

THE HISTORY OF CAD

THE MOUSE

The computer mouse became widely used in the late 70's, its original design was made by Douglas Engelbert who filed for the patent in 1967. The introduction of the mouse changed the way designing worked by making it easier for engineers to navigate a computer and design their parts.



The Future

Focus on Virtual Reality



Autodesk 360

Moved to the cloud, others followed



PRONTO

By: Dr. Patrick Hanratty



Dr. Patrick Hanratty, An American computer scientist, recognized as the "Father of CAD and CAM".

PRONTO was the first commercial numerical-control programming system, sparked everything that is CAD. Known as the building blocks of everything CAD

CADD

By: McDonnell-Douglas
Used for parts layouts and geometry work, continued to be improved upon and customized for specific uses

Digigraphics

By: Itek
First commercial CAD system, \$500000.00 per system, only sold 6 copies

ADAM

By: Patrick Hanratty



Interactive graphics design, drafting and manufacturing system written in Fortran and designed to work on virtually every machine, huge hit that went on to be updated to work on 16 and 32 bit computers, today 80% of CAD programs can be traced back to the roots of ADAM

GEOMOD

Featuring NURBS
SDRC developed GEOMOD which is geometric modeling product. This model generator was based on precision and accuracy



CADENAS Founded

Founded originally as an engineering firm but realized the potential of the engineering IT age

Unigraphics

By: Siemens NX
High end easy to use software used by many corporations that set a new gold standard for CAD software at this time

STEP

Took over from IGES as the new format to use when transferring 3D models from one to another, 1994 was the initial release of STEP that made it an international standard for models, still the most used format

SolidWorks 95

By: Dassault Systems
Another software that succeeded in ease of use, allowed more engineers than ever to take advantage of 3D CAD technology

CATIA Conferencing Groupware

By: Dassault Systems

The first to move online, allowing users to review and annotate CATIA models with others over the internet, quickly followed by others - Unigraphics' IMAN web author and CoCreate's Openspace Web

1957

Sketchpad

By: Ivan Sutherland

First to ever use a total graphic user interface, users wrote with a light pen on an x-y pointer display, let users constrain properties in a drawing, created the use of "objects" and "instances"

PDGS

By: Ford

Ford and other manufacturers started releasing internally developed CAD/CAM systems



SynthaVision

By: MAGI

First commercially available 3D solid modeling program

CADAM

Used by Lockheed, introduced CAD to aerospace design

MiniCAD

Best selling CAD software for Macintosh computers



Pro/Engineer

(PTC Creo)

First mainstream CAD program that took the ideas of Sketchpad and made it come to life, based on solid models, history based features, and the use of constraints, this was a huge turn in CAD history



Autodesk AutoCAD

Releases 13
Made the Autodesk program 3D



eCATALOG

By: CADENAS PARTSolutions

CADENAS enters the native 3D CAD model market with eCATALOG solutions digital product catalogs that featured multiple Native CAD formats for the first time

Solid Edge

By: Siemens

Made as a PLM software, functions on Windows, provides solid modeling, assembly modeling, and 2D orthographic view, response to the success of SolidWorks



Autodesk Inventor

Autodesk's new direction, tried to be more intuitive and simple, also allowed the creation of complex assemblies in record time, still in use, really turned the game in the CAD world

Onshape

Completely cloud based CAD program

CADENAS PARTSolutions

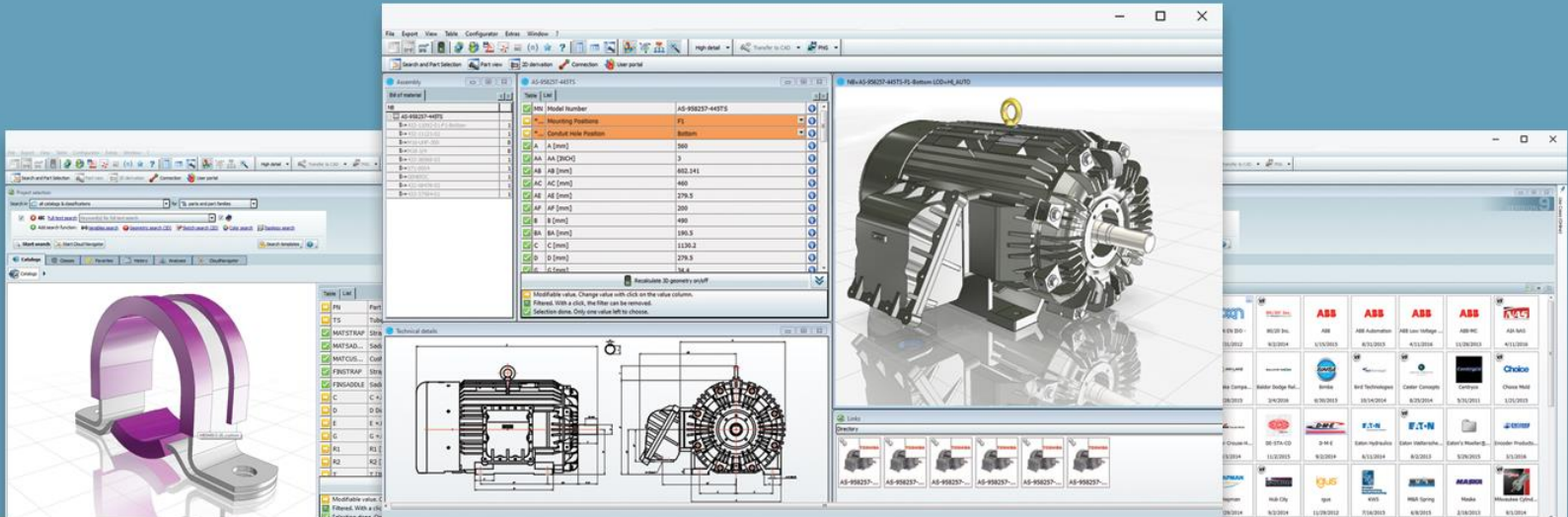
Helping manufacturers "future proof" their catalog by keeping current with future native formats, versions and revisions.

