APIS IQ-Software

Summary Functions for FMEA quality review

Content:

Introduction

This document focuses on the "quality review" of an FME file or FMEA. It demonstrates how individually configurable text templates and individually definable assistant rules may considerably facilitate many work steps in the field of analysis.

Further goals are to inform the APIS IQ Software adepts sufficiently, so that they are able to work with text templates, placeholders, and assistant rules in other use cases as well.

We do not address the available possibilities and the operation in detail with regard to some of the topics. In those cases, we simply assume that the reader already knows these things, may learn them from the integrated help assistant or gain this knowledge in a training course.

If you have any questions or ideas regarding the available functions, please do not hesitate to contact the APIS team at any time. For this purpose, we may also kindly refer to the APIs forum, where we will be happy to discuss matters with you and answer your questions on the topics dealt with in this document (see: http://www.apis.de/forum).

Your APIS team

BTW *Some of the images show content in German. If there are any questions please get in touch with us.*

Notes

For many object types in an FME file, the option is provided to record a note. Depending on the editor and the display option, a hot-click icon or the content of the note is displayed.
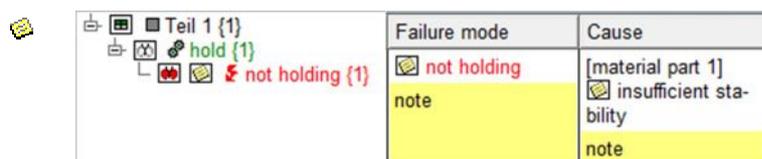
Figure: Notes icon and note in various editors

We are not going into detail of the recording of note contents, the translatability of notes, and the display options. For the necessary information, please refer to the integrated help assistant.

Keywords of the "notes" issue that are often ignored:

- Insert and, if applicable, embed graphics or external documents
- Workstation settings (copy note, maximum size of a graphic, global reference path)
- Send as email
- Notes categories
- Link (bookmark)
- Paragraph formatting
- Insert horizontal lines
- Sticky Notes

Tip: The notes list gives the best overview of the available notes (menu: Administration – Notes list).

Besides the typical note attributes, e.g. notes with objects, there are more areas in the IQ Software, which have identical options for contents, i.e. you can use another font for parts of the text and you can integrate graphics or use links as well. This works for cover sheets, e.g. the cover sheet of the FMEA form, or the Personal Information Manager (PIM). In this chapter, however, we are simply going to talk about notes for convenience.

HTML-like text

Information is recorded often in text form, e.g. the names of system elements, functions, failures etc. are text "only". You can change the font type, style, and size in the workstation settings or the print dialog for all these texts.

If you want to show parts of a text e.g. in another style, then this is possible only for those parts in the IQ Software where HTML-like text can be recorded, e.g. in notes. Entering HTML-like text is possible in other places as well, e.g. in forms and in the Personal Information Manager (PIM).

HTML (Hypertext Markup Language) uses text markups and is the basis of information in the World Wide Web (www or the internet). HTML and all of its variants is very complex and constantly evolving.

In the APIS IQ Software, a subset including the required functions has been implemented for some areas. The user can choose between several paragraph formats and can change the font size, type, and other parameters. The option to insert bookmarks and illustrations is available as well.

However, as not all of the HTML functions have been implemented, we are going to refer to "HTML-like text" in the following, when talking about text including changing font types or integrated illustrations.
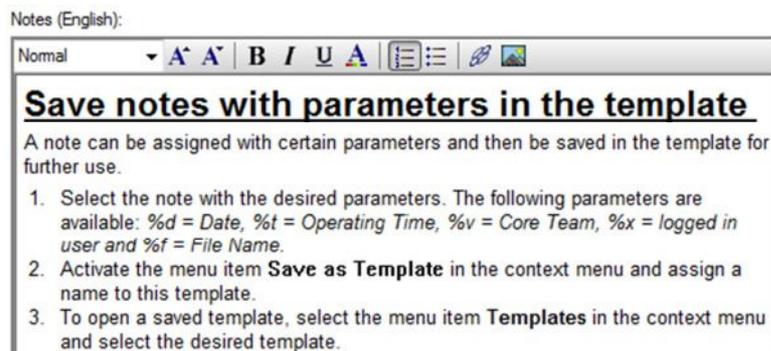

Figure: Example of a note with markup

Text templates

If you need to record frequently the same or similar text in those areas, where HTML-like text is possible, you can work with text templates.

Any of the already available notes can be saved as "text template", assigning an arbitrary name. Open a text template via the context menu in those places, where HTML-like text can be recorded.

Illustrations and placeholders can be integrated in text templates as well. Examples of placeholders:

%d = date
%t = time
%v = team
%x = logged-in user
%f = file name

The placeholder will be replaced as soon as a text template is inserted. The applied placeholder remains stored in the background though. A colored background marks this part.

