

A woman with long dark hair, wearing a white shirt, is holding a pair of blue binoculars to her eyes and smiling. The background is a solid light blue.

**GEO**  
SEARCH

## FINDING INSTEAD OF SEARCHING

FIND STANDARD-, SUPPLIER- AND COMPANY PARTS IN A SIMPLE  
AND FAST WAY WITH **CADENAS'** INTELLIGENT SEARCH METHODS

# THE TECHNOLOGY FOR INTUITIVE SEARCH BEHAVIOR

Searching for information becomes more and more difficult and time consuming for engineers and purchasers:

- Multiple locations
- Language barriers
- Competitiveness between the departments
- Information is difficult to access
- Complicated and inconsistent business processes
- Numerous systems
- Insufficient quality of master data
- No classification

CADENAS opens up totally new possibilities to engineers and purchasers for finding product information and CAD data of standard-, supplier- and company parts in an intelligent way.

CADENAS' innovative search methods are the best alternative or supplement to the traditionally classified parts master. The functions were especially tailored to the needs of engineers and purchasers and make it easy to find necessary parts intuitively. The search methods can be combined in a cascading way.

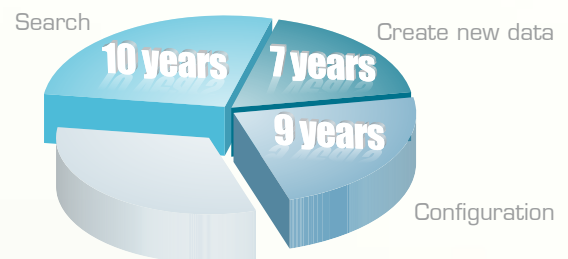
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» ...An engineer invests about 70 % of his time with nonconstructive activities – 27 % search, 18 % create new data, 23 % configuration. «

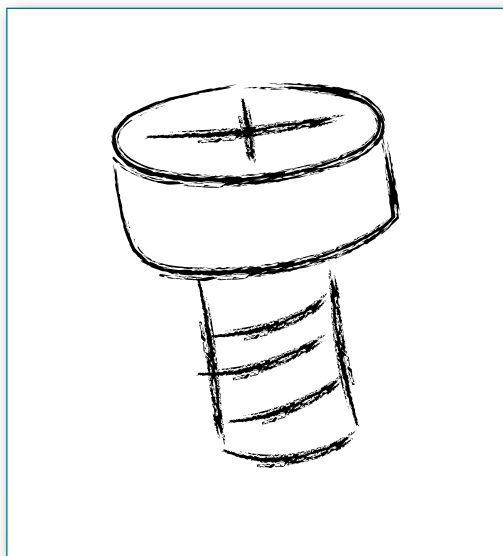
ABERDEEN GROUP, COMPONENT SUPPLIER MANAGEMENT, MARCH 2002

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Starting from the assumption of an average working life of 40 years, the following distribution can be found:



## SEARCH BY SKETCHING (2D)



### A picture says more than 1000 words!

How do engineers explain things to each other? They take a piece of paper and simply draw a sketch. CADENAS adapted this intuitive behavior for its 2D sketch search method.

With this search method engineers and purchasers quickly find the right component within the Strategic Parts Management PARTsolutions just with a simple drawing and no need of a CAD system or an article description.

### IN PRACTICE



You know what part you are looking for, but don't know the right manufacturer designation?

#### This way you'll find the right component:

1. Make a rough sketch of the part
2. Search the database
3. Receive relevant results

#### Your benefit

- Easy and fast handling with a 2D sketch
- No CAD system is necessary
- Language-independent
- No need of technical terms

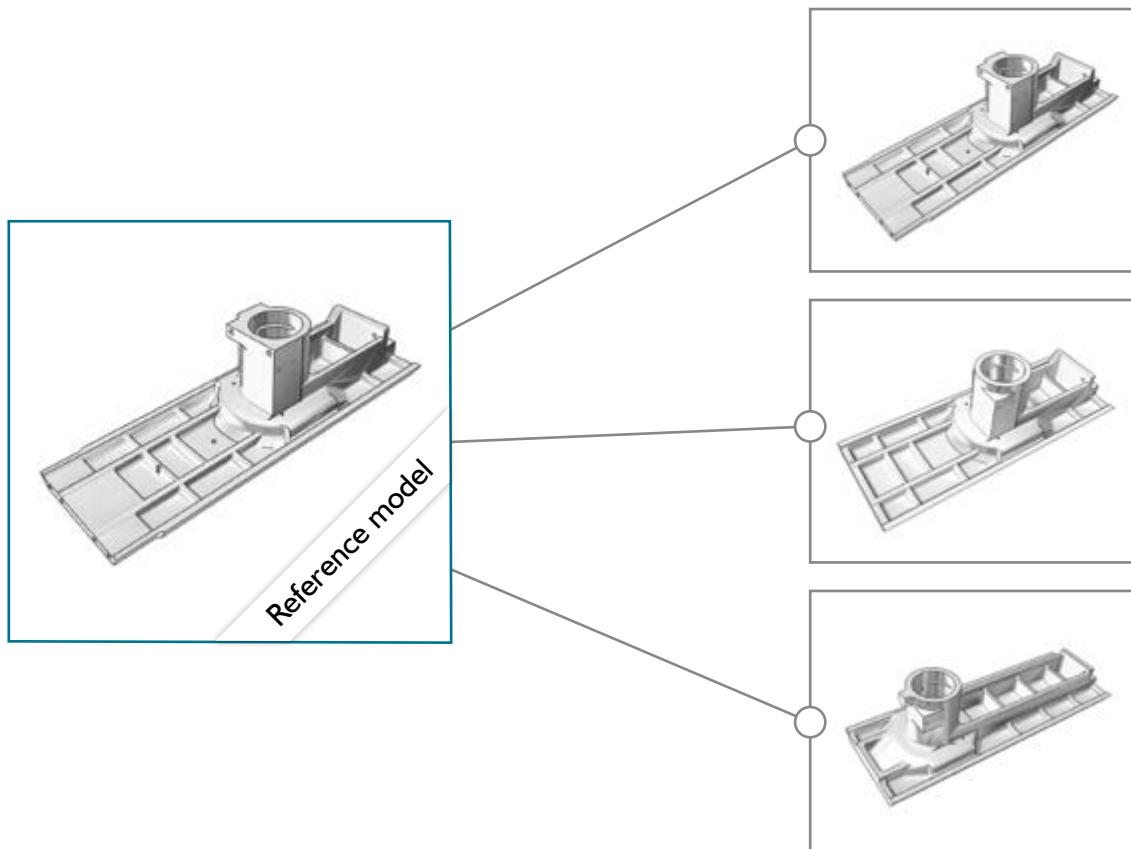
# THE GEOMETRIC SEARCH (3D)

The Geometric Similarity Search GEOsearch searches and compares parts according to the respective CAD geometries.

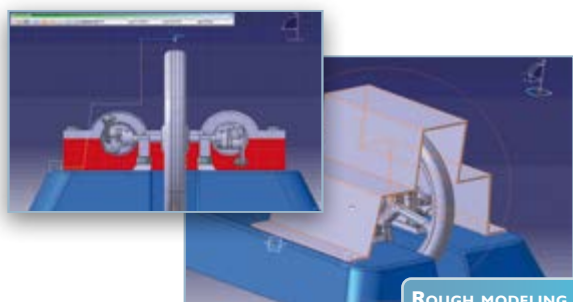
## Find the needle in the haystack!

Beginning with a reference part or the rough sketch of a 3D CAD model, standard-, supplier- and company parts are compared to your parts database and recommended.

The result is a ranking list of the geometrically most similar 3D CAD parts, which are displayed visually.



## IN PRACTICE

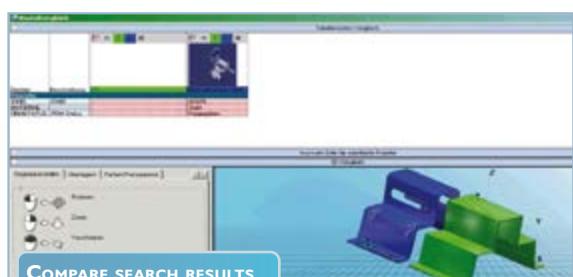


### 1. Modeling

You roughly model the necessary part in your CAD system. CADENAS' Geometric Similarity Search GEOsearch will then browse through the whole parts database for geometrically similar components.

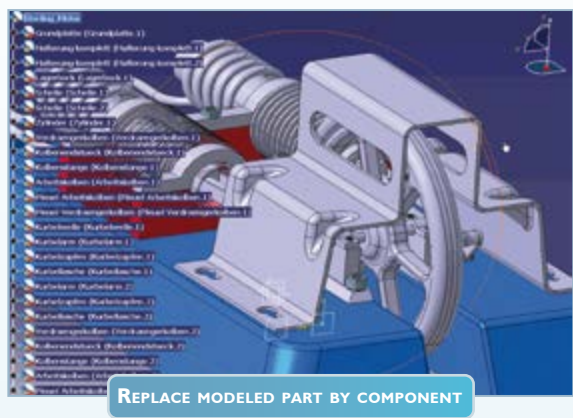
### 2. Comparing

The search results can be directly compared by overlapping of the 3D CAD models.



