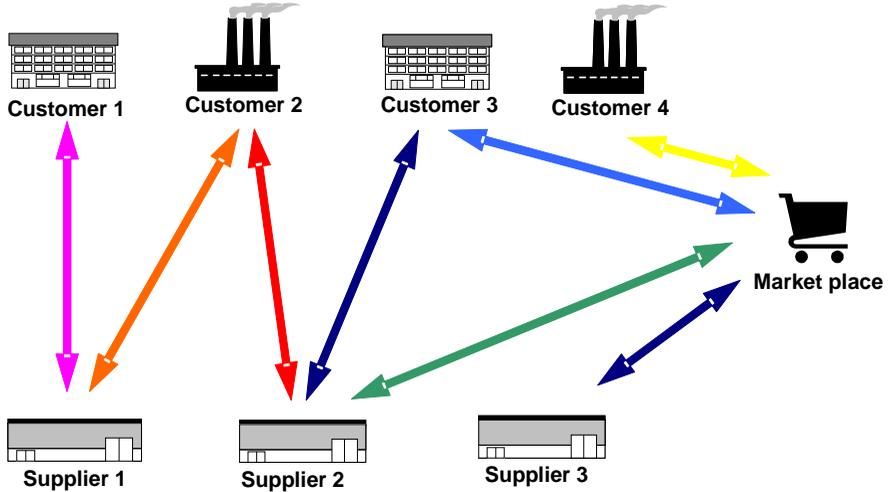

Fig. 1: Various individual interfaces increase the work-load

The second and third links in the supply chain are generally represented by medium-size companies. These normally have only limited resources with which to keep step with integration requirements, systems and processes. Very often, solutions are found which simplify the processes of the OEMs and 1st Tier suppliers but which add to the load on the medium-size suppliers.

The consequence is that the full potential of processes cannot be achieved and the planned increases in speed, flexibility and transparency cannot be implemented to the planned degree. As an example, consider the numerous supplier "portals" for purchasing and product creation, which transfer new and time-critical tasks onto the medium-size suppliers. In most cases, process-related data are taken from the portal (for example, as pdf files) and transferred manually by the suppliers into their internal IT systems, as well as being transferred manually from these systems into the web formats used by the customer portals.

1.4   The solution

The starting basis for developing QDX was the range of existing process standards, such as VDA publications. The aim was to support the processes and documents described in the VDA publications with standardised data exchange formats for quality management, in order to permit the rapid and problem-free integration of customer and supplier systems.
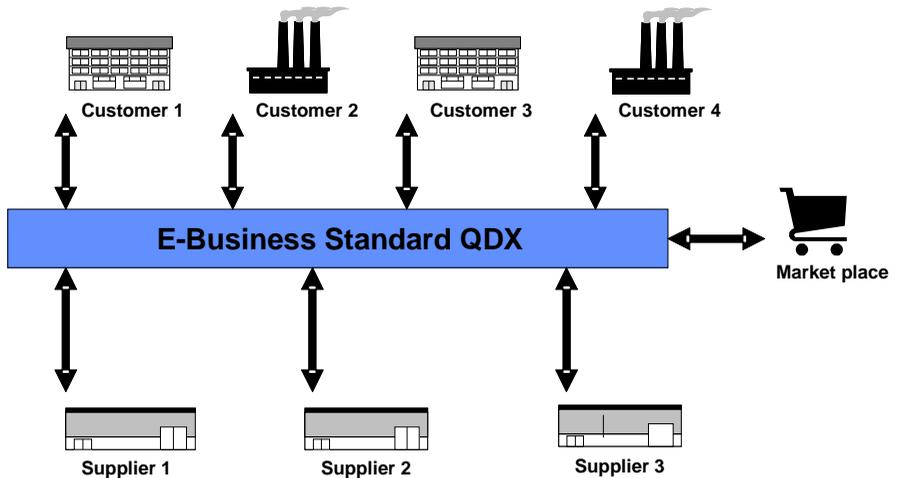

Fig. 2: Using standards permits efficient communication in customer / supplier relationships

The focus was laid on the following phases of the product life-cycle:

1. Product development

2. Pre-production

3. Production

In exhaustive preliminary work, analyses were made of all the documents and data to be exchanged between customers and suppliers. Here, the criteria were:

1. Allocation to a phase

2. Description and function for OEM and Tier x supplier

3. Frequency of data exchange

4. Essential / optional documents and data

5. Further processing of the structured data by the recipient, using electronic means

In total, 67 different quality documents were identified, which were exchanged at different frequencies in the 3 phases stated. Of these documents, 18 were classed as relevant for structured data exchange – that is, the data they contained were processed further by the recipient (customer or supplier) in electronic form. An example is the PPA report, containing data which are used in the customer's system for various purposes, including the control of project management and supplier assessments.

The other documents were used at the time mainly for information, documentation and archiving purposes but were not used further in a structured form. At present it is sufficient for these documents to be transmitted simply as pdf files, for example.

Based on this analysis of the current situation, quality documents on an XML basis were developed as an XML scheme (XSD). These were aligned with the semantic terms used by the VDA and by the AIAG (the US counterpart to the VDA). The structures are oriented toward the current standards and generalised extensions used by OEMs and Tier x suppliers.

The following documents were defined:

Table 1: List of QDX documents

No.	Title	Contents
1	QDXProjectPlan	Project Plan
2	QDXStatusReport	Status Report
3	QDXSpecialProductAndProcessChracteristics	List of special product and process characteristics
4	QDXMeasurementSystemAnalysis	Measurement System Analysis
5	QDXMachineCapabilityAnalysis	Machine Capability Analysis
6	QDXProcessCapabilityAnalysis	Process Capability Analysis
7	QDXCertificate	Quality Management System, Process- and Product- Certificates
8	QDXInterimApproval	Interim Approval
9	QDXInterimApprovalResponse	Response to the Interim Approval
10	QDXProductItemSubmissionWarrantRequest	Request from customer to supplier to start a PPA process
11	QDXProductItemSubmissionWarrantAgreement	PPA Agreement
12	QDXProductItemSubmissionWarrant	PPA report
13	QDXProductItemSubmissionWarrant Response	Response to the PPA report
14	QDXComplaint	Complaint
15	QDXShortConfirmation	Basic response to the Complaint
16	QDXReport8D	8D-Report
17	QDXWarrantyData	Field Failure Data
18	QDXAdvancedProcessing	Reference to individual agreement regarding mandatory data

In addition to the above documents, a further ten documents were defined as supporting the QM processes, which enable the actual communication between the CAQ systems.

The structure of all documents is based on the UN/CEFACT core component technology specification, ISO 15000-5) and uses elements such as *jaiqdt:JAIIdentifierSchemeAgencyIDContentType* of this specification for the supplier and customer numbers. This makes expansion in terms of quality data transparent for system suppliers and IT departments and existing software tools such as EDIFIX, XML-Parser, Converter or security systems, message-queuing mechanisms, can continue to be used. This protection of investments supports the rapid spread of the exchange format.

The QDX documents are made available as an XML scheme. Such schemes make it possible to carry out a precise, formal check on the conformance of quality data which have been transmitted, thereby eliminating any lack of clarity regarding date formats (American or European formats, for example) at the beginning of the exercise.

1.5   Future development

The exchange format QDX addresses both quality data and logistical complaint data and thus supports both the product development and production areas. Whereas exchange formats have been standardised for years in the logistics field (EDIFAKT, for example) there have so far been no equivalent E-business standards in the quality field for the seamless, automated exchange of information.

The supplier portals which are currently being developed by large-scale automobile manufacturers and suppliers may be regarded as the first step in the right direction toward supplier integration. The development of these portals into standard interfaces brings the companies involved into system-to-system communication which is not subject to media breakdowns, across organisational boundaries to achieve the planned advantages of speed and flexibility, as well as looked-for cost savings.

QDX represents an initial step into the future and must be continued, with the development of further harmonisation at IT level and also at process level, because only with the harmonisation of processes can the complete potential be achieved.

1.6 Notes on the 3rd revised edition of VDA Volume 7 (2021)

With the versions V2.2 and V3.0, QDX was adapted to the updated VDA volumes "8D – Problem solving in 8 disciplines" and "VDA 2 – Assurance of the quality of deliveries (PPF)". Furthermore, data fields according to "VDA 5011 – Evaluation of logistical delivery performance" have been added.

With earlier versions of the QDX standard, it was always ensured that higher versions are "downwardly compatible" with previous versions. As a result, new, additional data fields had to be defined as optional in the higher versions. Furthermore, no changes could be made to the basic data structure. Following this paradigm, an "intermediate version" V2.2 will be published at the same time as version V3.0. Compared to V3.0, V2.2 also offers a QDX version that is downwardly compatible with the previous V2.1. This can also be used to transfer all new data fields, but it does not contain any changes in the data structure or any new mandatory fields. All new data fields were defined as optional in V2.2. In V2.2 only changes were made to the "complaint documents".

With V3.0, the processes (workflows) defined in the updated VDA volumes can also be mapped via QDX interfaces. In order to be able to process the PPF procedure according to VDA 2 completely via QDX, the document "QDXProductItemSubmissionWarrantAgreement" has been defined in V3.0.

In addition, the structure of the 8D report has been changed in V3.0 so that the D4 is no longer "hanging" under the D3, but on the same level as the other disciplines – D5 and D6 excluded. The reason for this structural change was that the root cause analysis (D4) and the associated measures (D5 and D6) do not depend on the containment actions (D3) in practice.