If you want e.g. to record information on complaints in a structured form, then it is advisable to create a text template.
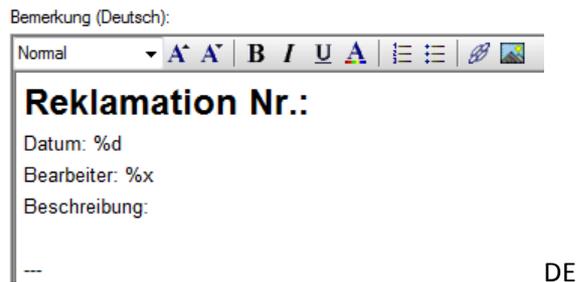

Figure: Text template to record complaints

If this text template is used for several complaints respectively, then the history of complaints is documented e.g. in the notes field.
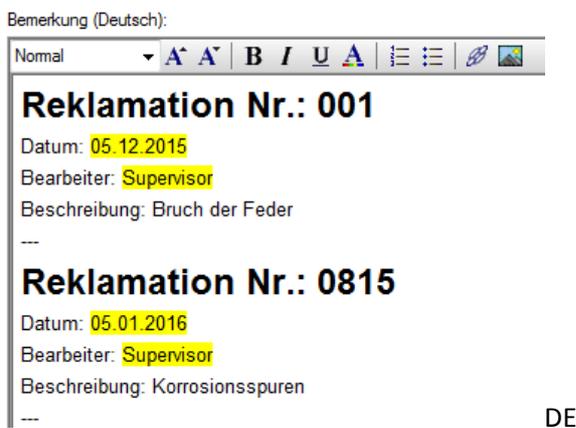
Figure: Text in a note based on the multiple use of a text template

It is possible to update the content of the placeholders later, e.g. via the context menu item "Update placeholder" or the function key F9.

Attention: All placeholders in a note are updated, irrespective of the selection!

If you do not want to lose important, historical information, then you need to convert the text inserted via placeholder into static text (context menu item "Convert placeholder into static text" or Shift+Ctrl+F9).

Figure: Text in a note, where the placeholder information was converted into static text

The editable preview of a text template

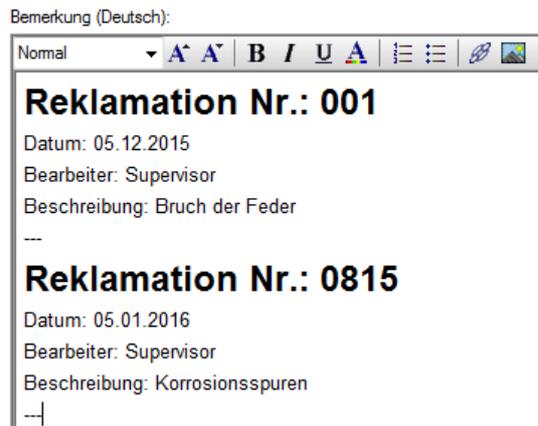To know the possible placeholders in text templates and to insert them correctly is not always trivial. You can avoid the trial and error approach by using the editable preview of already stored text templates, where you can select any kind of placeholder.

Work sequence:

1. Enter any kind of text in a note.
2. Save this text as text template via the context menu, assigning the required name.
3. Open the administration of text templates (context menu: Text templates – Administration…) and open the preview.
4. Edit the content of the text template, e.g. insert placeholders.

This method simplifies the insertion of placeholders. Besides simple placeholders like e.g. %d, there are placeholders that are associated with filters or assistant rules.
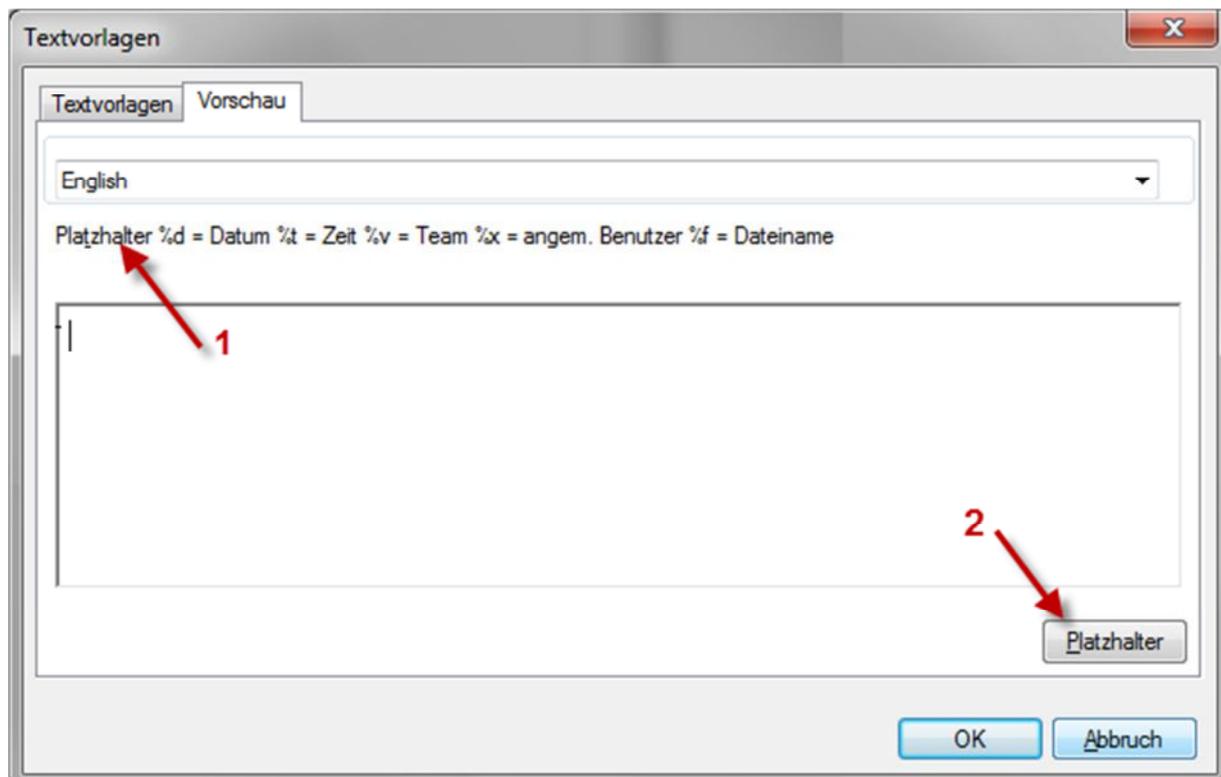
DE