INTO THE FUTURE...

POPULAR CAD FORMATS

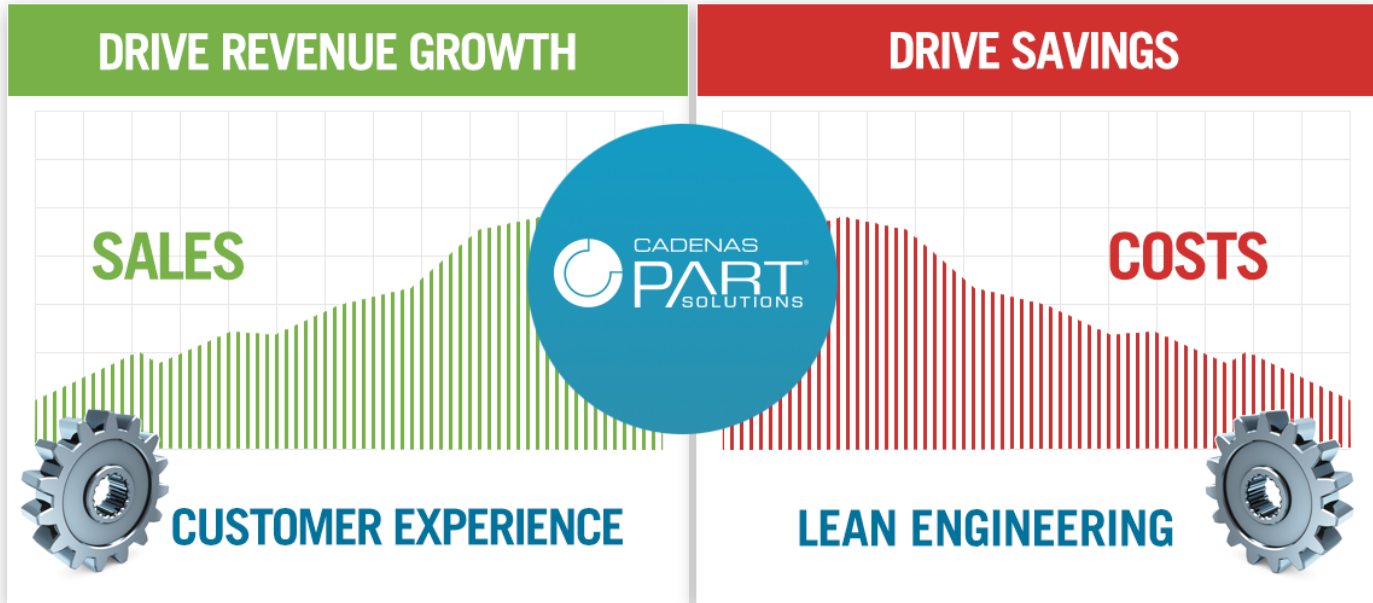


Popular CAD Formats and Versions Added to the CADENAS eCATALOGsolutions platform



The Future of 3D Standardization in the Digital Age

Helping Manufacturers Grow



**COMPONENT
MANUFACTURERS**

Top Line Revenue

**ORIGINAL EQUIPMENT
MANUFACTURERS**

Cost Avoidance

Reinheitsgebot:

“German Beer Purity Law”

According to the 1516 Bavarian law, the only ingredients that could be used in the production of beer were water, barley and hops.