Since the QDX document "QDXComplaintFieldFailureResponse" has not been widely used so far and, secondly, there were hardly any differences in content to the QDX document "QDXReport8D", the two documents were merged in V3.0 into one document "QDXReport8D".

Note: The QDX document "QDXComplaintFieldFailureResponse" is still included in V2.2.

In order not to endanger the acceptance and spread of the QDX standard, many data fields were previously defined as optional. This made it necessary that parallel – outside of QDX – individual agreements had to be made between customer and supplier in order to convert some of the data fields defined as optional in the standard into mandatory data fields. Although with version V3.0, in addition to changes in the structure, significantly more data fields have been defined as mandatory fields, it will probably still be necessary in the future to make such customer / supplier-specific agreements.

For this reason, an additional document was defined with V3.0, with the help of which further automated processing of the transmitted data in the receiving system can be ensured. This additional QDX document has been given the name "AdvancedProcessing".

2   Legal security

Where the exchange of quality data needs to be protected in law, the customer and supplier may agree on the issue of an accompanying declaration.

This accompanying declaration can be drawn up electronically and, in addition to the details regarding the actual transmission, it should contain the following information, for example, in compressed form:

- transmission / message number
- transmission date
- transmission time
- transmission duration
- test/inspection report number
- part number
- description
- specification / drawing number
- issue level
- identification (initial samples / production parts)
- release identification
- signature of the person responsible.

The full information should be archived electronically and be available at any time for inspection or printing out.

In Germany, the law states that so-called "declarations relevant in law" – that is, declarations involving legal transactions and those which may, for example, have financial implications (debit charges, production releases, etc.) – must be signed by at least two authorised representatives of the organisation. This legal requirement can be set aside only by mutual consent. To do so, each individual supplier must declare once only that he relinquishes the right to signed documents covering the relevant process (complaint; reject; product release, etc.) and accepts without reserve the information made available electronically. This agreement is best demonstrated by a signed framework agreement covering the IT

systems / processes involved. Ideally, this should include the mutual exchange of the customer and supplier numbers (*buyer* and *seller parties*).

2.1   Legal information regarding QDX

The end-user may use the QDX exchange format free of charge. The integration of QDX in technical software products or computer programs must be approved in each case by the VDA QMC (www.vda-qmc.de) and must be covered by a licensing agreement.

The VDA QMC (Qualitäts Management Center im Verband der Automobilindustrie e. V.) explicitly reserves all rights to the material and the object of the specification. The VDA QMC specifically declines any kind of warranty for this specification, including any guarantee implying that this specification or its implementation does not infringe the rights of any third parties.

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3 General information regarding QDX

3.1 Using XML

The quality documents are coded in XML (eXtensible Markup Language). XML is a W3C recommendation (see www.w3.org/XML) and is a de facto industry standard for the exchange of documents and data in the Internet. XML makes it possible to code structures and data simultaneously in a quality document, unlike more traditional methods such as Excel sheets or "comma-separated lists" (CSV). QDX is available in the form of XML schematics. The associated XML schemes (XSD = XML Scheme Definition) are published as an accompaniment in a separate document.

3.2 Compatibility with other standards and formats

The QDX standard is used to transmit units of information individually and linked in a logical structure. In principle, therefore, conversion into other format is always possible. The use of XSLT (XML transformation language, see www.w3c.org) and associated software.

3.3 Additional activities and standards

QDX uses individual elements and constructs such as address information on organisations and persons from the XSD files which have been generated from the JADM (joint automotive data model). This is a joint initiative by AIAG, JAMA/JAPIA, Odette and STAR for the harmonisation of the electronic data exchange formats used world-wide in the automotive industry. The JADM is based on the UN/CEFACT specification for core components (CCTS, ISO 15000-5).

3.4 Terminology

Quality data

The quantity of all necessary data, which are transmitted by the sender organisation to the receiving organisation.

Quality document (QDX document)

The XML file, in which the relevant quality data are contained in the QDX format and which is transmitted to the receiving organisation.

3.5 Structure of the specification / documentation

The documentation of the QDX format consists of various documents:

1. **QDX documentation**, which can be downloaded from the "VDA QDX Portal" following registration by e-mail

2. **xsd files**, which are sent by e-mail following registration (OEMs and suppliers) or signing of a licensing contract (CAQ suppliers)

3. **VDA publication "Requirements covering QDX data transport"**, which can be download free of charge and without registration from the VDA QMC home-page. http://vda-qmc.de/en/software-processes/qdx/

4. **VDA volume 7**

The inter-action between the individual documents is illustrated in the following overview:
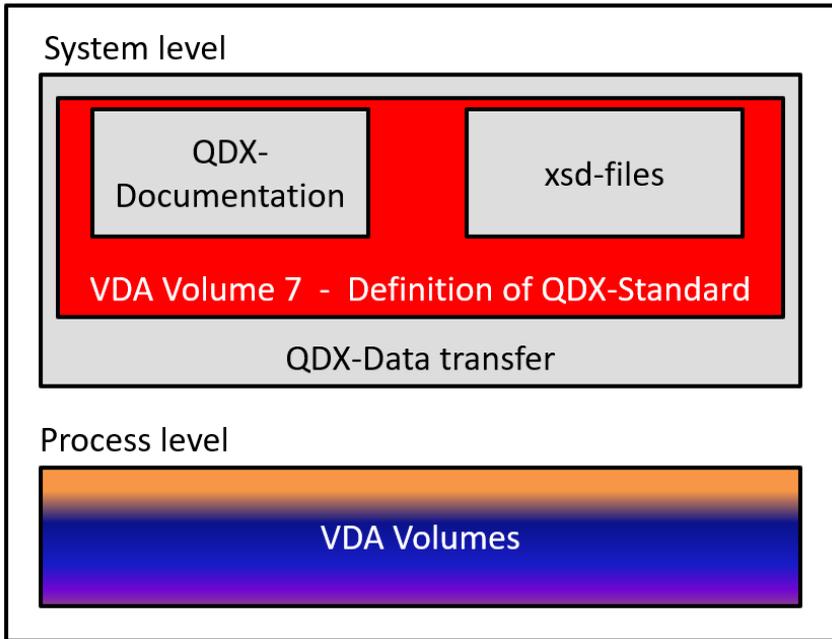
Fig. 3: Inter-action between the individual documents

The automated exchange of quality data using QDX is possible only if both parties (customer and supplier) have agreed on a uniform data format and a defined communication path.

Ideally, both parties will have implemented the same processes in-house. It must be ensured that the IT system which receives the data is also able to process the data and that appropriate data fields are available. Seen from the other side, essential data can be delivered only if the transmitting system can also prepare these data. Which data are actually to be transmitted is defined on the basis of the process description.

A complete print-out of the general QDX documentation would cover more than 400 pages and with a paper document of this kind, it would be practically impossible to link the individual elements in a form which could be easily read and handled. This present publication therefore includes no attempt to describe the individual QDX documents in detail.

The general QDX documentation has been generated as a "HTML file". Sections "Introduction" and "General" are explanatory notes. Section "Structure" contains the hierarchical view of a specific document (e.g. "QDXComplaint") beginning with the root element. The status and occurrence (MinOccurs and MaxOccurs) are shown on the left. In order to maintain a clear overview, attributes are not shown in the hierarchical view. The elements are linked with the descriptions of all elements and attributes in the section underneath.

QDXReport8D-3.0

Nachrichtenstruktur

St	Wiederholung	Element
		QDXReport8D
M	1 .. 1	xsd:sequence
M	**1 .. 1**	**Header**
M	1 .. 1	xsd:sequence
M	**1 .. 1**	**ControlInformation**
M	1 .. 1	xsd:sequence
O	0 .. 1	**VersionID**
O	0 .. 1	**StopAutomaticProcessing**
O	0 .. 1	**GeneratorInfo**
O	0 .. 1	**GenerationDateTime**

Fig. 4: Message structure

This section contains detailed information on each element and attribute. The message "tree" is shown on the left. The nodes of complex elements can be opened so that their structure can be seen. All information relevant to the pre-selected node is shown to the right.
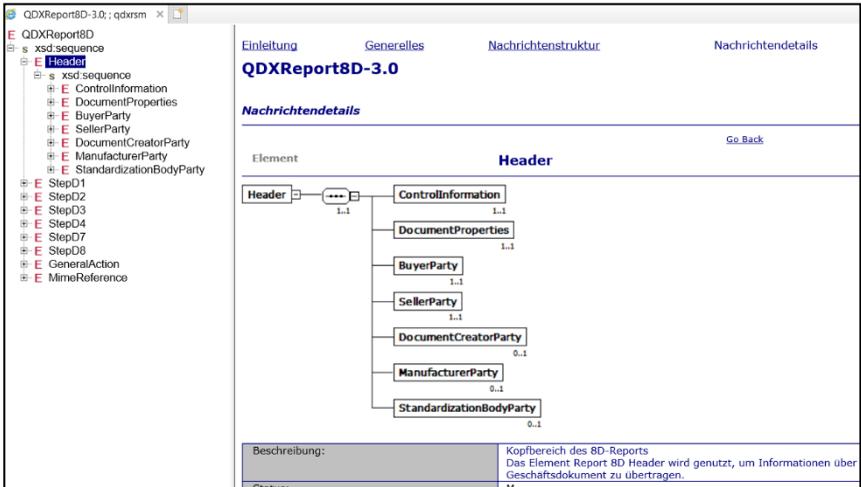
Fig. 5: Message details Header