Figure: Preview of text template (1 = simple placeholders, 2 = placeholders that can be used in the Summary Function area, e.g. assistant rules)

Placeholders that are associated with assistant rules or filters show a number instead of the placeholder when they are used. This number represents the number of occurrences, e.g. the number of violations of an assistant rule.

This results e.g. in the following entries:

- Change the name generated by the system: 0
- Introduce system elements to next level: 1
- Agree functions for the system elements: 1

For the predefined assistant rules, refer to the assistant rules administration dialog (menu: "Administration – Assistant rules"). The following paragraph explains how to add your own rules to the predefined assistant rules. This makes it possible to create any kind of analysis of available contents in an FME file, if the goal is to determine the number of occurrences.

Example of a simple analysis:

Number of uncompleted actions:
- Responsible persons from department ETD: 22
- Responsible persons from department ETS: 8
- Responsible persons from other departments: 12

Figure: Example of own analysis

Assistant rules

Assistant rules are used to check objects. If necessary, the user is notified that an object does not comply with the rule in one or more points.

They may be simple rules, e.g. "Each effect in the FMEA needs a rating number for the severity". If there is no entry for the object attribute "severity" for one of the effects, then the object does not comply with the rule, i.e. the rule is violated.

If an organization defines that only a few of the severity rating numbers are admissible, then you can create a rule, according to which all objects with inadmissible rating numbers are marked as noncompliant with the rule.

System rules and filter-based rules

Defining your own rules leads to the greatest possible flexibility. Such rules are always based on filters. Besides rules based on filters, there are other rules which are preprogrammed and included in the software as delivered, the so-called system rules.

Note: Some of the system rules can be created using filters. System rules are partially parameterizable.

Assistant based on assistant rules

If the assistant is activated, hot-click icons are shown with those objects that do not yet comply with the rule.

The integrated assistant helps to reach three goals:

1. Support during data recording
2. Verification of data in an editor
3. Quality review according to selected rules, i.e. counting violations of rules.

Before we address the issue of quality reviews, we want to deal with the other two possibilities, in terms of "prevention is better than detection".

Support during data entry

The prerequisite for the step-by-step support is that the assistant is activated already when data are entered. A suitable suggestion or recommendation is then made directly for each newly created object based on predefined assistant rules.

Double-clicking on the assistant icon opens the properties dialog of the object including the related detailed information in the "assistant" section. The assistant rules, in short rules, always refer to the properties of an object or of the information linked to the object.
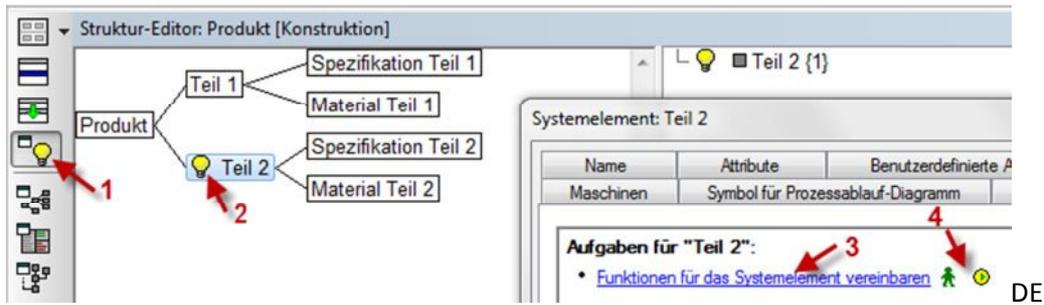
Figure: System element, for which functions are lacking (1 = display option assistant, 2 = hot-click-icon, 3 = action name and button to activate, 4 = hot-click icons for local and global deactivation)

For the experienced user, the suggestions are often rather trivial and part of the standard knowledge of every expert in methodology. In the simplest case, the experienced user can deactivate all the suggestions globally that are unnecessary from his/her point of view. It is more reasonable though to create a separate category of rules, to assign the relevant rules to this category and to activate the category of rules.