### 3. Replacing

Afterwards you replace the initially modeled part in your CAD design with the standard-, supplier- or company part, you found.



### Your benefit

- Increase reuse
- Reduce duplicate copies
- Increase standardization
- Compare suppliers

#### Reuse parts

Model a rough sketch **approx. 2 min**

Choose the fitting part **approx. 4 min**

#### Create a new part

Modeling 3D **30 min**

Create a new shop drawing 2D **60 min**

NC programming **30 min**

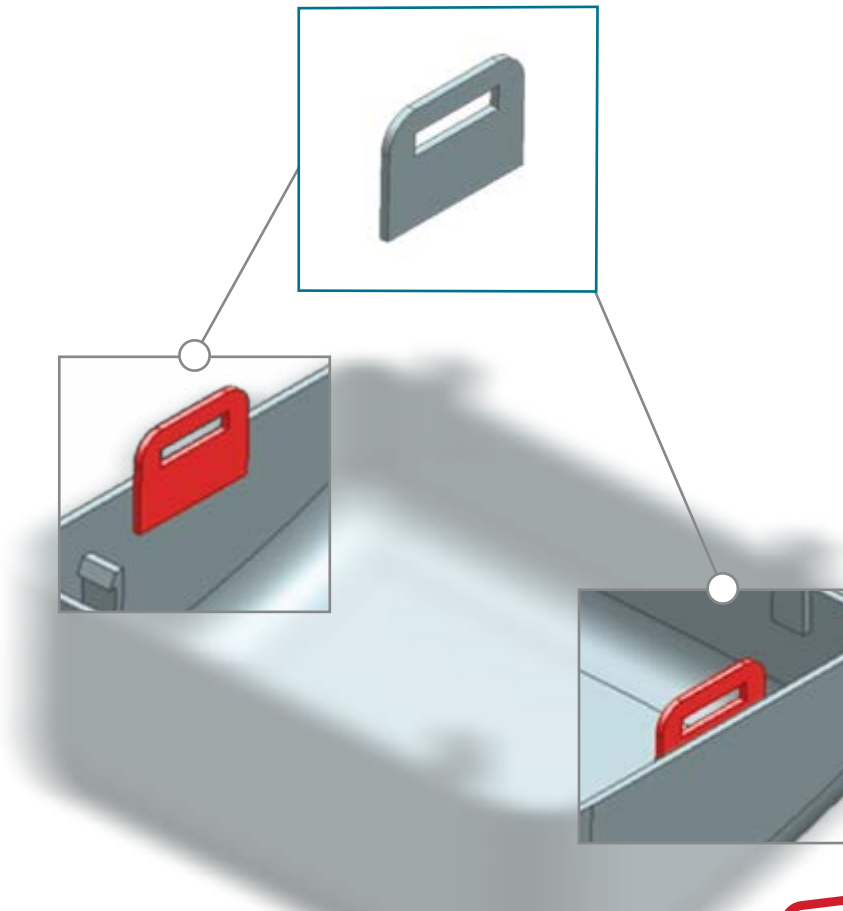
Work preparation **30 min**

+ **Approx. 90% time saving for the design engineer**

+ **Approx. 1,000 EUR saving for merchandise management by reusing parts**

# THE PARTIAL SEARCH

The Partial Search by CADENAS enables you to separate segments of an extensive group of parts and search within the existing data base for components and assemblies with similar partitions.



## IN PRACTICE

**IN DEVELOPMENT**



By means of the Partial Search you find small subsegments or designs within a complex component. Thus the corresponding proceedings and already available tools can be adopted for your engineering.



### Your benefit

- Detailed search according to a pre-defined shape in other components and assemblies
- Reuse of designs and work procedures
- Helpful when reducing the amount of different tools

# THE UNMACHINED PART SEARCH

The Strategic Parts Management offers a search for unmachined parts that enables you to find the matching unmachined part on the basis of a finished part within the existing data base.

The software checks if the finished part is at all dimensions smaller than the unmachined part, so that the finished part can be created by removing material from the raw part.



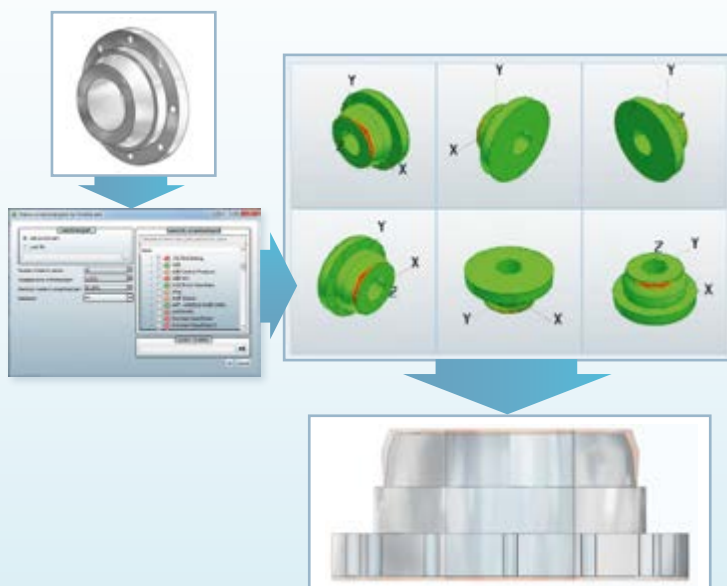
## IN PRACTICE

You create a new part and afterwards need the information, if a similar geometrically bigger unmachined part or semi-finished part is already available in the company. CADENAS' Unmachined Part Search detects which components within the database could be suitable.

The search results are listed in a report, which i.a. gives you an overview of the existing stock and the application fields for the unmachined parts. Moreover CADENAS' Unmachined Part Search calculates how much material has to be removed, that a finished part can be developed from a unmachined part.

Unmachined parts with a low loss rate have the highest rank in the search results. In an overlapped display the finished part can be compared visually to the unmachined part.

You can also search the other way around. Which finished parts can be created from an unmachined part?



### Your benefit

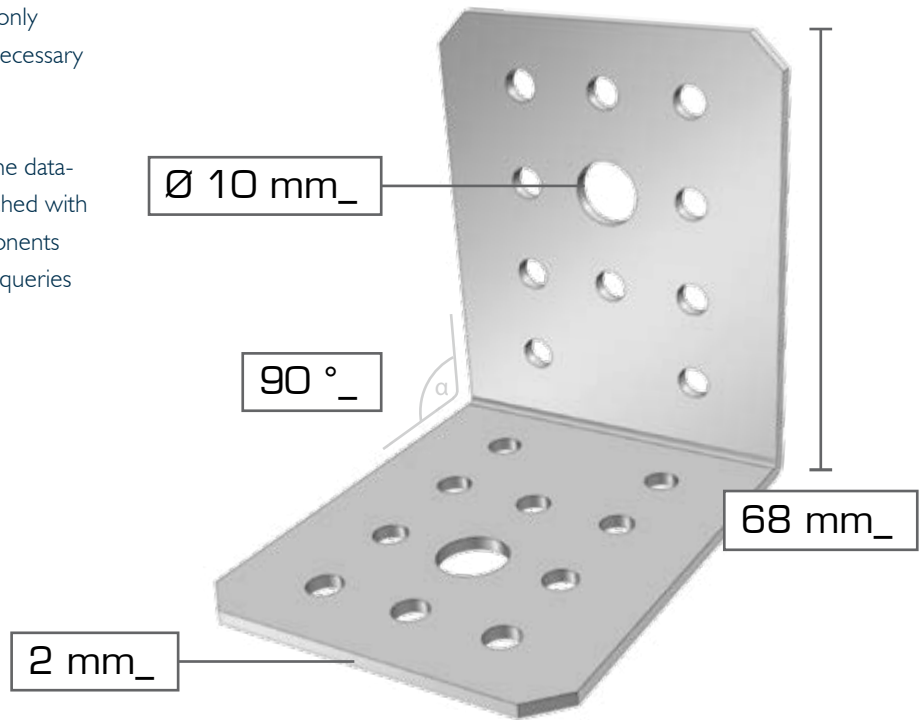
- Calculate the accruing cuttings
- Overlapping display of finished part and unmachined part
- Finished parts are automatically allocated to unmachined parts
- Supports standardization of parts by unmachined parts
- Also applicable for castings that are reprocessed



# THE TOPOLOGY SEARCH

In future engineers and purchasers only have to geometrically imagine the necessary component!

By means of the Topology Search the database of company parts can be searched with specific technical features for components and the amount of previous search queries can be limited.



