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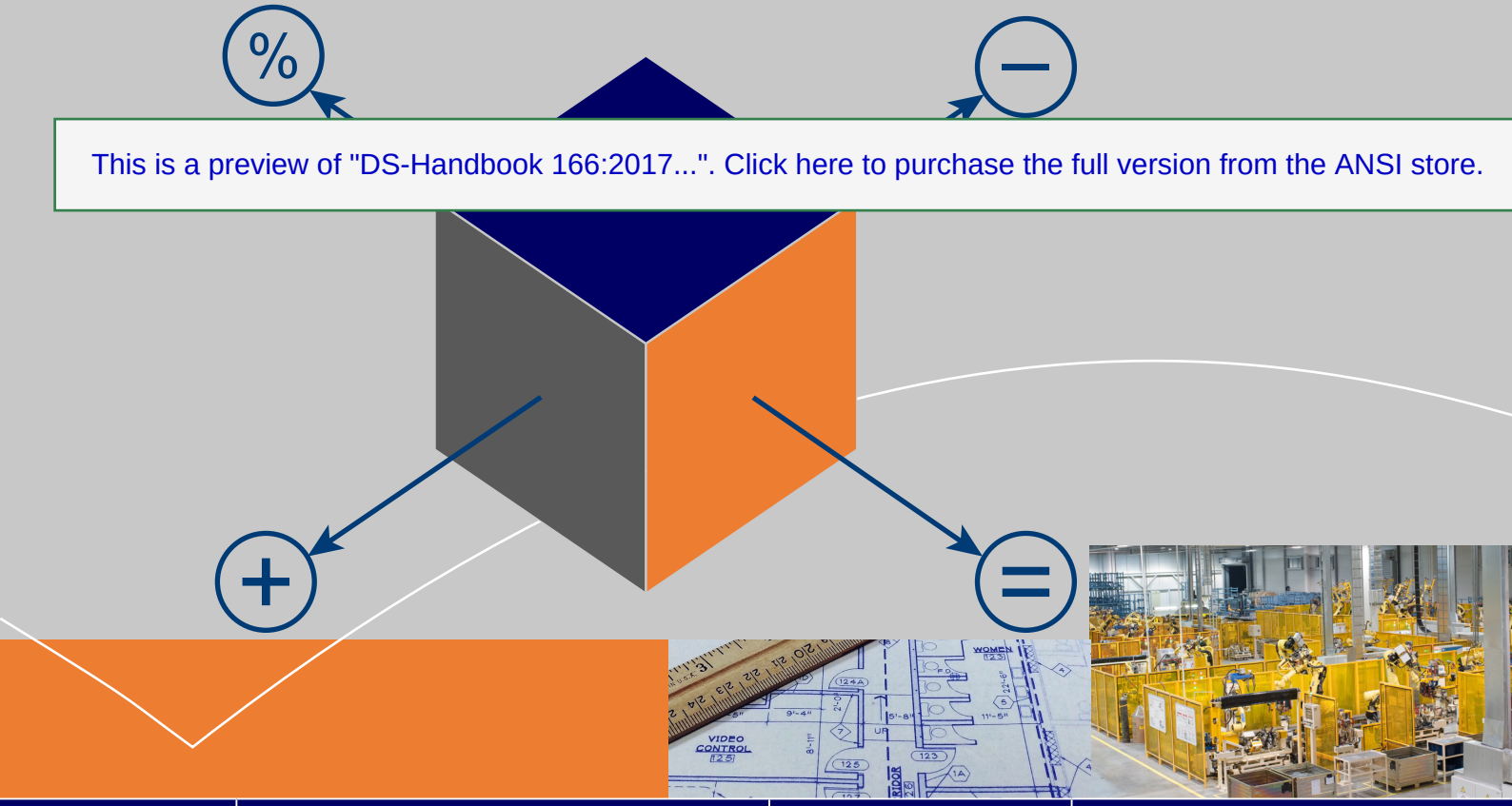

DS-HANDBOOK 166:2017 | 2ND EDITION

DS

A Guide to RDS – Reference Designation Systems

TAG Numbers for Systems in Accordance with the ISO/IEC 81346 Standard Series

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Henrik Balslev completed his engineering degree in 1988, and has for more than 25 years worked as a manager and systems engineering specialist on an array of projects, including high-profile, complex construction projects, industrial plants, machine engineering, and energy-producing units. Through his work he has accumulated a unique knowledge, which is applicable in practice, of the various requirements and solutions inherent to different professional fields.