Verification of data in an editor

If you want to verify that the contents of an FME file meet all the demands resulting e.g. from a specific FMEA method description or from customer specifications, support is required for this challenging and troublesome task.

The integrated assistant rules facilitate the verification of a dataset shown in an editor. Objects with a violation of rules displayed are searched for.
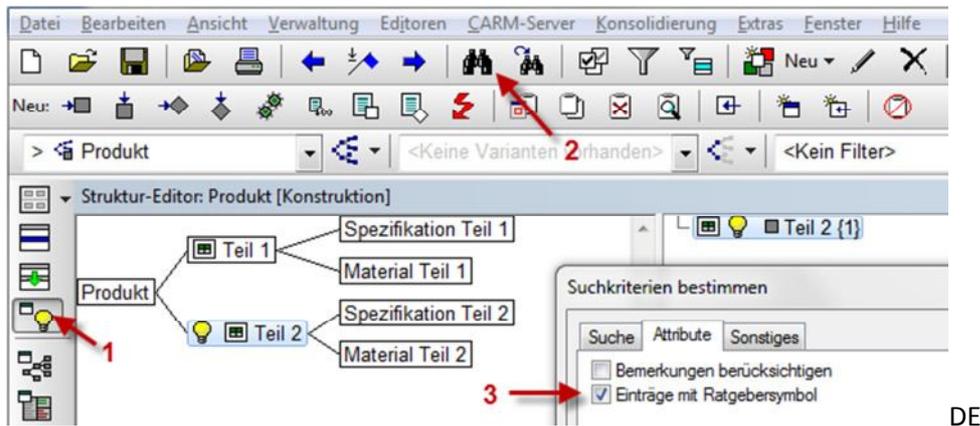

Figure: Search for objects with assistant icon (1 = assistant display option, 2 = Search…, 3 = Search criterion)

The search for objects that violate a rule is helpful in particular with regard to datasets that are more comprehensive. In FMEA forms with many pages, critical issues are otherwise easily overlooked.

Note: The search shows only occurrences in the currently active editor considering the display options. The results list of the IQ Explorer presented in the following shows all occurrences within the analyzed section, if applicable the entire FME file or several FME files.

Quality review according to rules

A quality review may have the goal of getting a list including specific violations of rules or it is interested only in the number of violations of rules.

You can search and find specific occurrences and include them in the results list using the IQ Explorer. You can use the results list as required, e.g. to synchronize or in the form of an exported file.
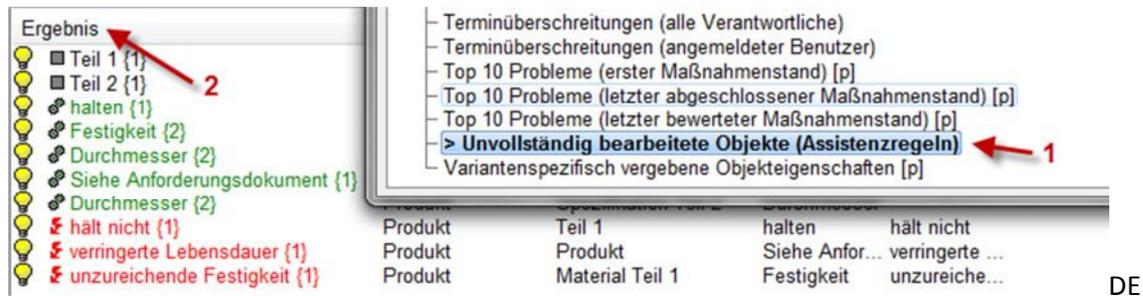

DE

Figure: Search for incompletely edited objects (1 = system-defined filter, 2 = results list)

Summary Function

If not the specific object is of interest, but e.g. the number of violations of rules is to be documented for a project status, then this number can be determined and documented by means of a suitable placeholder in a note template.

DE

Figure: Text template with placeholders

DE
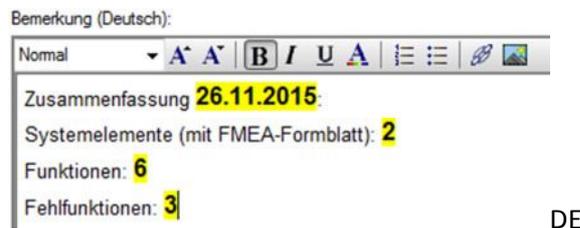
Figure: Note contents via text template

You can select the available placeholders from the related dialog and you can update the information shown via placeholders or convert it into static text later. These details will be explained elsewhere.

Filters as assistant rules

As already mentioned, there are assistant rules that are preprogrammed. They can include filter criteria that cannot be created by the user him-/herself via the filter dialog. They are therefore

system-defined rules (system rules). System rules are supplied with the IQ Software. In addition, there is the flexible concept of rules based on filters created by the user him-/herself.

The shared property of all assistant rules is that they incorporate filters of a special kind. Entries are made for those objects that comply with the filter criteria.