## IN PRACTICE

You are looking for an angle with a length of more than 20 mm, that should at least have three drills. The diameter of the drills should be  $10 \text{ mm} \pm 1 \text{ mm}$ .

By means of CADENAS' Topology Search a suitable component, in accordance with the technical features, is recommended.

	Property		Dimension [mm]	>
1	Number of borehole...	10 mm	1 mm	greater or equal...
2	Largest dimension			greater than (>) 20 mm

	Preview	Category	Name	Description
1			+Topology K... Bracket 1-A	Bracket
2			+Topology K... Bracket 1-B	Bracket
3			+Topology K... Bracket 1-C	Bracket
4			+Topology K... Bracket 2-A	Bracket
5			+Topology K... Bracket 2-B	Bracket
6			+Topology K... Bracket 2-C	Bracket
7			+Topology K... Bracket 4-E	Bracket



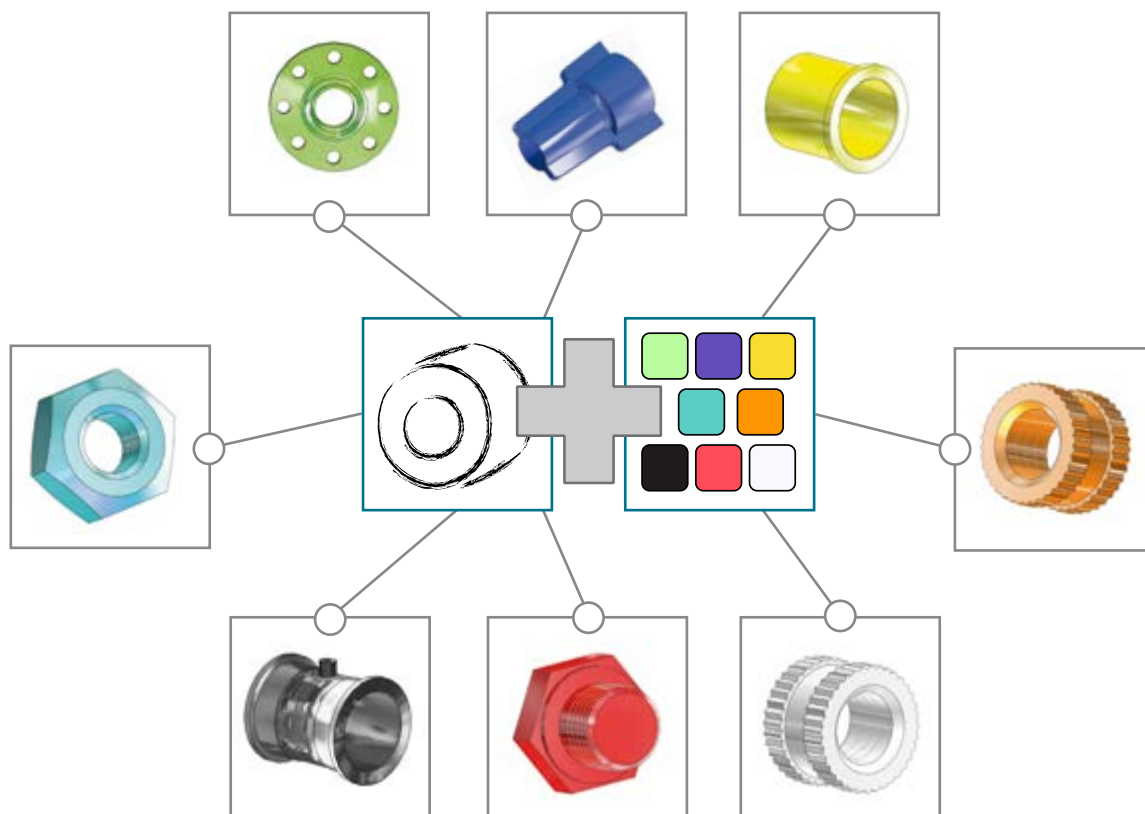
### Your benefit

- Filter components by circumference, surface, basic form, dimensions, drills, diameter, angles, etc.
- Features are automatically extracted from the CAD model, no manual classification is necessary
- No limitation to one classification feature, but search of all topologies possible



# THE COLOR SEARCH

The Color Search enables engineers and purchasers to look for components within a parts library by selected colors. This search method demonstrates its full potential if one of the numerous innovative search methods has been applied previously.



## IN PRACTICE



### Your benefit

- It is possible to combine several colors within one search query
- Search for precise color values possible
- Colors can be extracted from components and included in the color palette

CADENAS' Full-text Search offers an effective possibility to browse the complete standard-, supplier- and company parts world of your business for necessary parts.

A circular word cloud featuring various mechanical and industrial components. The words are arranged in a circle, following the perimeter of the shape. The terms include:

- Bearing
- Bypass
- Drives
- Bearing
- Fixtures
- Grippers
- Connector
- Pneumatic Handling
- Fastening
- conveyor
- Nut
- Bypass
- Drives
- Cable
- Mould
- Bushing
- Lead Screw
- Screw
- Brakes
- Chains
- Belt
- Pulleys
- Chuck
- Jaw
- Mozzles
- Roller
- Electric Handling
- Enclosures
- Motor's
- Chucks
- Chuck
- Law
- Spring
- Ball
- Caster
- Bolt
- Motors
- Nuts
- Cable Carriers
- Pumps
- Control Unit
- Cylinder
- Bearing
- Gear
- Cog
- Control Unit
- Cylinder
- Brakes
- Bypass

The screenshot shows a web-based search interface. At the top, there is a search bar with the text "Keyword search:" followed by a text input field containing "bolts D>40 L>200". To the right of the input field is a dropdown menu set to "in Machine elements". Further right are icons for saving, deleting, and other actions. Below the search bar, a large blue arrow points down to a section titled "Did you mean:". Under this heading, a long list of suggested queries is displayed, such as "bolts D>40 L>200", "bolts D>40 L>200", etc. Below the suggestions is another section titled "Related results:", which contains a single link labeled "GDT form between Counterforce GIL screen (Housen Product ANGE Thread counter 38 grade HG GOET)".

PC...	C...	Catalog	Name	Description	Description	Date
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M4x250	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M4x320	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M4x400	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M4x500	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M48x250	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M48x320	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M48x400	03.02...
		Industry ...	KS 8 1038	T slot bolts	T slot bolt KS 8 1038 M48x500	03.02...
		Industry ...	G8 799-88	Eyelet bolts	Bolt G8 799 M4x630	16.10...
		Industry ...	G8 798-88	Eyelet bolts	Bolt G8 798 M4x800	16.10...

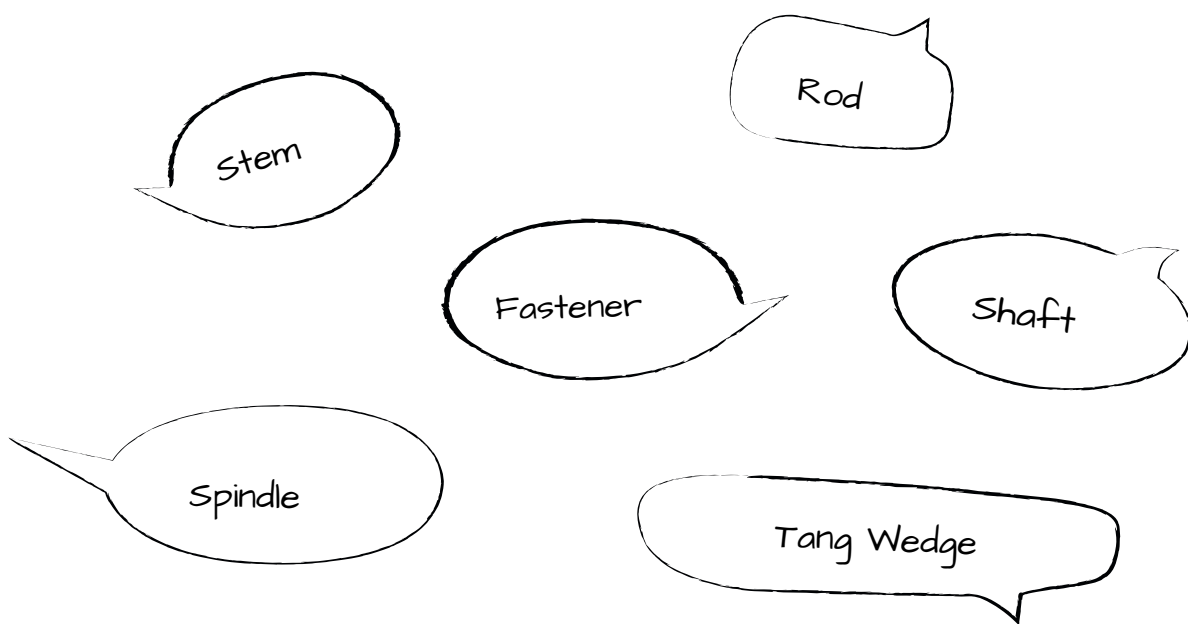
## Your benefit

- Text search with logical operators
- Multiple search terms can be combined
- High fault tolerance
- Cross-lingual