Since 1998, Henrik Balslev has been a member of the Standardisation Committee *Information Structuring, Documentation, and Graphic Symbols* at Danish Standards, and has since 2006 served as its chairman. Henrik Balslev has co-authored a number of significant international standards that have an extensive technical and financial impact on construction and industry at an international level, including the international maintenance team of the ISO/IEC 81346 standard series.

Hand in hand with the concept of systems engineering, Henrik Balslev works to apply international ISO/IEC standards in such a manner that it provides a practical daily approach to handle complex designs effectively. There is a continued focus on the ensuing significant financial rewards, which in turn are related to the administrative, legal and legislative conditions.

As founder and specialist in Systems Engineering A/S, Henrik Balslev specializes in structuring and reuse of engineering design, and he has since 1997 assisted a wide range of industries in preparing their respective reference designation systems in accordance with this international standard. *It's all about creating a common language*™ is a trademark of Systems Engineering A/S.

For additional information, please visit www.syseng.dk or email mail@81346.com.

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Special Illustrations
The illustrations of heating system and electrical supply system were created by Flemming Vestergaard, Technical University of Denmark and reproduced with kind permission. 3D illustrations for the car wash example in Annex D is downloaded from www.3dcadbrowser.com and is reproduced with their default permission.

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TAG Numbers for Systems
in Accordance with the
ISO/IEC 81346 Standard Series

DANISH STANDARDS

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1 Getting Started

1.1 Reading Guide

Synopsis: Read this guide in less than 15 minutes!

This is a guide for preparation of reference designations, also recognized as TAG numbers, for systems and their elements in accordance with the ISO/IEC 81346 standard series, henceforth called 81346.

The guide also includes directions on documentation, and in addition gives instructions on how to handle interfaces among systems, i.e. dependencies on other systems.

In order to make this guideline easy to use and read, you should note the following:

Synopsis: Each chapter begins with a short summary structured as a synopsis.
It appears in bold lettering immediately below each chapter headline.

By reading this synopsis you can quickly get a sense of what that particular chapter is about. By *first* reading the synopses throughout the *entire* book, you can quickly get a sense of the different chapters' content without necessarily having to study it in detail the first time around.

☞ Important points have been indented and are indicated with a hand-icon on the left.

- The use of colours **blue**, **orange**, **red** and **green** throughout the book is used to emphasize and link text with figures. The colours as such have no specific meaning.
- External references e.g. to the 81346 standard series are indicated in [brackets]

There will be instances where the same point is illustrated and repeated in different chapters. This is intentional, as it allows you to read one chapter at a time, or even to read the chapters in the order that best suits you.

Appendix A and B are illustrative examples of the application of reference designations.

Happy Reading and Kind Regards

Henrik Balslev

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1.2 Preface

Synopsis: It's all about creating a common language!

Have you ever been puzzled by different naming conventions – TAG's – and different meaning with coding among different disciplines? And would it make sense to you, if you could establish a common technical language among them instead, so everyone knew how to understand each other?

In a nutshell, this common language is achieved in three steps:

Step 1: Convert everything and whatever you do into systems thinking

Step 2: Arrange the systems in part-of relations i.e. systems consists of sub elements

Step 3: Apply the 81346 standard series as the naming convention for these systems.

The common language has a lot of benefits and among these you will find:

- ☞ The proven solution to increase productivity!
- ☞ The key to create TAG's which *never* run out of numbers!
- ☞ The method to handle unlimited complexity – taming the tiger – of any design!

In this guide you will be familiarized with the international naming convention from 81346, developed over 40 years and still the best way to TAG systems and their elements.

With the latest development of the 81346 series (year 2017), the standard has proven to be a perfect match for computer modelling of systems like Building Information Modelling (BIM), documentation and handling of information in general. This is done by combining part-of structures with classification codes and different aspects.

- ☞ The aim is to create a common code for all disciplines to create an unambiguous link between different models, documentation and the real world.