The data type of an element or attribute is linked via a hyperlink. The data types, attributes and/or segments are described, on which an element and/or attribute is based.
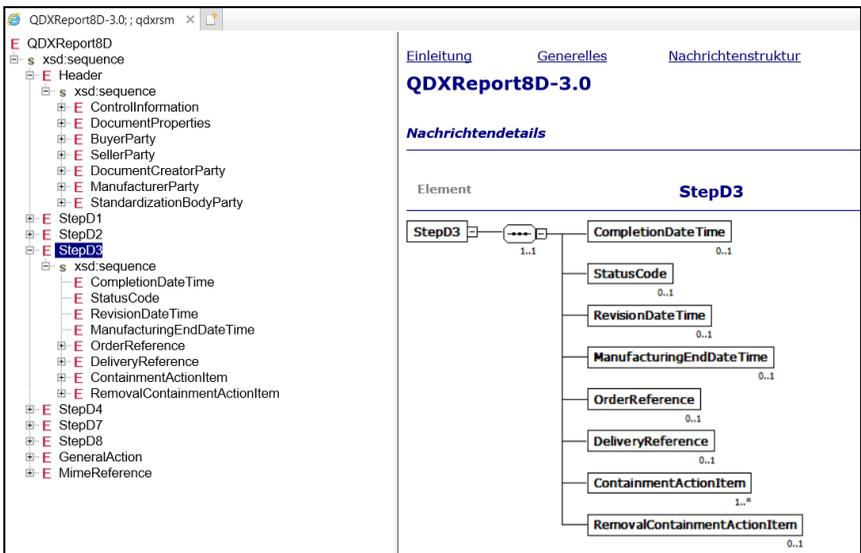

Fig. 6: Message details Step 3

In the details a graphic shows the structure of the element which has been selected. The names of the elements are linked with the relevant data types and sub-elements.

In some cases, figures are shown against the elements. These indicate the attributes minOccurs and maxOccurs, whereby:

- 1…1:   minOccurs = 1 maxOccurs = 1 ("must"   element)
- 0..1:   minOccurs = 0 maxOccurs = 1 (optional   element)
- 0..* or 1..*: maxOccurs = unbounded   (repeatable element)

The symbols used in the graphics have the following significance:

 xsd:sequence

 xsd:choice
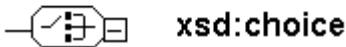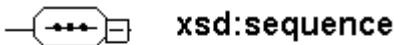
xsd:sequence – the elements must be contained in the XML instance exactly in the sequence described. Optional elements can be deleted if they are not needed for data transmission. "Must" elements are obligatory details in the relevant structure.

xsd:choice – one (and only one) of the sub-elements must appear in the XML instance.

3.6   Symbol coding in XML

The coding of the individual symbols in the XML elements is specified in each XML file. This is carried out in the attribute "encoding" in the XML text declaration as in <?xml version="1.0" encoding="UTF-8">.

Here, "UTF-8" is shown as a symbol set. QDX supports all symbol sets mentioned in the XML specification (for example, ISO-8859-1, UTF-8, UTF-16). With UTF symbol sets it is usual to save one symbol in one or more bytes.

Field lengths are not stipulated in this specification and must be agreed bilaterally between the commercial partners as necessary.

The individual data fields should not be empty in an XML document. The general rule is that, if there is an empty field, it should be occupied with at least one symbol.

3.7   XML structure – files scheme (XSD)

The XSD files have been constructed in accordance with the procedure recommended by UN/CEFACT (so-called ATG2 rules, ATG – Applied Technologies Group):

+ jai/common
  Re-usable components from the Joint Automotive Industry project

+ jai_qdx/common
  Re-usable components in QDX

+ jai:qdx/maindoc
  Message schemata for the individual messages (QDXCertificate, QDXComplaint, etc.) – the XML instances can be validated against the relevant scheme in each case

+ jai_qdxcom/common
  Basic components in QDX

+ standard/common
  standardised data types for code lists (enumeration types)

The name prefixes have been generated automatically and can be replaced in the XML instances by any prefixes, provided that the allocation to the relevant URI is carried out correctly.

4   Description of the documents in QDX

The documents defined in QDX are based on those nominated by the largest users of requirement documents in the VDA and AIAG, as well as company-specific documents used in operational activities by members of the working group.

When defining a standard it is obviously impossible to include complete illustrations of all the specifications of all the individual organisations. Even so, an attempt has been made to illustrate these documents and data fields as well – insofar as they were known – by means of optional elements.

In principle, all the QDX documents are structured in the same way, in that they all divided into a *header* and the concrete contents of the document.

The *header* contains the header data of the individual document and ensures a connection between the document and the associated product. In addition, it defines the persons responsible on the customer side and supplier side for the product and the document.
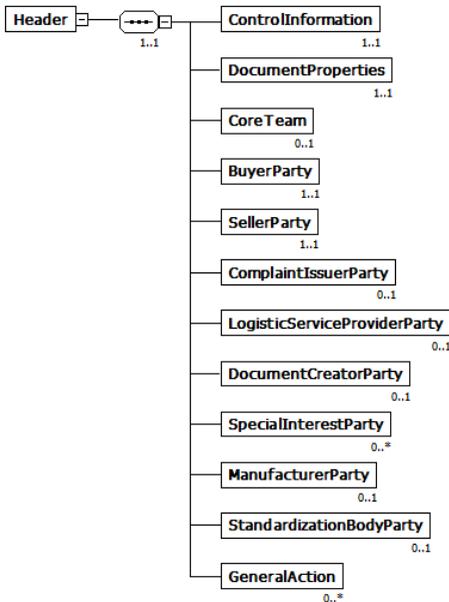
Fig. 7: Message details Header

Here it must be noted that the "document authorities" (responsibilities) apply only to the data fields *BuyerParty* and *SellerParty*. All other "party" data fields must be regarded simply as provided for information. Because these are optional fields it must be assumed that the contents of these data fields may not be processed further on the receiving side.

So that the individual documents can be called up without any confusion, the transmission should include a document number with the issue level (change level) and date.

The transmitting and receiving systems must have an unambiguous ID by means of which the messages (and their responses) can be routed correctly.

Control information for the automatic processing of the document is contained in "*ControlInformation*".

Where it was reasonable to do so, the possibility of attaching any number of attachments to the message has been provided – so-called *MIME elements* are oriented on the usual MIME types in the Internet (www.iana.org/assignments/media-types/).

By using EDIFACT messages the VDA-Recommendation 4983 should be considered.

In the transmitting system there must be a clear definition as to whether the complete document is to be transmitted, or only those elements which have changed since the previous transmission. Similarly, the receiving system must determine whether incoming QDX messages should over-write data field which are already filled, or whether the new information should be logged in redundant form.

The receiving system must generate an error message if the transmitting system sends a document sends a document other than the one which was expected. Without an error message of this kind, the user of the transmitting system would assume "message sent", whereas in fact the contents off the message have never arrived at the receiving system, because it was not processed or because it has "stuck" in the receiving system' rotary data disc without being processed.

For further information on achieving direct communication between CAQ systems, see the VDA publication "VDA requirements for the transmission of QDX messages".

4.1 Project plan

The quality document "QDXProjectPlan" is used to exchange a single project plan bi-directionally between customer and supplier. The project plan covers information on tasks, actions, data, milestones (quality gates) and documents / results. The project plan is illustrated as hierarchical task / action planning "trees".
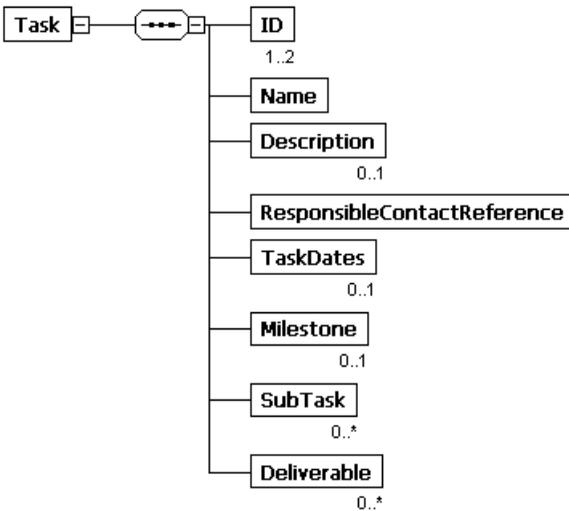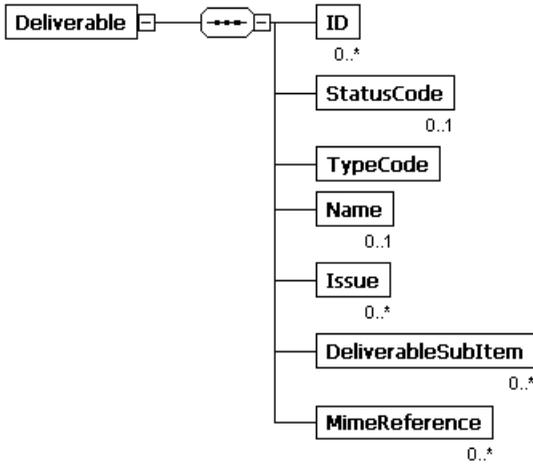
Fig. 8: Message details Project Plan

4.2 Status report

The quality document "QDXStatusReport" is used to exchange status information on a project, bi-directionally between customer and supplier. It contains a "to do" list (a list of outstanding items). The status is indicated on the "GYR" principle ("green-yellow-red-pending-not applicable").