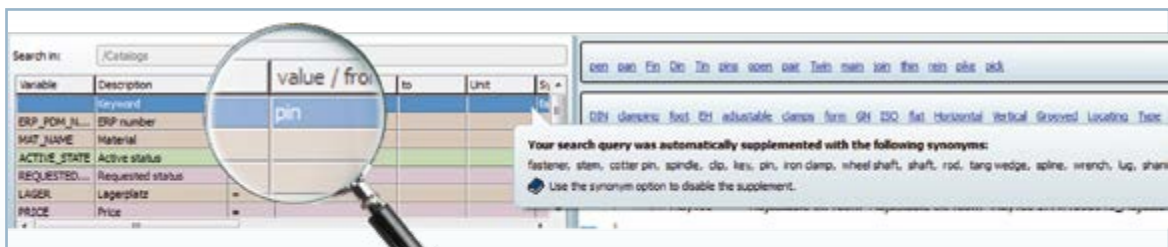
# THE SYNONYM SEARCH

Often there are different synonymous designations for a component, which can vary depending on the manufacturer. This is why a textual search can often only lead to insufficient search results.

CADENAS' Strategic Parts Management PARTsolutions checks search terms already when entering them. Thus the system can supplement your search query with synonymous descriptions.



## IN PRACTICE



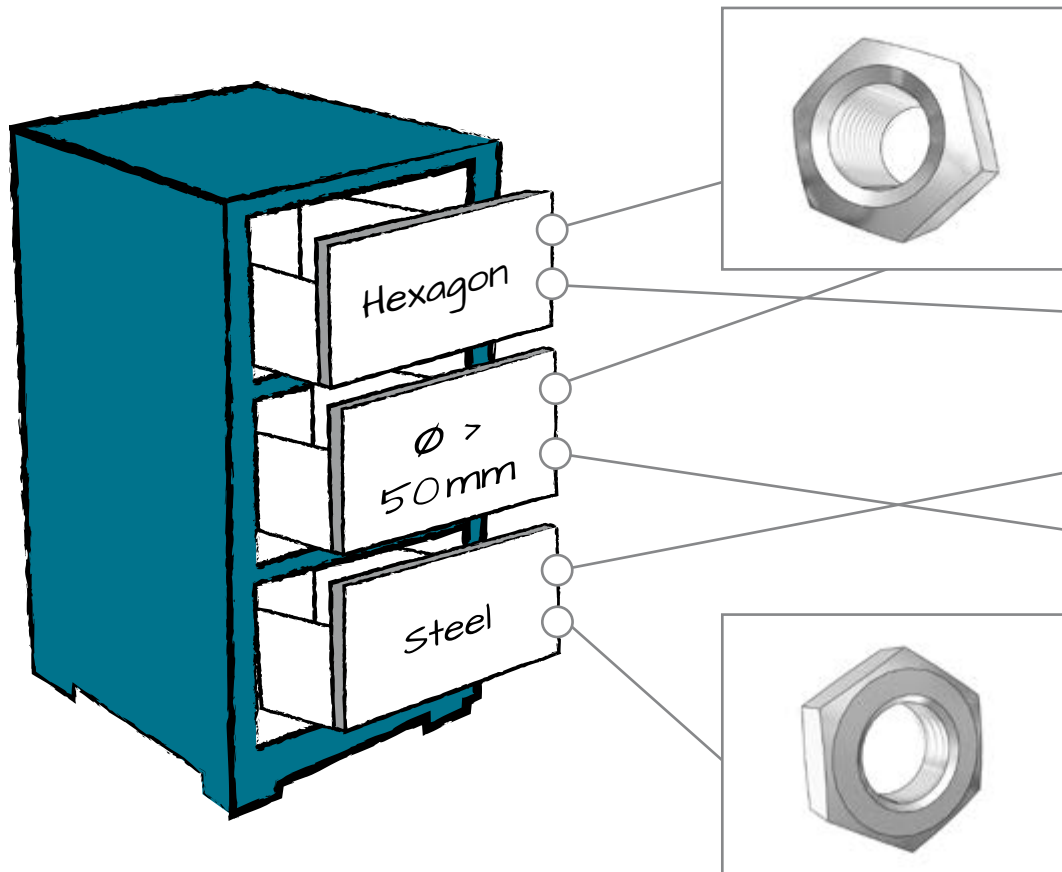
When you carry out a search query and use the term „pin“ for instance, PARTsolutions automatically includes related terms like “Stem” or “Rod” in the search query.

### Your benefit

- Search beyond all features
- Recommendation and display of synonyms
- Available in various languages
- Possibility to build up and maintain an individual synonym encyclopedia

# THE CLASSIFICATION

Classified parts master data enables engineers and purchasers to efficiently find necessary components. However, most of the times it is very time-consuming to classify the available parts master manually.

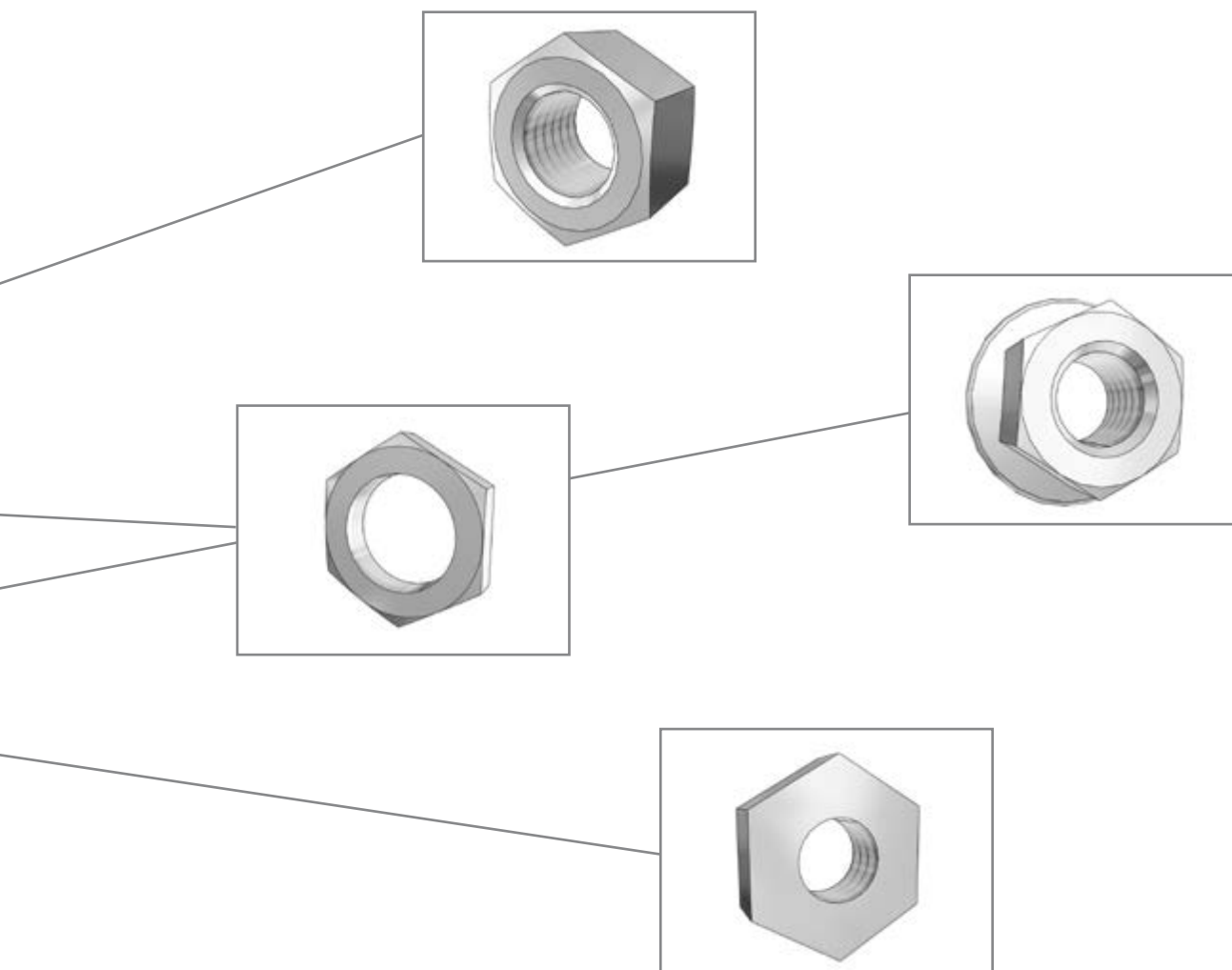


## Semi-automatic development of a structured parts database

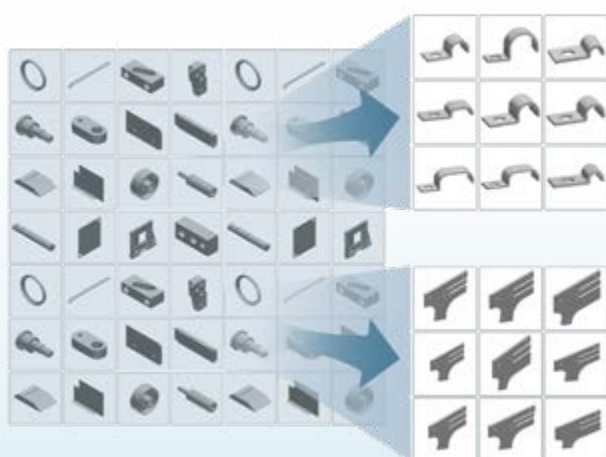
The semi-automatic classification of your master data by means of the software solution PARTwarehouse significantly reduces the effort of manually allocating existing parts into a class system.