It depends on the goal, whether a rule is devised with the summarized information in mind or whether it is about the identification of objects, for which "there is still something to do". In general, every rule can be used for both goals.

Regel	Betroffene Objekte	Deaktivierte Objekte	Globale Aktivierung /	Parameter	Erklärung	Regelkategorien
💡 Die E-Note (Entdeckungswahrscheinlichkeit) für die Maßnahme definieren	Enteckungsmaßnahmen		✓		Für Entdeckungsmaßnahmen muss die Wirksamkeit in Form der E-Bewertung (eine Zahl zwischen 1 und 10) angegeben werden. Diese Bewertung geht in die Berechnung der RPZ ein.	

DE

Figure: Extract from the administration dialog of assistant rules: Define the D rating (probability of detection) for the action

Compliant dataset

The user of the IQ Software should remain untroubled by limitations encumbering his/her work, as this is the only way to work efficiently. This approach has been tried and tested particularly with regard to teamwork.

The user should additionally be able to recognize easily whether he/she still works in compliance with the rules so that he/she eliminates violations, if necessary, or documents that such violations are to be ignored (temporarily).

As a FMEA involves different processing phases, it is required to group the rules to be applied appropriately. According to VDA, a FMEA is subdivided into several phases, which are known as the five steps of FMEA (structuring, function analysis, fault analysis, risk assessment, and optimization).

In the function analysis (step 2) for instance, you do not need to consider yet the completeness of the risk assessment (step 4), i.e. violations of rules related to the later work phase are not focused on yet.

Options in case of a violation of rules

The user of the IQ Software has the following possibilities after the violation of a rule has been detected for an object:
1. The rule shall not be used in the current work phase. Either you deactivate the assistant rule globally or you activate a rule category, which does not contain the assistant rule. The latter is the recommended proceeding.
2. The rule does not apply to one specific or several selected objects, i.e. it is noted for the object or in the assistant rule that this should be excluded from the verification. The assistant rule lists the deactivated objects.

3. The action is taken to eliminate the violation of the rule.

Delivery status

After having installed the IQ Software, the user can access the assistant rules supplied with the software in the rule category "System rules". If no adjustments were made, then they are considered when you activate the display option "Show assistant icons".
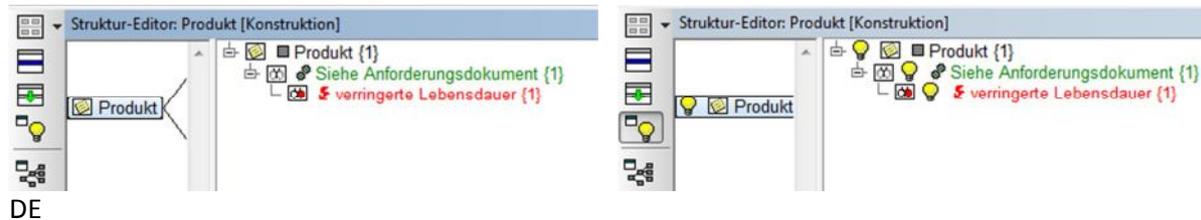

DE

Figure: Toggle icon "Show assistant icons" active/inactive

We want to demonstrate by means of the following examples that there are relatively simple rules (example 1) and complex rules (example 2).

Example 1

(Assistant) rule:	**Define the responsibility**
Affected objects:	Actions or requirements
Parameters:	-
Explanation:	You must define a responsible person. You can select responsible persons specifically in the Deadline Editor and send an e-mail to the responsible person, if necessary.

Example 2

(Assistant) rule:	**Define severity (S rating) for the effect**
Affected objects:	Failures
Parameters:	Failure requires causes: Yes; Assess only, if no cause has been assessed: Yes; minimum depth of cause chain: 2; take minimum depth of causes into account: No
Explanation:	The severity of effects needs to be specified as a number between 1 and 10. This number is incorporated in the calculation of the risk priority number (RPN) of the assigned causes.

The basis of assistant rules are filters, in which the parameters as described above are incorporated. The user may change the parameters or define his/her own additional assistant rules.

Assistant rules and rule categories

Assistant rules (system rules) are saved in the file AssistantRules65.ICE.

The assistant rules are administrated in the Data Manager (menu: Administration – Assistant rules). To get an overview, it is reasonable to group the assistant rules so that only the names of the rules are shown at first.

Figure: Assistant rules grouped by rules

You can see in the administration dialog that a symbol is associated to the rule. This symbol is shown with the affected objects when the display option is activated accordingly and if the rule is globally activated in the active rule category and has not been deactivated for the shown object.

The following columns are available in the administration dialog:

Rule

The name is the information visible to the user in the assistant dialog, when he/she e.g. clicks the hot-click icon. When you want to change the name, you need to take into account that the Summary Function uses the name as a parameter, i.e. you need to apply the changes there as well, if necessary.

For non-parameterizable rules that are not based on filters, you cannot open the properties dialog. Apart from that, opening the properties dialog e.g. by means of Alt+Enter for:
- Parameterizable system rules: opens the dialog to enter the parameters
- System rules based on filters: shows the filters (not editable)
- User-defined rules (based on filters): opens the filter dialog.