The current status can be transmitted as a summary, individually for each part number contained in the report (product; item) and for each measurement indicator (*deliverable*) associated with the part number. In addition, if an assessment is shown as red or yellow, it is possible to transmit corrective actions (*issue, corrective action*).
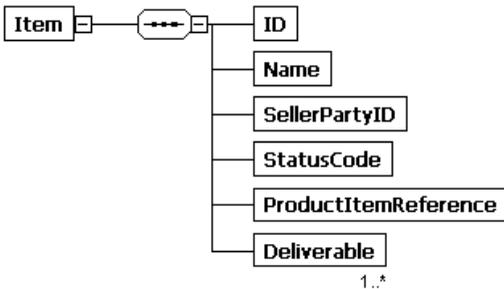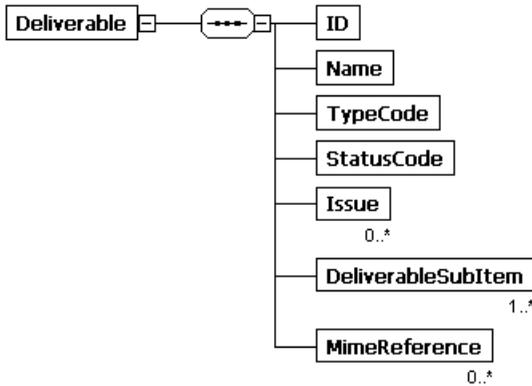
Fig. 9 and 10: Message details Status Report

Status codes

Table 2: Status Codes in Status Report

Green	All objectives achieved. No deviations from the plan (or none of any consequence).
NotApplicable	Not relevant. No assessment of achievement of requirements
Pending	Assessment not yet completed
Red	Objective is not achieved. Impossible to achieve requirements before SOP (start of production). No (further) corrective actions possible. "No Go".
Yellow	Substantial deviations from the plan. Objective not yet achieved. However, deviations have no negative effects on the progress of the project. Corrective actions are defined
YellowRed	Manageable deviations from the objective. It should be possible to correct the deviations before SOP (start of production). However, SOP / end of project / target end date are under threat. Correction required to the objective in order to meet the target end date (extent; costs; number of parts; …)

4.3 List of significant and critical product and process characteristics

The quality document "QDXSpecialProductAndProcessCharacteristics" is used to exchange significant and critical product and process characteristics bi-directionally between customer and supplier. As a general rule, the list is specified by the customer. The supplier can add items to the list.

The list of characteristics differentiates between quantitative and qualitative characteristics. The *SpecialArchivingIndicator* can be set for each characteristic – this is often referred to as a characteristic requiring special documentation (or a "D" item).
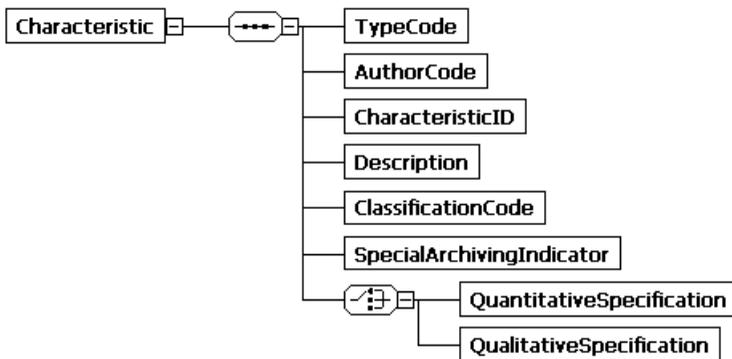
Fig. 11: Message details Special Characteristics

4.4 Evidence of capability of measurement systems

The quality document "MSA" (Measurement System Analysis / Study) is used to provide information regarding the evidence of capability of measurement systems. The document is sent from the supplier to the customer.

Information which is not to be allocated to a single characteristic can be stated in the *MIME-Element* immediately under the *MSA* element, which is why it appears at the top level here.
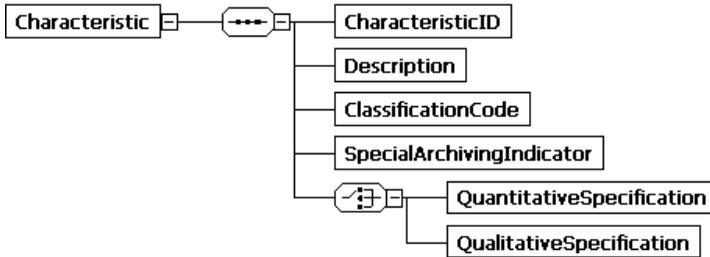
Fig. 12: Message details MSA

The *SpecialArchivingIndicator* can be set for the characteristic in question – this is often referred to as a characteristic requiring special documentation (or a "D" item). The characteristic for which evidence of capability is provided can be classified either as a quantitative or a qualitative characteristic.
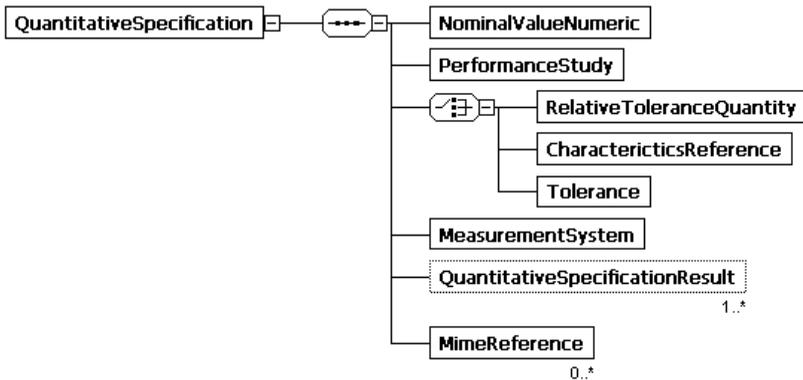

Fig. 13: Message details MSA

The precise identification of the procedure which is used to demonstrate capability is transmitted using the elements *PerformanceStudy* and *AttributeGaugeStudyCode*.

The transmission of individual measurement figures is not covered by the QDX framework. In the case of quantitative characteristics the result of the investigation is transmitted as a capability indicator. The minimum requirement regarding the capability indicator is also transmitted. However, there is no statement regarding logical further action in terms

of providing evidence of capability – that is, the receiving system must compare the minimum requirement against the actual figure to determine whether capability has been demonstrated or not.

For qualitative characteristics the result is transmitted in the form of *(True / False)* regarding achievement of the minimum requirements.

4.5   Machine performance study

The quality document "MCA" (Machine Performance Analysis / Study) is used to provide information on the machine performance study. The document is sent by the supplier to the customer.

Information which is not to be allocated to a single characteristic can be stated in the *MIME-Element* immediately under the *MCA* element, which is why it appears at the top level here.
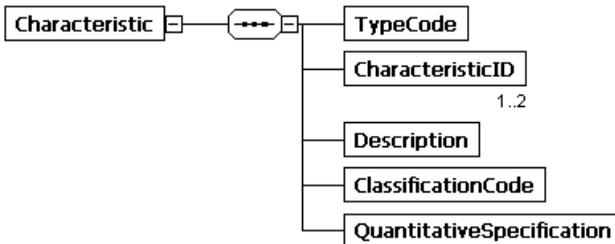

Fig. 14: Message details Machine Performance

The precise identification of the procedure which is used to demonstrate performance is transmitted in the element *PerformanceStudy*.

The transmission of individual measurement figures is not covered by the QDX framework. The result of the investigation is transmitted as a performance indicator. The minimum requirement regarding the performance indicator is also transmitted. However, there is no statement regarding logical further action in terms of providing evidence of performance – that is, the receiving system must compare the minimum requirement against the actual figure to determine whether the required performance has been demonstrated or not.

4.6   Process capability study

The quality document "PCA" (Process Capability Analysis / Study) is used to provide information regarding the process performance, resp. capability study. The document is sent by the supplier to the customer.

Any information which is not to be allocated to a single characteristic can be stated in the *MIME-Element* immediately under the *MCA* element, which is why it appears at the top level here.
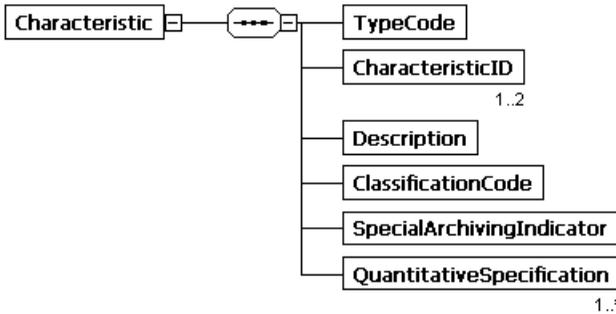
Fig. 15: Message details Process Capability

The precise identification of the procedure which is used to demonstrate performance, resp. capability is transmitted in the element *PerformanceStudy*.

The transmission of individual measurement figures is not covered by the QDX framework. The result of the investigation is transmitted as a performance, resp. capability indicator. The minimum requirement regarding the performance, resp. capability indicator is also transmitted. However, there is no statement regarding logical further action in terms of providing evidence of performance, resp. capability – that is, the receiving system must compare the minimum requirement against the actual figure to determine whether performance, resp. capability has been demonstrated or not.