On the basis of texts and geometries CADENAS solution supports companies with finding parts and effectively cleaning up chaotic parts master.

The multitude of available manufacturer catalogs in the Strategic Parts Management PARTsolutions enables you to additionally enrich your data with the product information of component manufacturers.



## IN PRACTICE



Due to geometrical or textual similarities PART-warehouse identifies similar components and pre-classifies them semi-automatically.

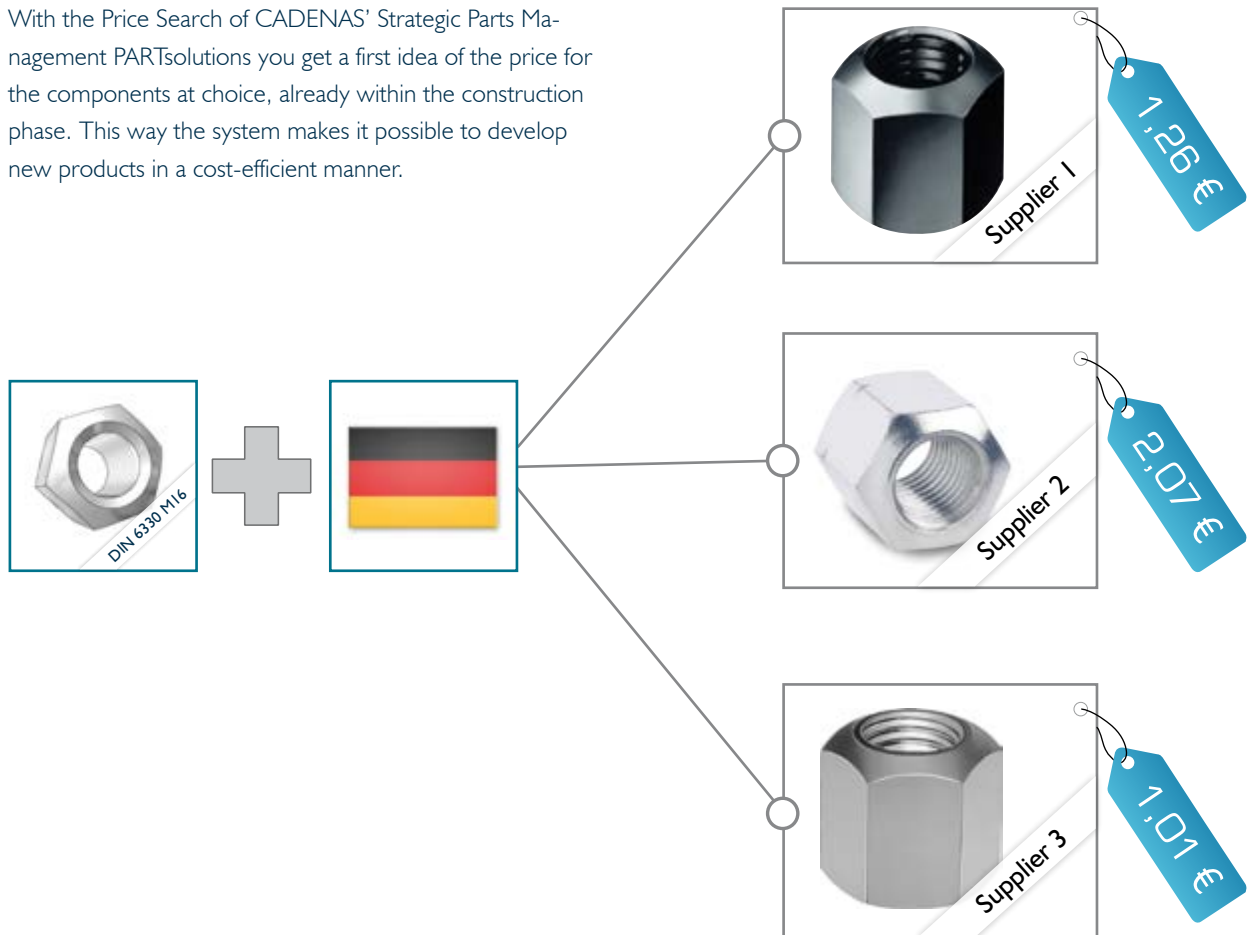
This significantly reduces the effort of manually allocating parts into a class system and afterwards makes it easy to find components quickly and efficiently.

### Your benefit

- Structure and clean up chaotic parts master
- Precise search for definite classes and defined values

# THE PRICE SEARCH

With the Price Search of CADENAS' Strategic Parts Management PARTsolutions you get a first idea of the price for the components at choice, already within the construction phase. This way the system makes it possible to develop new products in a cost-efficient manner.



## IN PRACTICE

By means of the Price Search you'll find the most cost-effective component, that meets your requirements. This way you can find out quickly and uncomplicated, which parts would be also suitable for your design, while causing significantly less costs.

Search term: wing nuts m16							
Image	Title	Description	Price	Distributor	Brand	Creation date	Latest change
	06m040075wn Wing Nut, Nylon, Finish Natural, Thread Size M16 x 0.75mm, Thread Type Metric, Th...	Wing Nut, Standard, Nylon, Finish Natural, Thread Size M16 x 0.75mm, Thread Type Metric, Th...	3.48 USD	Granger Industrial Supply	APPROVED VENDOR	05/07/2012 17:34	02/01/2013
	Other - 06m040075wn Wing Nut, Nylon, Finish Natural, Thread Size M16 x 0.75mm, Thread Type Metric, Th...	Wing Nut, Standard, Nylon, Finish Natural, Thread Size M16 x 0.75mm, Thread Type Metric, Th...	7.95 USD	freelinks.com	Other	20/11/2012 17:21	06/01/2013
	Wing Nut Nylon M16x0.75mm PK25	06m040075wn Wing Nut, Standard Nylon, Finish Natural T...	3.19 USD	Online Supply	APPROVED VENDOR	08/07/2012 13:19	02/01/2013
	Drillspot M16, Zinc Plated Cold Forged Wing Nut	DrillSpot M16-Zinc Plated Cold Forged Wing Nut 90675 Wing Nut; Wing Nuts permit rapid assembly	0.90 USD	Pricefalls.com	Drillspot	06/01/2013 10:00	06/01/2013

### Your benefit

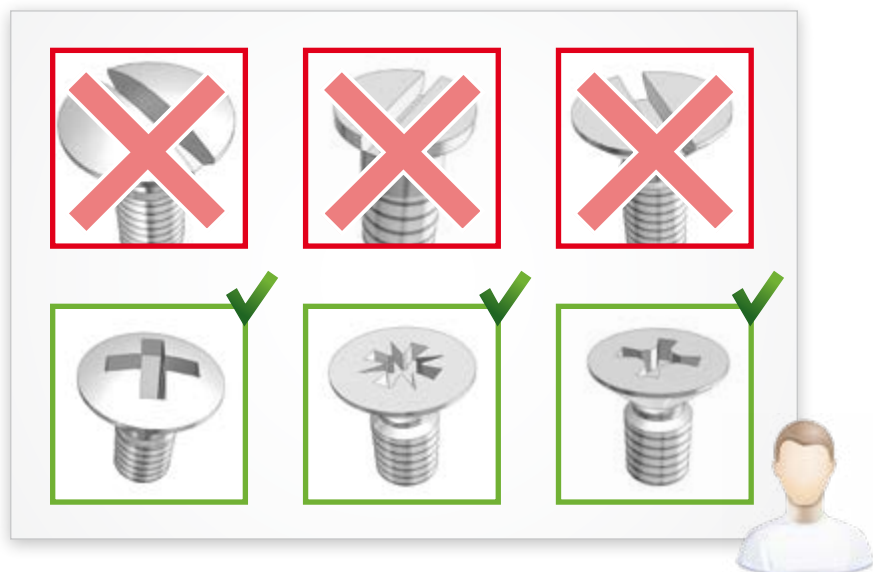
- Get a first idea of the costs for components
- Influence the product costs within the development phase
- Optimized cooperation of engineering and purchase