Affected objects

If the grouping is done by "affected objects", then you can see which objects are regarded as affected.

Betroffene Objekte: Alle Objekte, die verändert werden können (20 Einträge)
Betroffene Objekte: Anforderungen (Merkmale) (3 Einträge)
Betroffene Objekte: Elemente eines Funktions- oder Fehlernetzes (2 Einträge)
Betroffene Objekte: Enteckungsmaßnahmen (1 Eintrag)
Betroffene Objekte: Fehlfunktionen (11 Einträge)
Betroffene Objekte: Funktionen (2 Einträge)
Betroffene Objekte: Funktionen oder Anforderungen (Merkmale) (2 Einträge)
Betroffene Objekte: Maßahmen (1 Eintrag)
Betroffene Objekte: Maßnahmen oder Anforderungen (5 Einträge)
Betroffene Objekte: Objekte, deren Bezeichnung vom Anwender festgelegt werden kann (3 Einträge)
Betroffene Objekte: Prozesselement (1 Eintrag)
Betroffene Objekte: System- oder Prozesselemente (5 Einträge)
Betroffene Objekte: Vermeidungsmaßnahmen (1 Eintrag) DE

Figure: List of possibly affected objects and number of rules used to check the object type

Deactivated objects

This column documents, which objects the user excludes from the examination. Excluding objects is possible by means of an icon, if the corresponding violation of a rule is detected for the object.

Figure: Assistant dialog with hot-click icons to exclude an object from a rule (1 = object is included in the rule check, 2= symbols that the object is not included in the rule check).

Global activation

Shows whether a rule is globally active for all rule categories or not.

Figure: Assistant dialog with hot-click icons for global deactivation of a rule (1 = rule is active, 2= rule is not active).

Note: With respect to the result, the global deactivation corresponds to the deletion of a rule.

Explanation

Many of the rules are provided with an explanatory text. If the user creates his/her own rules, it is reasonable to write an explanatory text. Please note that the user can create only rules based on filters and that the explanation is assigned to the filter.

The explanation for user-defined rules can therefore not be edited directly with good cause, but must be recorded via the following procedure:
1. Open the properties dialog of the rule, i.e. open the filter dialog.
2. Open the properties dialog of the filter.
3. Devise the required explanation for the rule in the Note section.

Rule categories

Rules can be assigned to one or more rule categories. One of the rule categories respectively is always active. The active rule category is prefixed by ">".

Rule category, global deactivation, and deactivated objects

Users who are familiar with filters can consider the rule category a kind of a named filter for the available rules. If no rule category is active, then all the rules are available, i.e. all rules are applied to all the affected objects.

If a rule category is set to active, then only the rules included in this category are applied to check the affected objects, and those rules, which are not assigned to any rule category.

Note: When you work with rule categories, make sure that every rule is assigned to at least one rule category.

The software as supplied contains a great number of rules. They are from various subject areas, e.g. FMEA and Functional Safety. Upon the first activation of the rule check, the will probably face violations of rules and the associated rules, which are not relevant to him/her.

The user has two simple options to eliminate displayed violations of rules:
1. The rule is deactivated globally.
2. A specific object is excluded from the rule check.

Corresponding icons are available for both options:

Figure: Assistant dialog with hot-click icons (1 = symbols that the object is not included in the rule check, 2= rule is not active, i.e. globally deactivated).

Upon global deactivation of a rule, the set of available rules does not include this rule anymore and this rule is set to inactive in all (!) rule categories. Upon exclusion of an object from the rule check, the object is included in a list of objects not to be checked, i.e. it is made sure in all rule categories not to apply the rule to check the object.

Tip: It is not required to deactivate a rule globally, when you work with rule categories. Because of the greater flexibility, it is anyway recommended to assign rules to rule categories and activate them respectively.

Perform the following steps:
1. Create one or more rule categories.
2. Assign the rules to the required rule categories.
3. Activate the rule category.

Assistant icon

The assistant icon is shown whenever the corresponding display option is active. In contrast to the editors display options, this refers to a display options from the objects point of view according to the motto "the object violates one or more rules".

Detecting the violation of a rule is always irrespective of the currently selected display option. For the reason, there is the corresponding menu item "Assistant – Show assistant icon". Alternatively, you can use the corresponding toggle icon in the editor toolbar.