4.7   QM system, process and product certificates

The quality document "Certificate" is used to transmit information regarding management system certificates and factory inspection certificates from the supplier to the customer.

```
QDXCertificate ─┤──(•••)─┤── Header
                           ── ManagementSystemCertificate
                                                      0..*
                           ── AnalysisCertificate
                                                0..*
```

```
ManagementSystemCertificate ─┤──(•••)─┤── ID
                                        ── StatusCode
                                        ── Scope
                                        ── StandardNameCode
                                        ── PublicationDateTime
                                        ── ValidStartDateTime
                                        ── ValidEndDateTime
                                        ── CertificateAuthority
                                                            1..*
                                        ── MimeReference
                                                      0..*
```
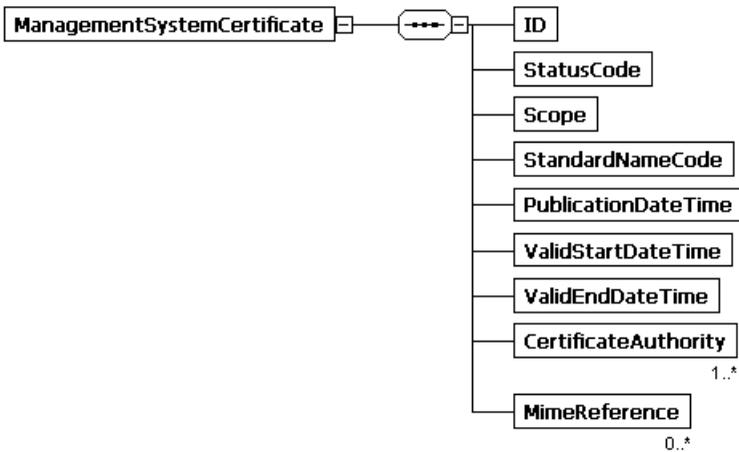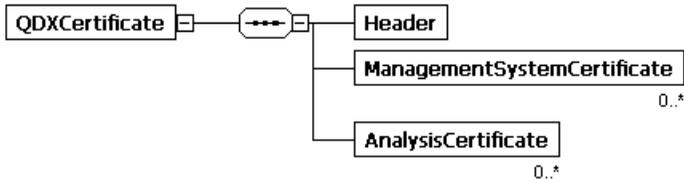
Fig. 16 and 17: Message details QMS Certificate

The element *ManagementSystemCertificate* is used to provide information on a management system certificate.

The standard / the requirements against which the certificate has been drawn up is stated in the element *StandardNameCode.*

The validity / scope and the period of validity can be clearly defined.

35
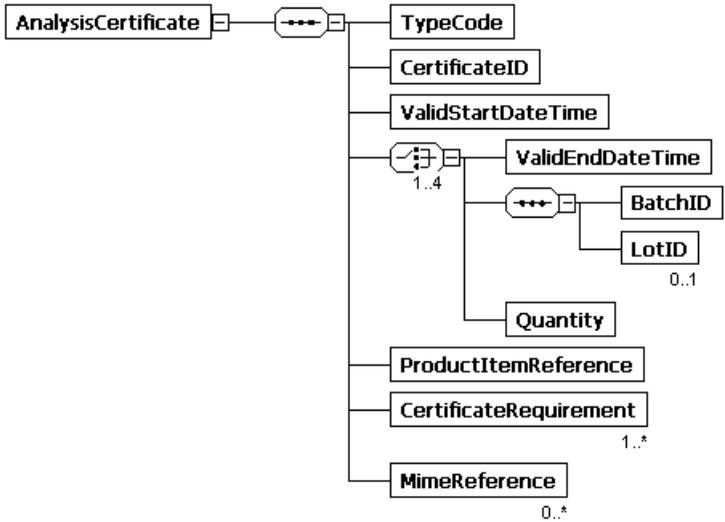
Fig. 18: Message details Analysis Certificate

Certificates covering process, product and materials can be specified via the element *TypeCode* to DIN EN 10204 and others.

As a general rule the certificates refer to concrete deliveries and can therefore be restricted in terms of their validity (period, batch number and quantity).

4.8   Interim or time-restricted approval

The quality document "InterimApproval" can be used as a temporary solution in the sense of a "time-restricted release" as long as a final release is not possible. The document is drawn up as a "request" and is sent by the supplier to the customer.

Note: Essentially, within the framework of the PPAP (production part approval process,) the document "InterimApproval" is based on the AIAG document "BULK MATERIAL INTERIM APPROVAL FORM" and the associated document of the NedCar Material Review Board (M.R.B.).
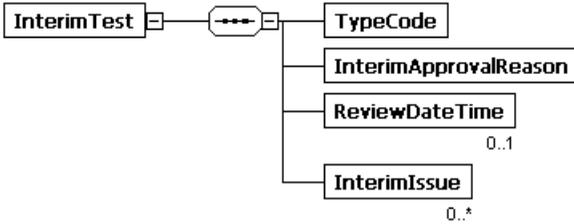
Fig. 19: Message details Interim/Time restricted Approval

4.9　Response to interim or time-restricted approval

The quality document "InterimApprovalResponse" is the answer to the document "InterimApproval" and is sent to the supplier by the customer.
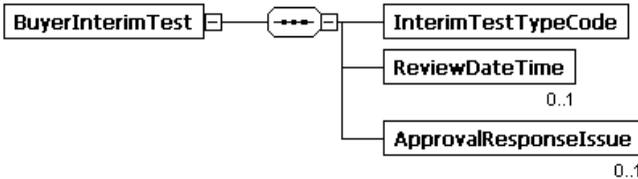
Fig. 20: Message details Response to Interim Approval

BuyerInterimTest is used to state information on the customer's own tests and checks for the time-restricted release. The customer's own checks and tests can also be an assessment by the customer of the checks and tests carried out by the supplier. The customer should respond to each check made by the supplier and list his own checks and tests.

4.10　Request from customer to supplier to start a PPA process

Some customers are stamping the drawings of supplied parts and send pre-defined PPA reports to the suppliers with already defined relevant characteristics. In the previous understanding of QDX usage the supplier has had to stamp the drawing by himself and he has to send the stamped drawing together with the corresponding report to the customer. With implementation of the QDX document "QDXProductItemSubmissionWarrantRequest" it is possible now to transfer customers' requirements with QDX as well.
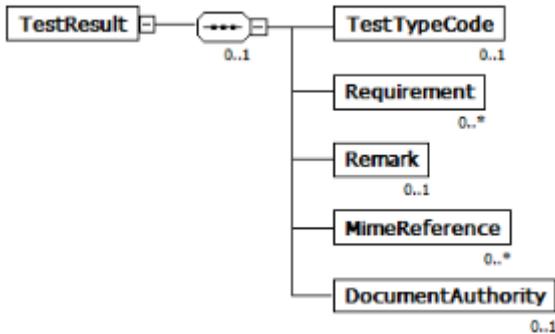
Fig. 21: Message details Request PPA Process

There are no mandatory data fields in this document for that reason. The customer has to specify which characteristics are relevant for him and which characteristics have to be documented in the report. Structure and content of this request is similar to the QDX document QDXProductItemSubmissionWarrant in principle.

4.11   PPA Agreement

According to VDA Volume 2, a coordination meeting must be carried out between the supplier and the customer for each PPA procedure. As part of this coordination, it must be agreed, among other things, which evidences have to be submitted to the customer later along with the PPA report.

The QDX document is based on the PPA form according to VDA 2.
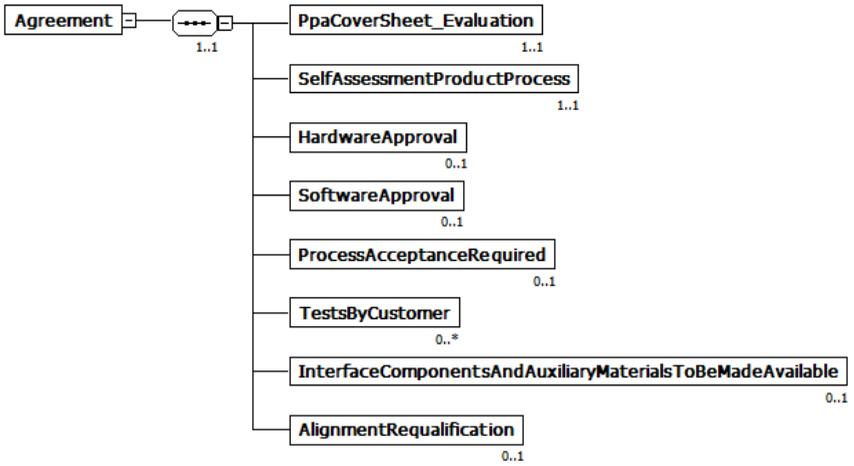
Fig. 22: Message details PPA Agreement
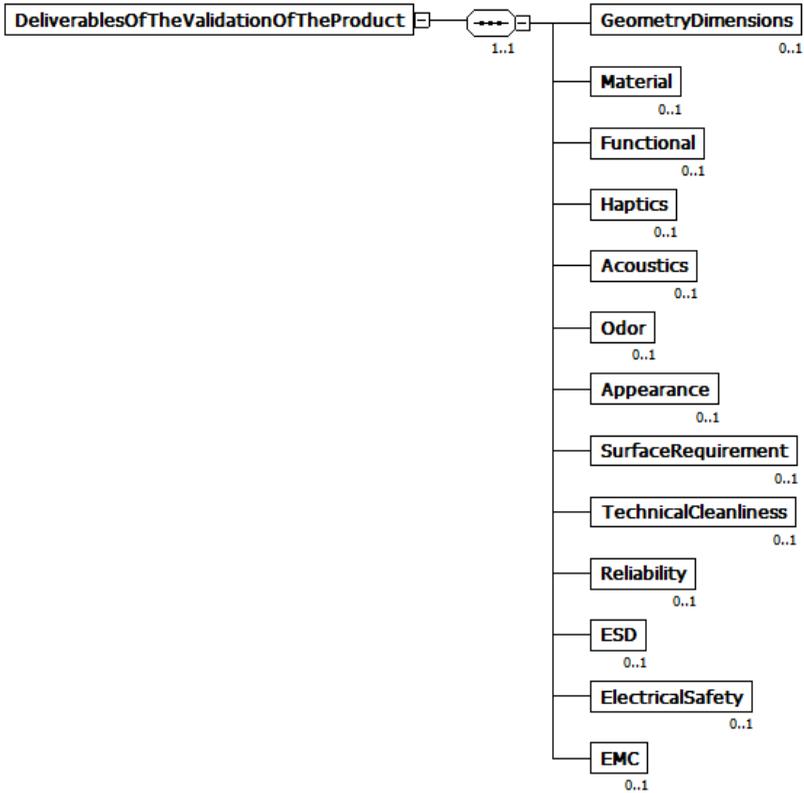
Fig. 23: Message details PPA Agreement