# THE ROLE- AND FILTER SYSTEM

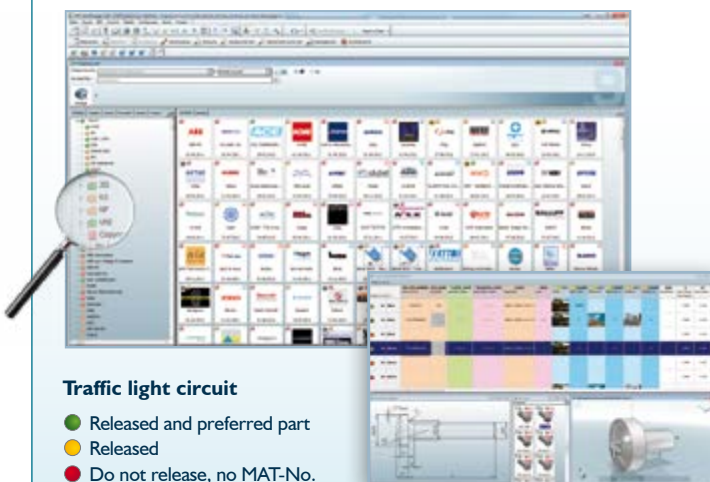
In most companies engineers have access to the whole parts data base. Thus it is often difficult to ensure, that the choice is made for the technically and economically best component.

The consequences could be higher prices, due to lower quantities and a multiplicity of suppliers as well as missing price comparisons.

The role- and filter system of CADENAS' Strategic Parts Management PARTsolutions puts the focus of the engineer on preferred parts and -suppliers and thus the freedom of choice for a component is restricted in a sensible way.



## IN PRACTICE



The role- and filter system of CADENAS PARTsolutions shows every department the components that are of relevance to them and were released by the purchasing department. This supports engineering and purchasing department at their common goal, to keep production costs as low as possible.

### Your benefit

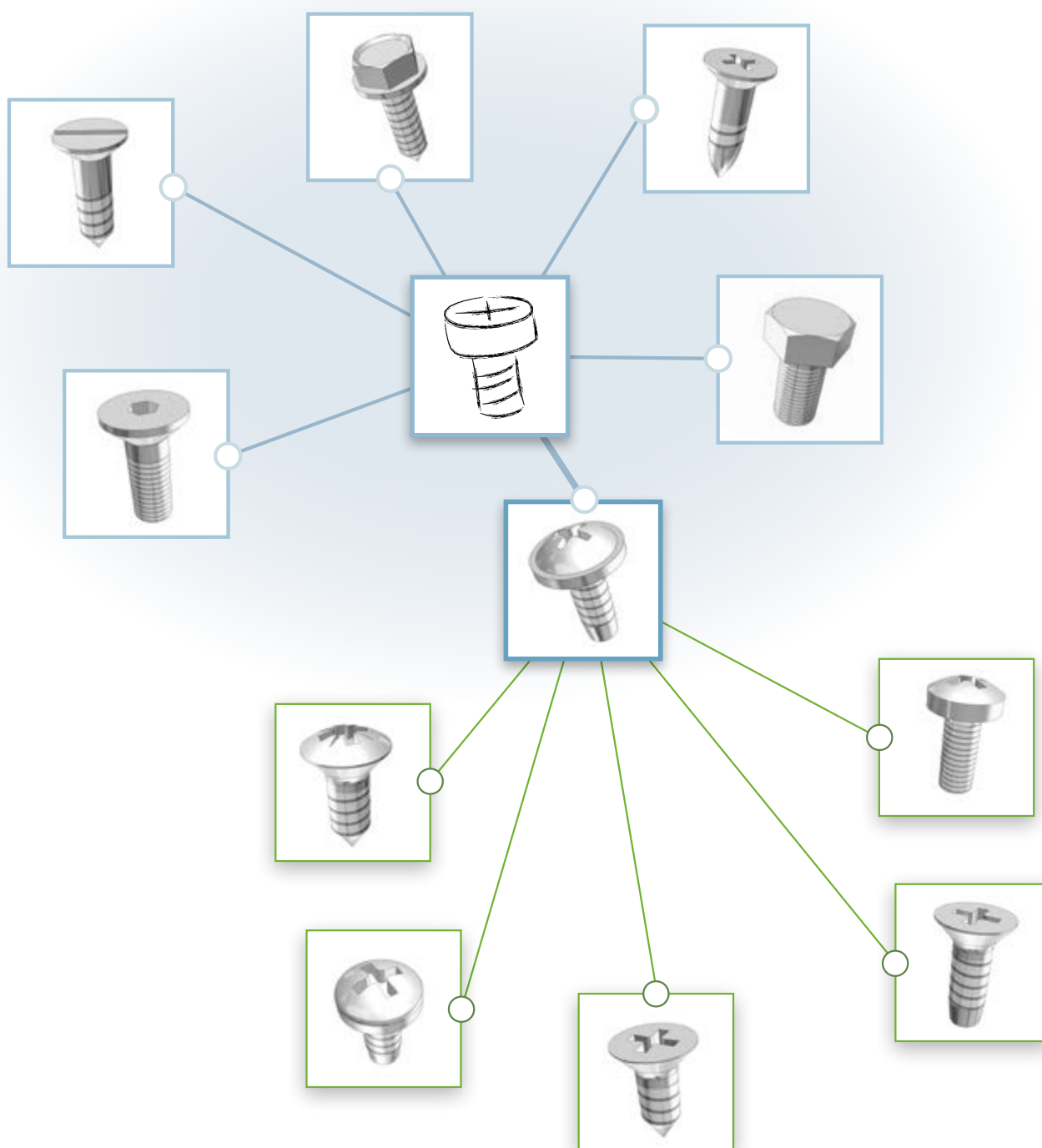
- Tag preferred parts and parts that should be avoided
- Higher reuse rate
- Avoid maverick buying



## THE CLOUD NAVIGATOR

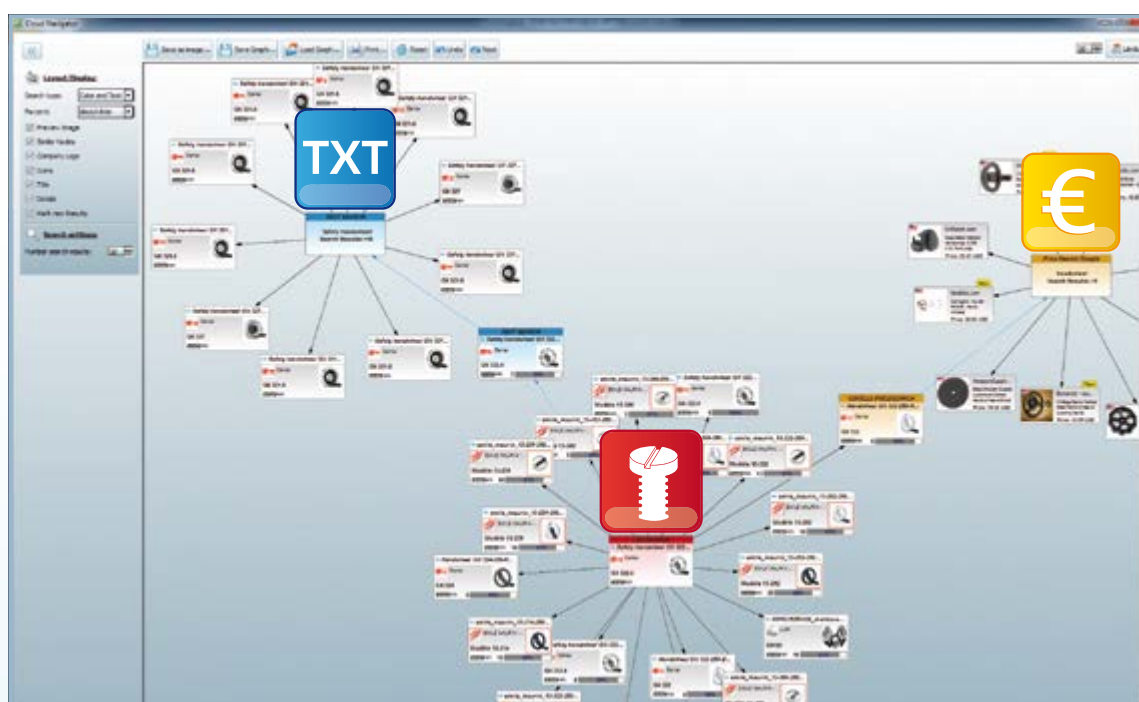
The Cloud Navigator is an innovative search method of the Strategic Parts Management PARTsolutions which helps you to navigate quickly and easily to the right result in huge data volumes. It is not necessary to know the exact product description.