  This link is a TAG number created in accordance with the reference designation system defined in the 81346 series, and called a *reference designation*.

If you are to profit from the concept, you need to study the methods and practice. You will not find an easy "off-the-shelf solution", as this would not make sense in the real world. So the price that you must pay for all the goodies, including the **common language**, is to practice the technique followed by basic structuring work that reflects your own system design.

It's all about creating a common language™
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1.3 On Complexity

Synopsis: Only complexity can reduce complexity.

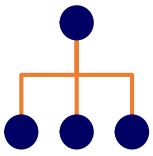
I assume that you deal with engineering complexity like machine design, plant processing, building construction, IT networks, chemical plants or any other aspects of engineering art.

> The quote ***Only complexity can reduce complexity*** is a system theoretical rule by the late prominent German system thinker Niklas Luhmann (1927-1998).

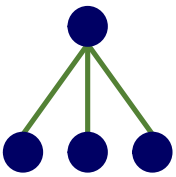
The necessary complexity that you have to adopt, which can reduce your engineering complexity, is **systems thinking**. What this means is that:

1.) Everything can be regarded as a **system**, see chapter 2.1 for definition.

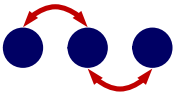
2.) System elements are related by three kinds of **relations**:
Part-of relation, Type-of relation and Pragmatic relation, see [ISO 1087]:



The **part-of relation** is used to sub-divide any system into its constituent parts, recognised as system elements.
This enables unlimited subdivision of complex systems and this is what 81346-1 is about.



The **type-of relation** is used to create classes of systems and system elements. This is used for recognition of the systems and to prevent information from “growing wild”. This is what the classes in 81346-2 is about.



The **pragmatic relation** handles the integration among the systems. This is a positive benefit of working with systems as such, however it is not a part of the 81346 series.

3.) It is necessary to name or **label** the systems, so you can recognise them from each other, and this is what the 81346 standard series is about:

81346-1 (2009) makes designations (i.e. labels or TAG’s) for systems which are arranged in part-of relations.

Different needs for part-of relations are handled by means of five aspects (**=** / **+** / **-** / **%** / **#**).

81346-2 (2009/2017) provides the international classification for technical systems, based on type-of relations. In this regard, the new 2017 edition is recommended.

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1.4 About 81346

Synopsis: A short description of the international 81346 standard series.

81346 is about labelling of systems and the system elements. Most people find the standard a bit complicated to grasp. This might be due to the fact that most people are looking for a fixed recipe for labelling their systems, which is not provided by the standard; The scope is a common naming convention of how to label systems.

In contrast to most other designations, the reference designations based on 81346-1 is not bound to a fixed structural pattern. The reference designations which complies with the rules from 81346-1 are vertically and horizontally expansible, and thereby 100% flexible. This means that you will never run out of numbers and you will never be blocked for future development if you comply with the rules of 81346-1.

The labelling is a clear and unambiguous TAG (name) to be understood across all disciplines. You may know the standard under its nickname “RDS”:

RDS

Which is an abbreviation for **R**eference **D**esignation **S**ystem

The official title of 81346 is however:

"*Industrial Systems, Installations and Equipment and Industrial Products – Structuring Principles and Reference Designations.*"

As a result of the collaboration between ISO and IEC it is a part of the 80000 series. This means that both ISO and IEC are behind it. There is nothing above and nothing next to it, but you may find many local branch related standards with the same aim. The 81346, however, is international and is the only cross-disciplinary standard that can be used within all professional disciplines as a tool to create a common language for any given project of any given size.

☞ One thing which is a fundamental presumption in 81346-1, is that *everything is about systems*. It is not spelled out in the way I do it here, but you need to buy in on this presumption to be able to understand how the standard works.

Examples of systems are: Load-bearing system, roof system, wall system, HVAC system, drainage system, electrical system, communication system, transportation system, planting system, landscape system, window system, suspension system, fan system, prefabrication system and so on.

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The main trick about systems thinking is to collect components which work together and recognize that specific collection as a 'system'. A system of systems brings together a set of systems for a task that none of the systems can accomplish on its own.

By viewing the complexity of your design as a complexity of systems, you can monitor the systems of interest and the relation to all other systems. It is just as easy and smart as it sounds!