4.12 PPA report

Other names given to the quality document "ProductItemSubmissionWarrant" include "Production process & product approval" (PPA) or "Component submission confirmation". The document is sent by the supplier to the customer.

The QDX document is based on the PPA form as in VDA 2.

Requirements from PPAP (= Production Part Approval Process), as well as further requirements by customers and suppliers have also been incorporated, where these were known.
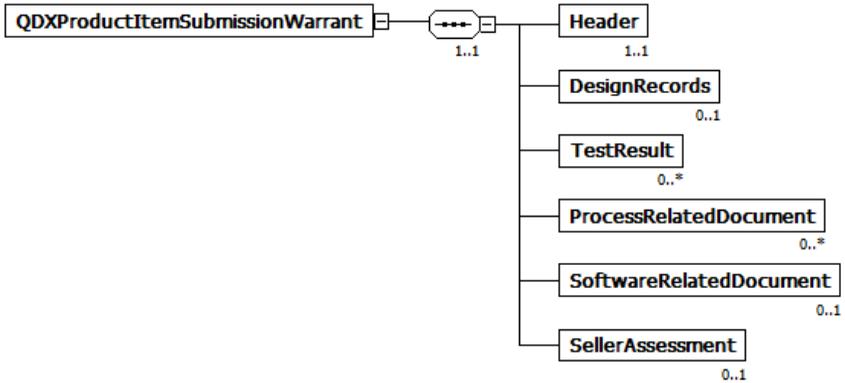
Fig. 24: Message details PPA Report

In addition to the actual test results, items such as the numbered drawing, specifications or the performance specification can be sent within the element *DesignRecords*.
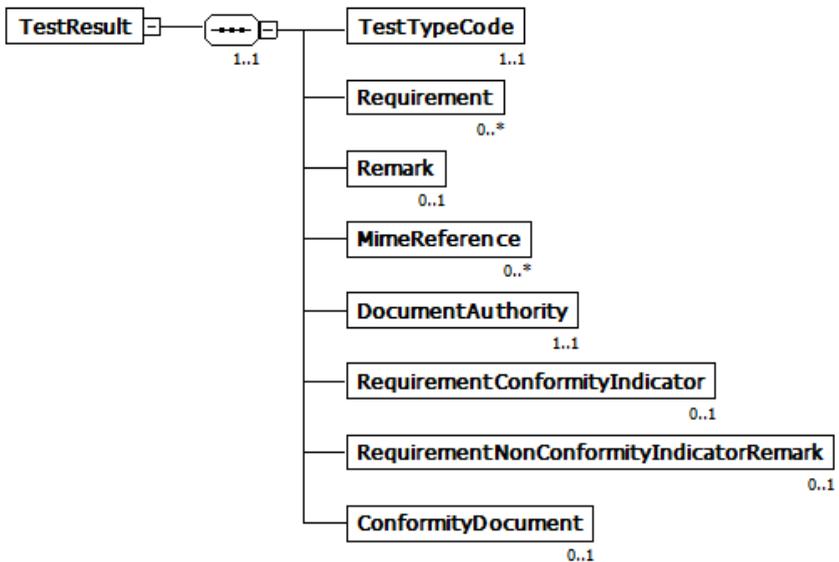
Fig. 25: Message details PPA Test Results

In addition to the evidences defined in VDA volume 2 regarding product and process-related tests, other company-specific items can be sent. The structure of these attachments is always the same: a specified value is compared with one or more actual value. For each characteristic the transmission must state whether the requirement is met.

In addition, the *TestFrequency* and the *TestedQuantity* can be transmitted for each characteristic.

4.13 PPA response
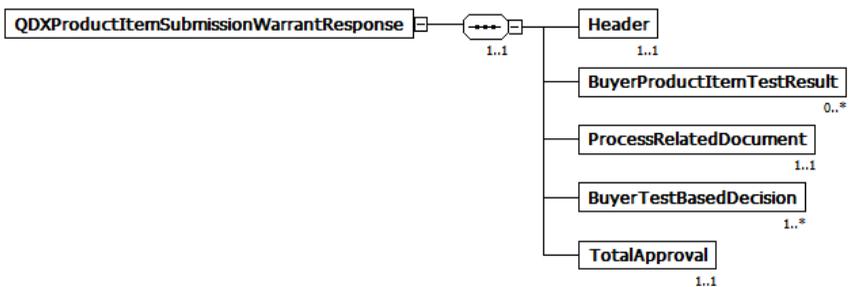
Fig. 26: Message details PPA Customer Feedback

In the quality document *Product Item Submission Warrant Response* a differentiation is made between the decisions regarding the individual tests (one attachment per test) and the overall decision (*Total Approval*).

VDA volume 2 allows only a "Pass" or "Fail".
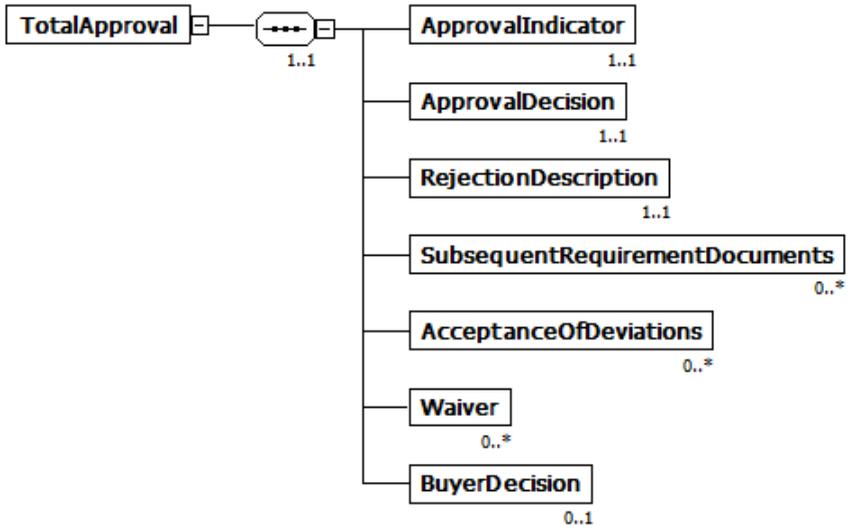
Fig. 27: Message details PPA Approval

In the *ApprovalIndicator* the first decision is also between "Pass" and "Fail". In addition, however, as a third alternative, a deviation approval (*Waiver*) can also be issued. This is normally restricted in terms of time and always requires a new sample submission to be made.