You start the search with an existing part, a sketch or a search term. The results of the search are graphically ordered in so called clouds, around the original component or the search term. Starting from these results, users can further refine their search and in the course of the multi-layered search process they always see the complete search history at a glance.



## IN PRACTICE

You load an existing CAD model of a component into the Cloud Navigator, which is similar to the necessary part. You choose a search result, that comes closest to the desired part and refine your results with the textual search, the price search or a 2D sketch.



Again clouds appear, which are radially ordered and can serve as starting point for further searches. Additionally you can continue your search anytime at another point and choose any cloud as new starting point.

### Your benefit

- Selection proposals to deepen and improve the search results without losing the overview
- Combinable with the Geometric Similarity Search, the 2D Sketch Search and the Full-text Search
- Documentation of previous searches

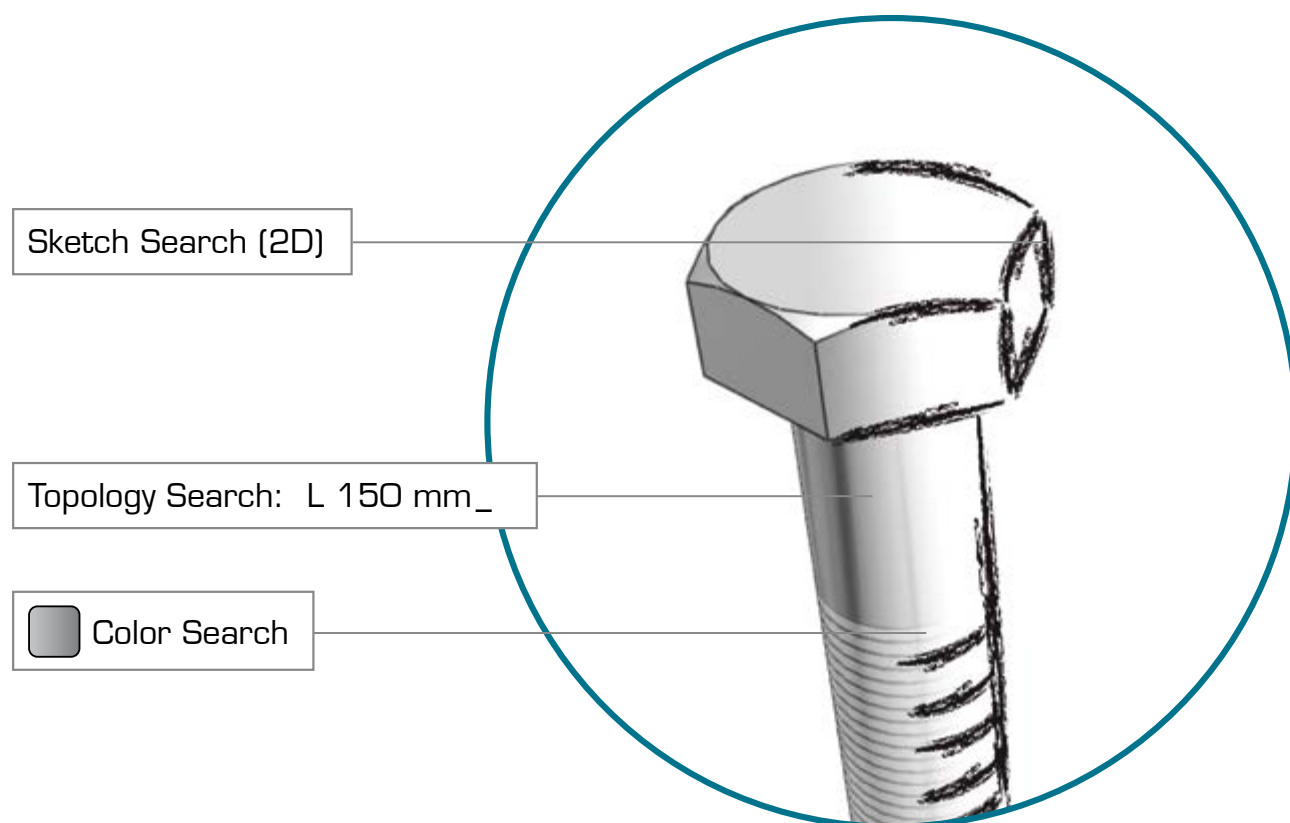
## THE COMBINATION OF THE SEARCH METHODS

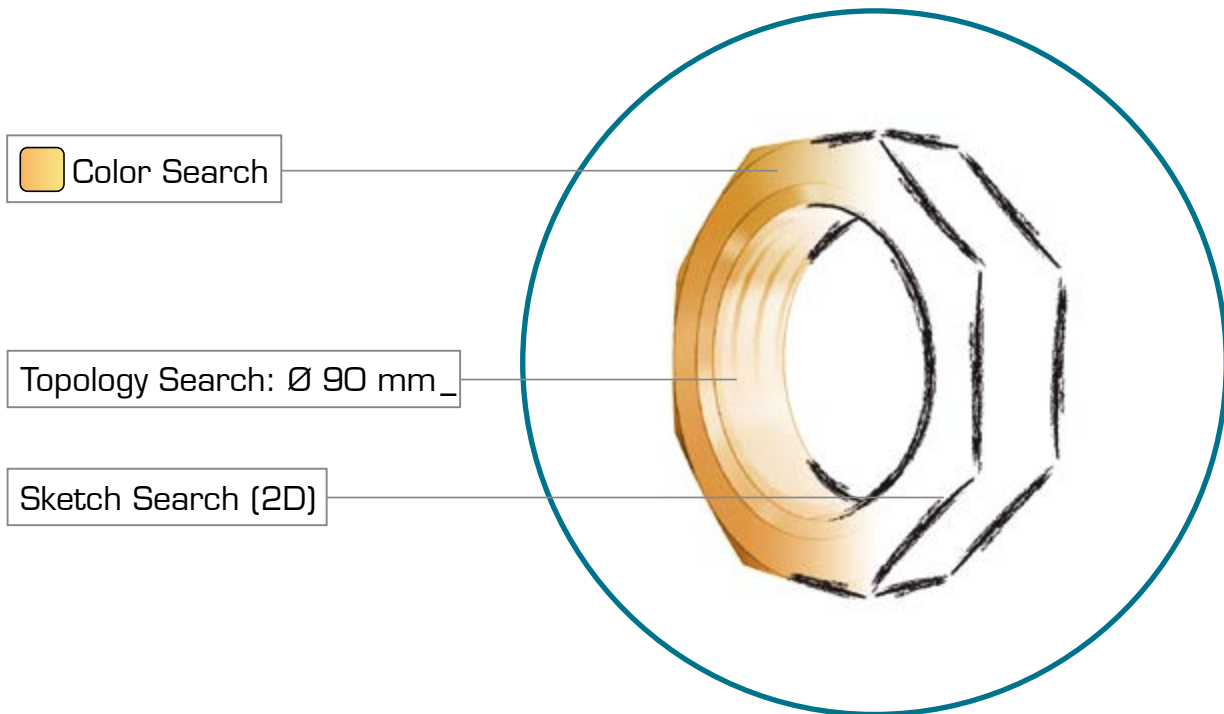
CADENAS opens up numerous innovative possibilities to engineers and purchasers, to find product information like CAD data of standard-, supplier- and company parts in an intelligent way.

Opposite to the traditional classification of parts master data, users neither have to learn a class system, nor adapt their search behavior to the system.

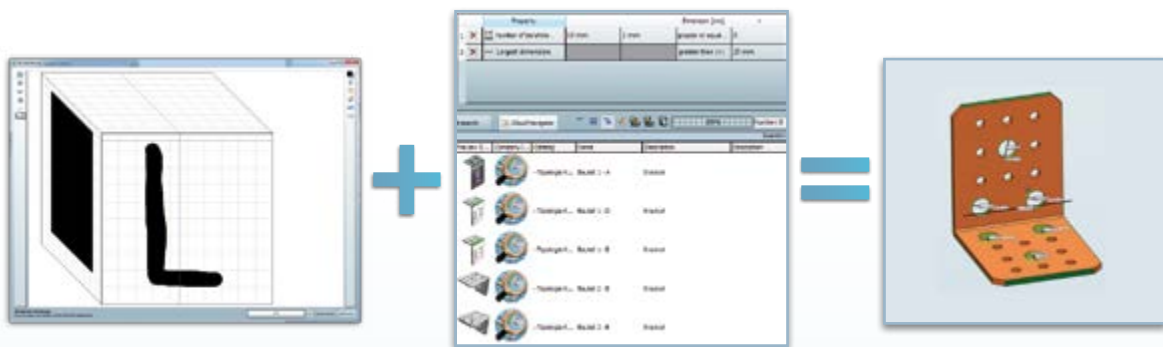
CADENAS' search functions were especially optimized to the needs of engineers and purchasers and make it easy to find necessary parts through intuitive handling.