The assistant icon is part of the group of hot-click icons. Double-clicking directly opens a dialog, which lists all the violations of rules for the specific object.
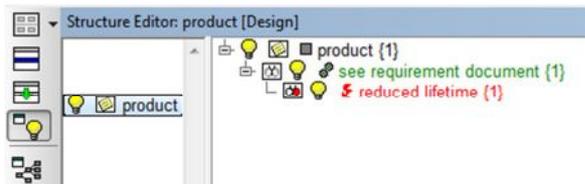

Figure: Structure Editor with shown assistant icons

If you want to check in the active workspace, whether violations of rules are available for the shown objects, you can apply the simple search for that purpose, which contains the option "Entries with assistant icon". If this option is active, the search goes to the respectively next object violating a rule.
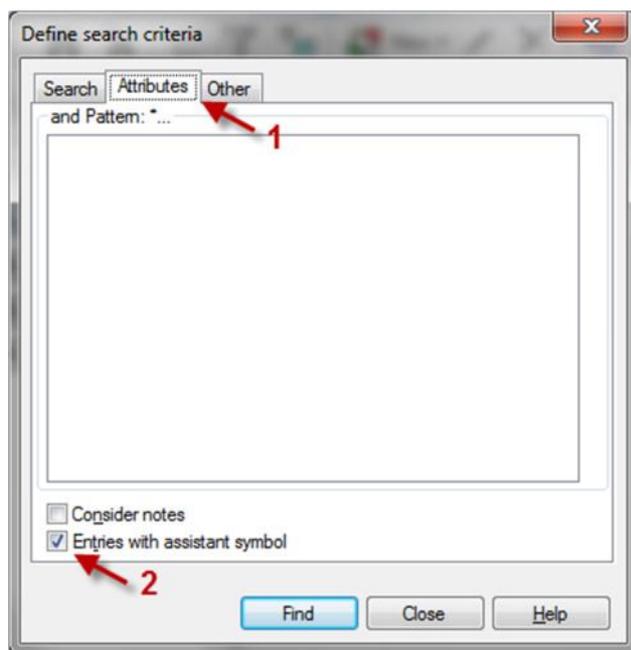

Figure: Search applying simple search criteria, e.g. per Ctrl+F or menu: Edit – Search… (1 = attribute selection, 2 = search criterion assistant icon)

Alternatively, you can use the IQ Explorer, which contains a system filter "Incompletely edited objects (assistant rules)", which considers the active rule category

Quality report and Summary Function

If you apply dozens of rules to thousands of objects in a FMEA, a summarizing representation of results is reasonable, e.g. the number of violations of rules is to be counted in the following manner:

- Number of uncompleted actions: 197
- Number of actions with overdue deadline: 17

This type of summation of the number of violations of rules is called Summary Function. If you want to use a Summary Function in a template, you have to adhere to the following syntax:

%rule(<Name of assistant rule>)%.

In the example above, there are altogether 197 violations for one rule and 17 violations for the other.

Besides the assistant rules, you can use the filters known from the IQ Explorer in a Summary Function. The syntax then is as follows:

%sfil(<Name of filter>)%

Note: The available filters are stored in the administration directory in the file filters65.ice.

If you do not want to check the entire FME file for violations of rules, then you can define the basis of the counting procedure by means of one or more entries. You can choose between project, structure, and the container documents (FMEA form, Process Flow Diagram, Control Plan). The syntax for this is:

%base(<Name of project|Structure|
FMEA form|Process flow diagram|Control Plan>)%

Attention: Before the Summary Function determines the numerical value, all (!) %base entries in the text template are added up. It is therefore reasonable to put all %base entries always in the beginning of a text template. One might otherwise assume that the dataset in a text template can be changed, which is not the case!

Assisted input for %base, %rule, %sfil

It is much easier to make use of the assistance to enter the dataset and the rule or the filter respectively, which is provided by the IQ Software. Open the assistance via the administration dialog for text templates (see chapter "The editable preview of a text template"), where you can access the three main sections.
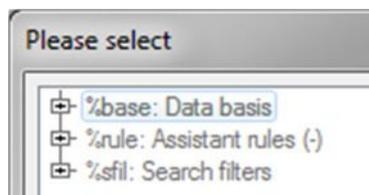

Please select
- %base: Data basis
- %rule: Assistant rules (-)
- %sfil: Search filters

Figure: Assisted input for database, assistant rules, and search filter

Application of Summary Function

It is reasonable to check at first, whether the required numerical values can be determined by means of one of the predefined system rules. If this is not the case, you need to define your own rule.

In our example, the following required system rules are already available:

- "Complete editing of this object" searches for uncompleted actions
- "Complete editing as soon as possible because of overdue deadline" searches for all actions with overdue deadlines
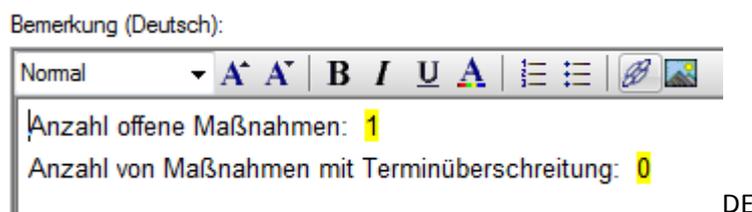
Thus, you can use the template as shown in the following figure.
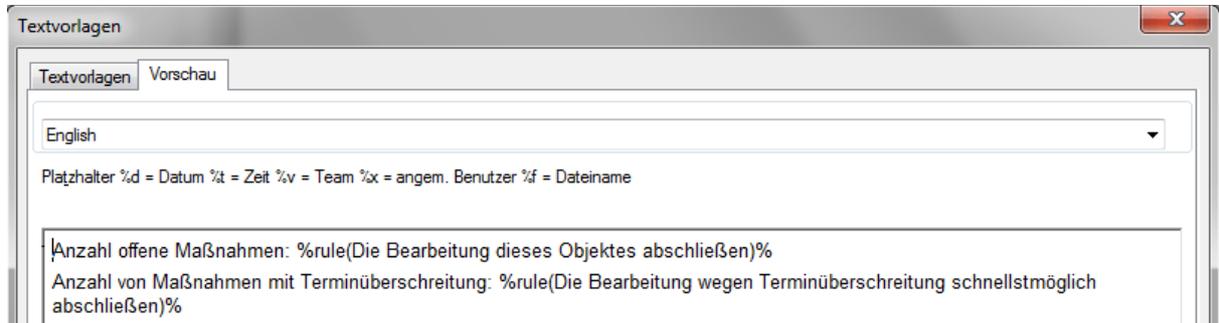
DE