Figure 1 illustrates the system-way of thinking:

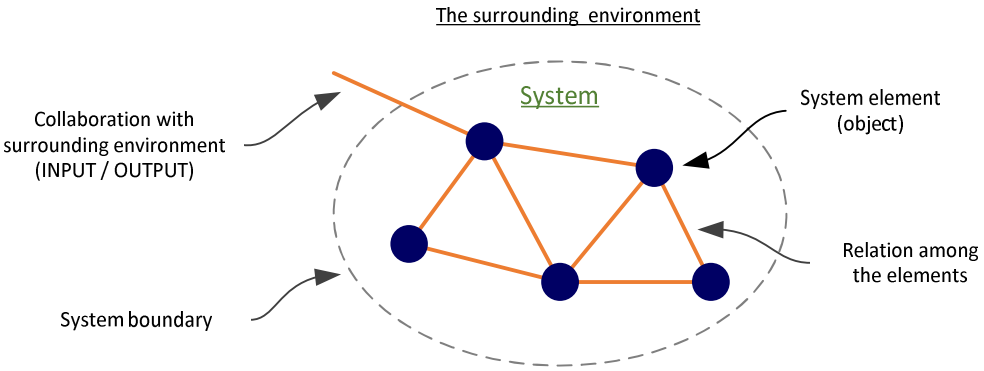

Figure 1 - A schematic representation of a relativly closed system and its boundary, system = your design

EXAMPLE 1 – Non system approach

Within an organization, no specific concept for cooperation exists. This is observed by the fact, that different disciplines use different terms (words) for the same components. To illustrate this, Figure 2 below shows different words in different formatting. It is so to speak a randomized puzzle, which you only get to know if you become a part of the organization for at least one year:

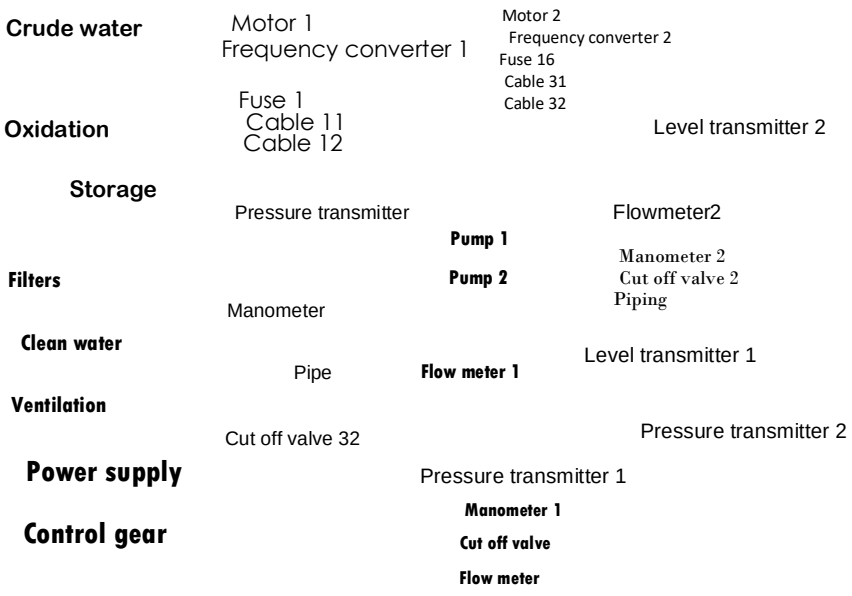

Figure 2 - Objects in a non-system approach

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If you take all words in Figure 2 and apply systems thinking to it, it will look like Figure 3. The terms are arranged in part-of relations as systems and system elements:

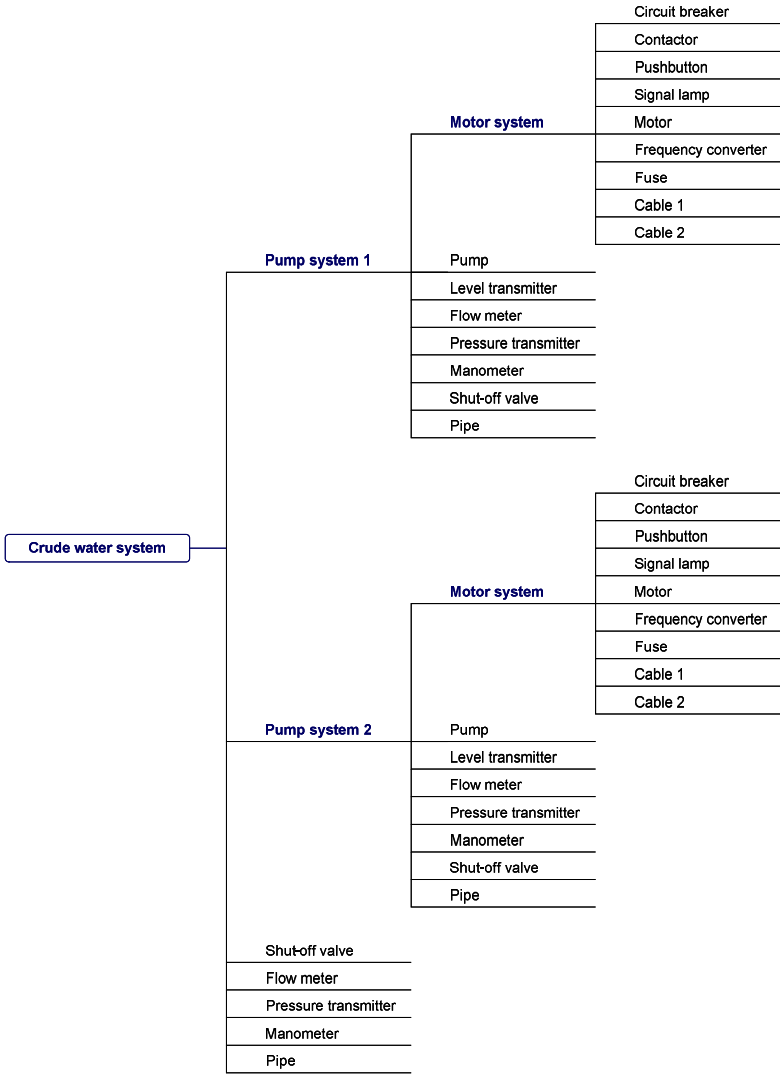

Figure 3 - Terms organized by means of systems thinking in part-of relations

As shown in Figure 3, the result of systems in part-of relations is a clear overview of any design, which almost everyone can learn to read and understand. What 81346 does is to set the rules of how to designate the systems and their elements.

You can see the result of naming constituents from Figure 3 in *Appendix B – Process Plant Example*.

The designation rules from 81346 fully support the system approach. In 81346 the most important thing is to structure - that is to sort - your objects in part-of relations, and not just sort and structure in any way you like. The specific meaning behind part-of relations is the key to reuse any design. If the structure complies with part-of relations and the rules of thumb given in this guide, reuse of design more or less goes without saying.

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As the functional structure are created, reference designations can now be added:

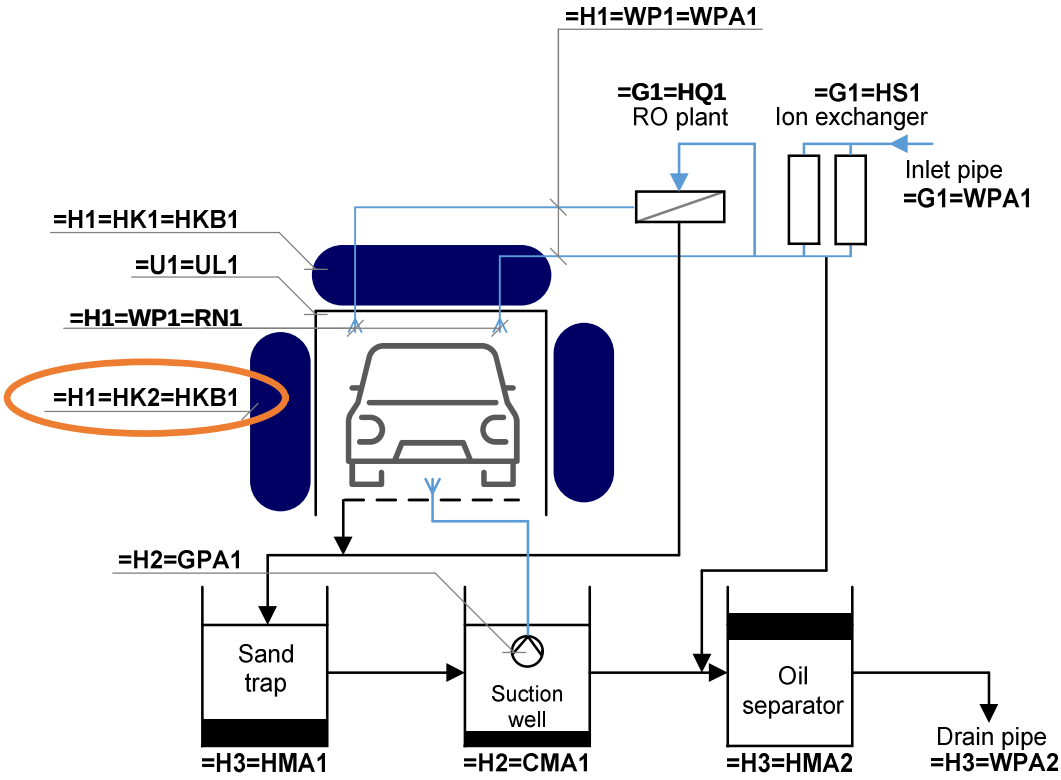

Figure 111 - Simplified water diagram with functional reference designations, car shown in rear view

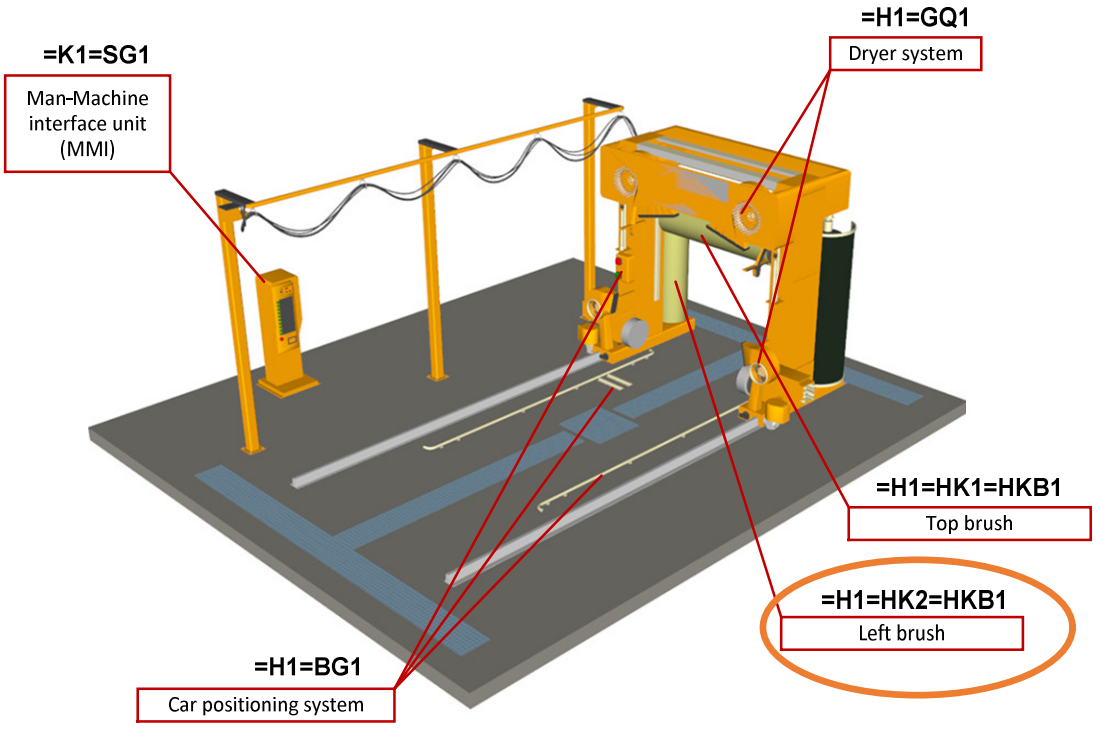

Figure 112 - 3D illustration with functional reference designations

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