All search methods are combinable in a cascading way.





## IN PRACTICE



Within PARTsolutions you make a simple 2D sketch of a component with the sketcher and as a result you get a list of hits that is too extensive.

However, you know that the component is bigger than 20 mm and has several drills of a certain diameter; thus you can consolidate your result list by means of CADENAS' Topology Search.

### Your benefit

- Combination of Full-text Search, Search by Sketching, Geometric Search, Topology Search, etc.
- No class system necessary

# Now it's GETTING TECHNICAL

## THE BENEFITS

With CADENAS intelligent search methods companies can significantly reduce the search effort for part information.

All search methods are applicable for:

company parts

supplier parts



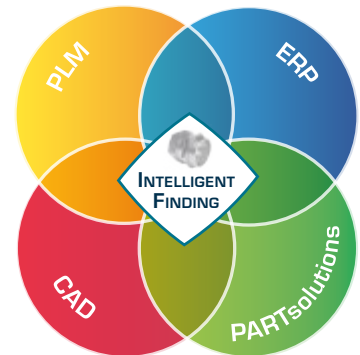
standard parts



Not much time or personnel effort is necessary for indexing the search data base.



The intelligent search functions can be integrated into existing CAD, PLM and ERP systems.



## Intelligent Finding vs. Conventional geometric similarity search methods

Range of functions: Intelligent Finding

	Standard- and supplier parts	Company parts
<b>Full-text Search</b> <ul style="list-style-type: none"> <li>■ Synonyms</li> <li>■ Related search terms</li> <li>■ Catchwords</li> </ul>	+	+
<b>Color Search</b>	+	+
<b>Search by Sketch (2D)</b>	+	+
<b>Geometric Similarity Search (3D)</b>	+	+
<b>Topology Search</b>	+	+
<b>Buy analysis</b> <ul style="list-style-type: none"> <li>■ Alternative suppliers</li> <li>■ Make or Buy</li> <li>■ Price Search</li> </ul>	+	+
<b>Cloud Navigator</b>	+	+

Range of functions: geometric similarity search

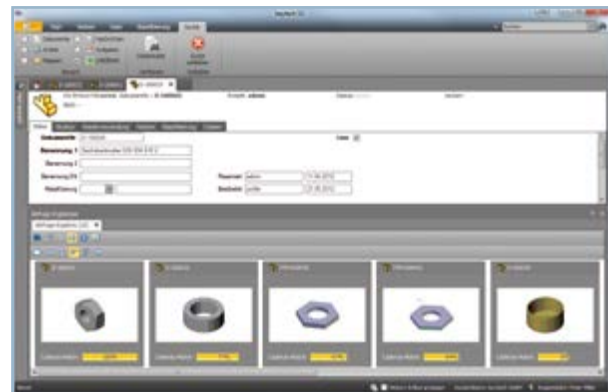
	Standard- and supplier parts	Company parts
<b>Full-text Search</b> <ul style="list-style-type: none"> <li>■ Synonyms</li> <li>■ Related search terms</li> <li>■ Catchwords</li> </ul>	-	-
<b>Color Search</b>	-	-
<b>Search by Sketch (2D)</b>	-	-
<b>Geometric Similarity Search (3D)</b>	-	+
<b>Topology search</b>	-	-
<b>Buy analysis</b> <ul style="list-style-type: none"> <li>■ Alternative suppliers</li> <li>■ Make or Buy</li> <li>■ Price Search</li> </ul>	-	-
<b>Cloud Navigator</b>	-	-

## THE SYSTEM ARCHITECTURE

Combine CADENAS' PARTsolutions with the intelligent search methods and find suitable components within the available standard-, supplier- and company parts world of the Strategic Parts Management. Moreover the search functions are integrated into numerous systems.

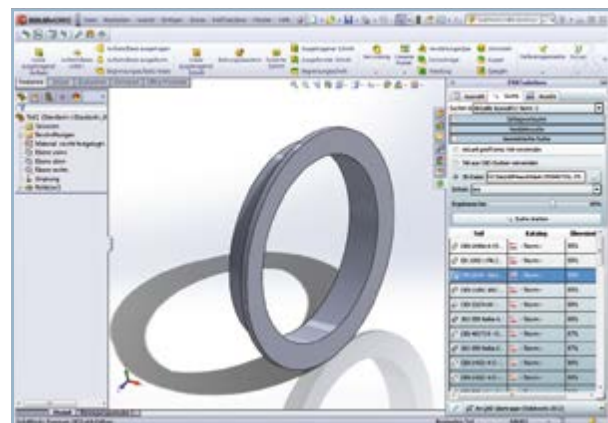
### Deep integration into PLM systems

The close cooperation to keytech Software GmbH resulted in a deep integration of CADENAS intelligent search functions into a PLM system. These can be directly started in keytech, without a change of system.



### Integration into CAD systems

CADENAS innovative search methods can be used with available CAD systems like CATIA®, Autodesk® Inventor®, SolidWorks®, Creo™ Parametric, NX™, AutoCAD® or Solid Edge®.



### Integration into other systems for instance: cost analysis

Combining TOOL4TOOL with CADENAS Geometric Similarity Search resulted in TOOL4Search, an extended calculation solution and structure for tool- and mold-making.



# USE CASES

## GEOMETRIC SIMILARITY SEARCH AT MAN TRUCK & BUS AG



### Search directly within the design

Advantages of the Geometric Similarity Search for engineering

For several years, PARTsolutions has been enjoying a high degree of acceptance, especially in engineering. The Geometric similarity search is the consistent amelioration of the PARTsolutions functional range.

The simple search functions promote the willingness of engineers to search for existing parts and thus significantly increases the reuse of MAN parts.

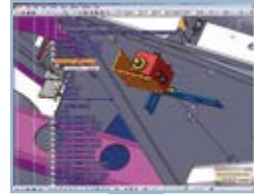
### Advantages at a glance

All important search functions for design and construction are summarized in CADENAS' Strategic Parts Management System.

### Resulting in:

- A higher willingness to search for and research parts
- Increased use of standard and supplier parts
- Minimal training needed

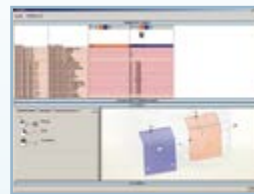
### Example:



In the respective CAD system, a part is created, whose 3D geometry is consulted for the search.



In PARTsolutions, the users are shown a list of all results of the Geometric Similarity Search with the respective percent value of geometrical conformity.



The geometrically similar part that was found can then be compared and measured with the constructed part in a 3D view.

»Engineering is enthralled by the new search methods that PARTsolutions offers. Especially the combination of classification and pure geometric similarity is a big hit. The fast and complete 3D preview has become indispensable.«



LUTZ GINSBERG  
DIRECTOR OF DEVELOPMENT CITY BUS  
AT MAN TRUCK & BUS AG

## AIRBUS AWARD FOR EXCELLENCE 2008



The project »GEOsearch Geometric Parts Search« was awarded the Airbus Award for Excellence.

### Results Project A380:

- Reuseability rate of nearly 40 % with the Geometric Similarity Search
- Due to savings during the pilot phase it was possible to refinance the entire pilot
- Decision of customer, to implement the Geometric Similarity Search of the Strategic Parts Management as a short term solution



# CADENAS – SETTING STANDARDS

CADENAS is a leading software developer in the areas of Strategic Parts Management and reduction (PARTsolutions) as well as Electronic Product Catalogs (eCATALOGsolutions).

CADENAS tailorable software solutions act as a link between component manufacturers, their products and the buyers.

With its 300 employees at 14 international locations, the name CADENAS (Spanish for chains) has stood for success, creativity, consulting and process optimization since 1992.

As a trend setter and initiator, CADENAS has already introduced many important innovations and trends.

These innovations include:

- The search for CAD parts using topologies
- The similarity search for CAD parts which runs automatically in the background
- The CAD parts search through sketching
- The Raw Part Search and the Cloud Navigator Search



More information about the latest innovations and our company can be found on our website at:  
[www.cadenas.de/en](http://www.cadenas.de/en)



# CADENAS UNITES

COMPONENT MANUFACTURERS & SUPPLIERS  
WITH THE INDUSTRY!

CADENAS SOLUTIONS  
for **industrial buyers** of components

## THE STRATEGIC PARTS MANAGEMENT

Sustainable cost reduction of standard, supplier and company parts for engineers and purchasers.



## THE GEOMETRIC SIMILARITY SEARCH

Find available CAD geometries in a smart way and classify them semi-automatically.



## THE ELECTRONIC PRODUCT CATALOG

The software solution to create and promote Electronic CAD Product Catalogs.



## THE SUPPLIER PORTAL

The platform improves the communication to external suppliers.



## THE VERTICAL MARKETPLACES

Numerous online marketplaces to multiply your Electronic CAD Product Catalog.



## THE PURCHINEERING CONCEPT

Improves the cooperation between purchasing and engineering.



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