4.14 Complaints, rejects, failure reports, test/inspection report

The quality document "Complaint" is used to transmit information regarding complaints, from the customer to the supplier. The document is usually used both in the 0km phase (incoming goods) and in the after-sales phase (field failures). The supplier's response to a complaint is given at least with a short confirmation, but usually in form of an 8D report ("Report8D").
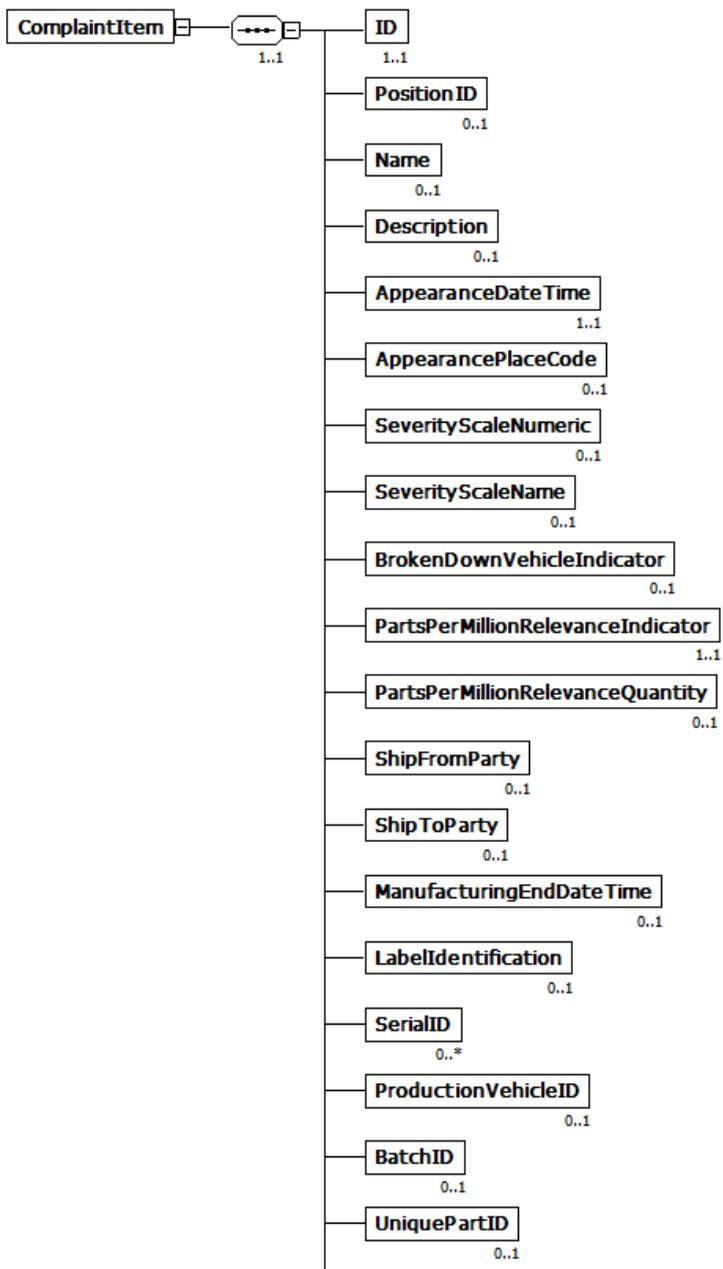
Fig. 28: Message details Complaint

In the data field *Name* the customer names the failure which has occurred and the symptom from his stand-point (for example, shock-absorber oiled up). The data field *Description* is used to state the concrete reason for the failure (for example, "sealing ring defective" or "sealing ring fitted incorrectly") – this is usually from the supplier's stand-point.

In the element *DecisionCode* the customer's decision regarding further action in respect of the defective parts can be transmitted:

Table 3: Decision Codes in Complaint

Other	Codes to be agreed by both parties
ProductItemAccepted	The item is accepted
RemoveByBuyer	The item is removed and installed by the customer
RepairByBuyerThirdPartyFault	Rework by the customer / fault lies with a third party
RepairedByForeignCompanyAtBuyer	Rework at the customer's premises by a third-party company
RepairedBySellerAtBuyer	Rework at the customer's premises by the supplier
ReturnedForRepair	Return to the supplier for rework
ReturnedToSeller	Return to the supplier
ScrappedyBuyer	To be scrapped by the customer
ScrappedBySeller	To be scrapped by the supplier or at the supplier's premises
SellingBack	Sell back to and debit the supplier

The *PreDefinedAction* and *GeneralAction* fields can be used to describe pre-defined actions (pre-defined in the sense that the customer defines the action). Because several actions might be defined for a *ComplaintItem*, an *ID* (*PredefinedAction/ID*) is allocated to each action. The *Description* (a description of the required action) must also be completed. In "Report8D" or in the "ShortConfirmation" it is possible to use *GeneralAction* as the relevant element (see these documents for further details).

The element *RequiredResponse* can be used to advise the supplier of what form of response is expected by the customer and when. This feedback can range from a simple acknowledgement of receipt ("ShortConfirmation") to the submission of a complete 8D report.
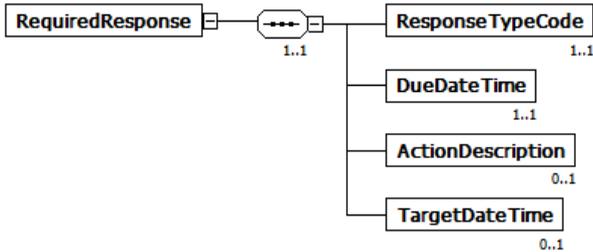

Fig. 29: Message details Required Response

The reasons for "versioning" of a "Complaint" (e.g., a repeat transmission of the document because the findings in the "Report8D" have been rejected) are advised to the supplier in the data field *ProcessingNote*. Because this is an optional field, the supplier must nevertheless ensure that this field is read out. Individual agreements between the parties are required for this.

The element *FieldFailureProperties* is used in particular to transmit specific information regarding field failures.

Fig. 30: Message details Field Failures

4.15   Basic confirmation of receipt of a complaint

The "ShortConfirmation" is used in order to advise that, in advance of the 8D report, actions have been introduced to eliminate or prevent quality deficiencies.

In certain processes the "ShortConfirmation" can be sent instead of the 8D report. However, this requires the agreement of both parties.
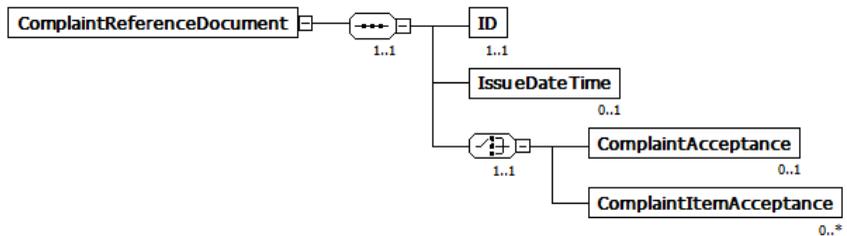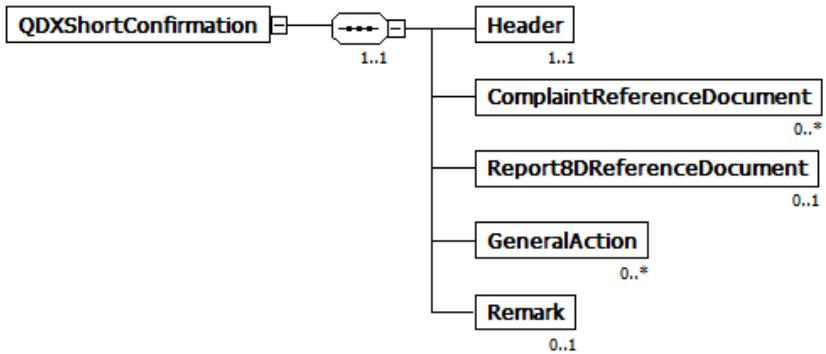
Fig. 31 und 32: Message details Short Confirmation

The element *ComplaintAcceptanceIndicator* states whether the complaint is accepted (true) or not (false) – this statement also recognizes the financial obligations which may be associated with the complaints.

For repeat failures the element *Report8DReferenceDocument* may be used to refer to 8D reports which have already been issued.

If the customer has specified an action, the supplier confirms that he is carrying out or has carried out the action. The supplier gives this action an *ID* (*GeneralAction/ID*) – he issues this ID himself. *GeneralAction / ExternalActionID* is then the reference for the action which the customer has demanded.

In addition, the supplier can report that he has taken further actions which the customer has not specified and which the supplier has nevertheless taken in order to restrict the failure. In this case there is no *ExternalActionID*.

4.16 8D report covering handling of a complaint

The term "8D" refers to the eight disciplines (tasks), which should ideally be carried out in order to cover the comprehensive processing of a complaint. The disciplines are often also referred to as "steps". In many organisations, individual steps are combined, so that instead of 8 there may be 7 or even 5 steps.

No matter how the method is referred to, the core activities always remain the same, namely:

1. Problem solving team
2. Description of the problem
3. Immediate containment action
4. Root cause analysis
5. Selection and verification of corrective action
6. Realization and validation of the corrective action
7. Avoid recurrence of errors
8. Conclusion and commendation of the team's success

The quality document Report 8D is used to transmit information regarding an 8D report from the supplier to the customer. An 8D report is the possible response to a complaint from the customer.

It is recommended that complaints from the customer should always be handled exclusively via the document "Complaint" in order to ensure the integrity of the information.
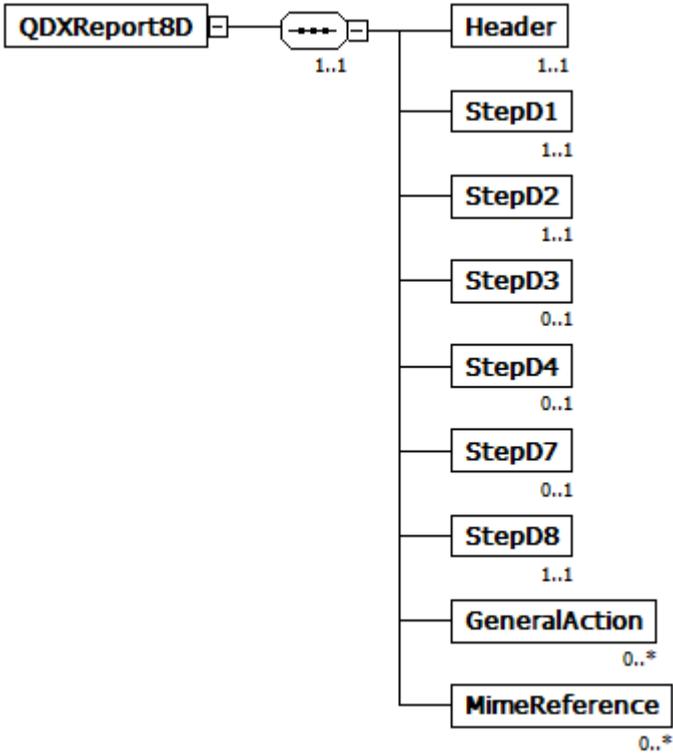
Fig. 33: Message details 8D Report

If the customer has specified an action, the supplier confirms that he is carrying out or has carried out the action. The supplier gives this action an *ID* (*GeneralAction/ID*) – he issues this ID himself. *GeneralAction / ExternalActionID* is then the reference for the action which the customer has demanded.