Figure: Template to record uncompleted and overdue actions

When using this template, then this results e.g. in a virtually automatically generated entry in a note.

DE

Figure: Automatically generated entry in a note

The shown information, which is based on a placeholder, is color-highlighted, so that you can recognize that the information can be updated as well. Update by means of the function key F9.

Attention: In contrast to the update of field functions in MS Word, which is also done by means of F9, all placeholders available in the section of HTML-like text are updated and not only those within a selected section. If the user has e.g. used a text template several times in a text template, in which the date (%d) and time (%t) placeholders are applied, then the current dated and time information are applied to all the available placeholders.

In the following example of updating placeholder-based information, it is assumed that the date has been inserted via %d at different times and this information will be updated later.

before:	1st customer visit **7/12/2014**	after:	1st customer visit **1/4/2016**
	2nd customer visit **12/14/2015**		2nd customer visit **1/4/2016**

Conversion of placeholder information into static text

If you do not want to change the information determined and shown by means of a placeholder later anymore, then it is recommended to convert the information into static text. Similar to the updating procedure, the entire section is converted irrespective of the selection. Conversion is done by pressing Shift+Ctrl+F9.

Note: The function keys F9 and Shift+Ctrl+F9 were chosen, because MS Word includes corresponding field functions and placeholders in the IQ Software can be used in a similar way.

Bemerkung (Deutsch):
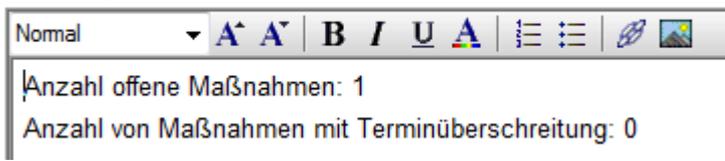
Anzahl offene Maßnahmen: 1

Anzahl von Maßnahmen mit Terminüberschreitung: 0   DE

Figure: Note entry with static text, i.e. the placeholder function does not apply

Additional information

The names of the assistant rules are analyzed across languages, i.e. an assistant rule, for which further names in other languages are available, can be addressed in any language via the name.

The user must make sure that the required translations in the required languages are available for a template. The translation can be done in the administration dialog of the templates, where you can see that no reference language is available for templates!

As the % symbol plays a special role for placeholders, the name of a search filter or assistant rule to be used as placeholder must not contain the % symbol.

If the user amends a text, which is still linked to a placeholder, this text will possibly be lost when the placeholder is updated. Make sure to insert amending information outside of the placeholder text.

The time required for the Summary Functions is in general not predictable. As this depends on the manner of the applied filters, you may need to check, whether the filters can be optimized.

Personal Information Manager (PIM)

The Personal Information Manager (PIM) is a project-independent section in the FME file. The information are stored in various categories of the PIM. A "note field" is available for each entry in a structured list.

Because of these possibilities, the PIM is suited to store information that is not directly related to an object. Tis may include also data to be determined by means of Summary Functions via text templates.

The following example shows that it is possible to store all the individual quality reports in one file-related place and to access previous quality reports as well.

Zusammenfassung 25.11.2015

Systemelemente (mit FMEA-Formblatt): **2**

Funktionen: **6**

Fehlfunktionen: **3**   DE

Bild: Beispiel für individuelle Qualitätsreports (IQR) im PIM

Tip: You can send a PIM entry by e-mail as usual.

Transfer to other workplaces

To be able to use the Summary Functions in several workplaces with identical specifications, you need to consider the following:

- The assistant rules (system rules) are saved in the file AssistantRules65.ICE.
- The text templates are saved in the CFG file and can be transferred from one CFG file to another CFG file by export and import. Alternatively, you can use the template document (FMT file, e.g. Normal.FMT).
- Search filters are saved in the file Filters65.ICE and can be transferred by export and import.

Therefore, three steps are required in order to transfer the basis of the individual quality report from one installation of the IQ Software to another installation.

Note: Please contact the APIS team (**info@apis.de**), if you need easier handling of the transfer. There are several options available and we would like to discuss the further proceeding together with the users. It is our goal to create specifications that meet the user demands.