In addition, the supplier can report that he has taken further actions which the customer has not specified and which the supplier has nevertheless taken in order to restrict the failure. In this case there is no *ExternalActionID*.
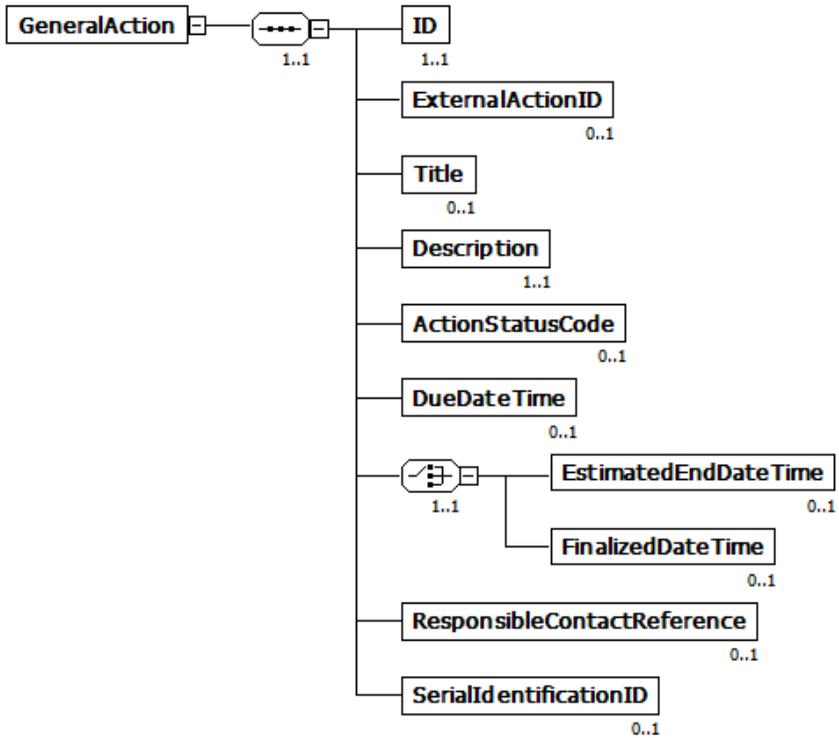
Fig. 34: Message details Specified Action, defined by customer

In QDX there is the provision for an 8D report to be exchanged between customer and supplier several times during its elaboration and completion. Because of this, it is not possible to define the individual steps as "must" elements.

Because an 8D report may be exchanged several times between customer and supplier, it is important for the transmitting system to define whether the complete document is being transmitted or only those elements where changes have been made since the previous transmission. Similarly, the receiving system must determine whether incoming QDX messages should over-write data field which are already filled, or whether the new information should be logged in redundant form.

Note: The contents of the individual steps (e.g., step 2, see above) go much further than the current VDA recommendations regarding 8D reports.

In order to realize the opportunity for exchanging the main root causes between Buyer and Seller party, each confirmed root cause has to be matched with the corresponding failure cause category. This information has to be transmitted by usage of the following data fields of D4:

Syntax

<FailurePreAnalysis>

<FailureCauseCode>1w3x5y7z9</**FailureCauseCode>** – Failure Cause Categories; nine-digit; alphanumeric;

<FailureCauseDescription>1.0</ **FailureCauseDescription >** – Version Failure Cause Categories

</FailurePreAnalysis >

The defined failure cause categories and a guideline regarding motivation and usage of these categories is available under the following URL:

http://vda-qmc.de/en/publications/download/

4.17   Field failures

The quality document "WarrantyData" is used to transmit information regarding field failures from the customer to the supplier.
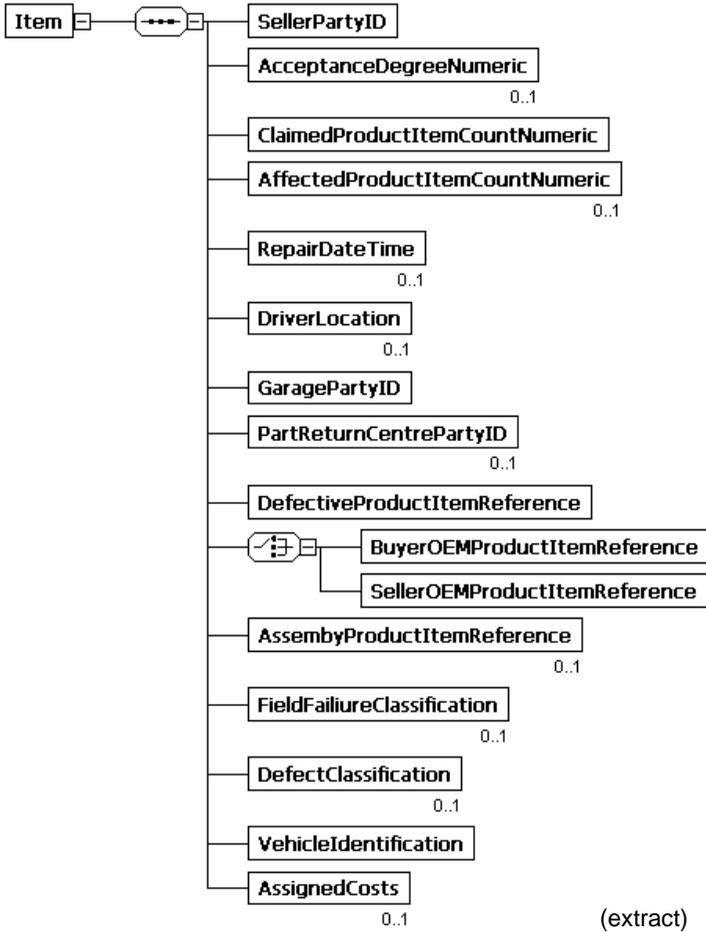
Fig. 35: Message details Field Failures

Note: In practice, OEMs instruct suppliers regarding the processes to be followed. Even so, the data and information from customers must be collated at a central point by suppliers, so that common features can be detected and appropriate conclusions drawn regarding suitable corrective actions.

Except for the absolutely essential elements, therefore, most elements have been defined as optional. In this way a high degree of flexibility is achieved; however, in comparison with the other QDX documents, a more intensive agreement between the two commercial partners is required regarding the exchange of data.

4.18   Advanced Processing

"Advanced processing" is – figuratively spoken – inserted once with the QDX document actually to be transmitted into the "QDXEnvelope" and transmitted together with it. The receiving system receives the information via "AdvancedProcessing" which individual agreement regarding the mandatory fields the actual QDX document follows or corresponds to. This means that when the data is read in, it can be verified on a partner-specific basis whether the mandatory fields, expected by the recipient, are filled or not. If individually agreed mandatory fields are missing, the sent document will be rejected and not processed further.
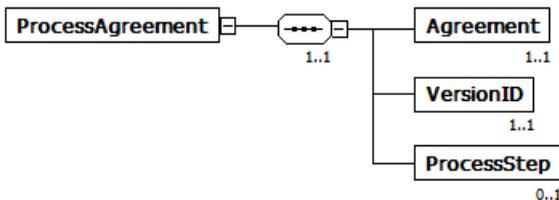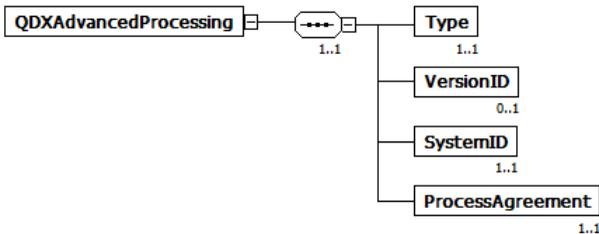

Fig. 36 and 37: Message details for Advanced Processing of the data in the receiving system

In each QDX document, reference is made to this agreement under *ControlInformation*. So the QDX document "AdvancedProcessing" does not have to be retransmitted every time the QDX data file is transmitted.

Here is an example for the 8D report:
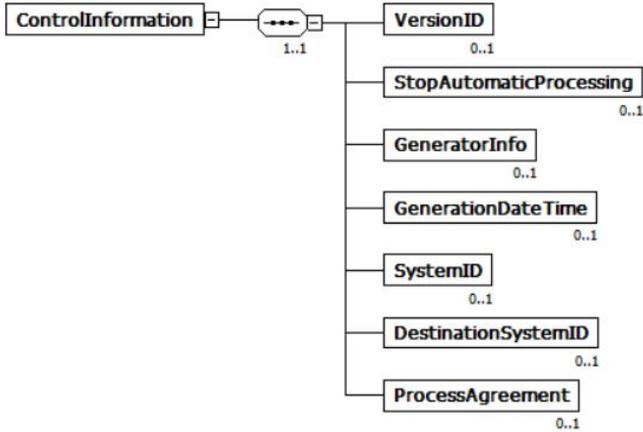
Fig. 38 and 39: Message details in the actual QDX document for referencing to agreements made outside of QDX

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