The 1516 Bavarian law set the price of beer (depending on the time of year and type of beer), limited the profits made by innkeepers, **and made confiscation the penalty for making impure beer.**



2 Main Categories:



Varieties of Beer



2 Main “Core Geometry Kernels” in use today

CAD Purity:

ACIS (enhanced)



PARASOLID



Industry terms used today

PDM – Product Data Management

PLM – Product Lifecycle Management

MBD – Model Based Definition

MBE – Model Based Enterprise

ERP – Enterprise Resource Planning

SCM – Supply Chain Management

IIoT – Industrial Internet of Things

Digital Twin



Industry terms used today (cont.)

CAD - Computer Aided Design

“**Full Fidelity**” Native File- CAD Specific file

STEP- Standard for the Exchange of Product Model Data (Neutral Format) (LOTAR)

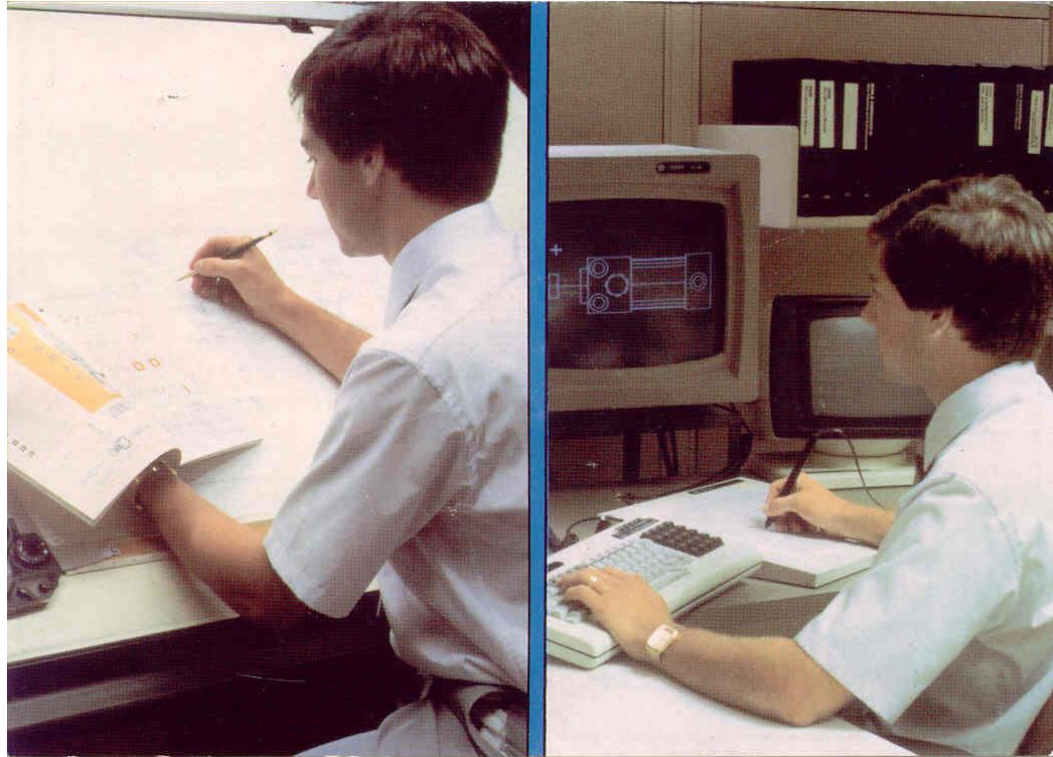
BREP- Boundary Representation
(space claim, no fidelity)

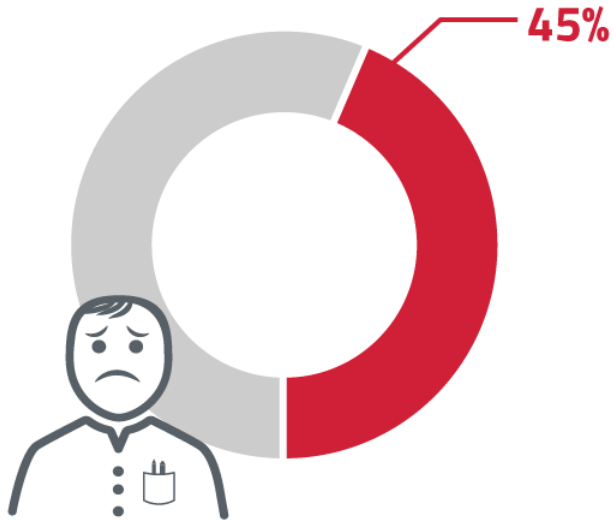
IP- Intellectual Property

Form, Fit and Function model = Derivative work



1984 – My “Purity” quest





45% of engineering time is wasted searching for or redrawing parts

that's non-value added time

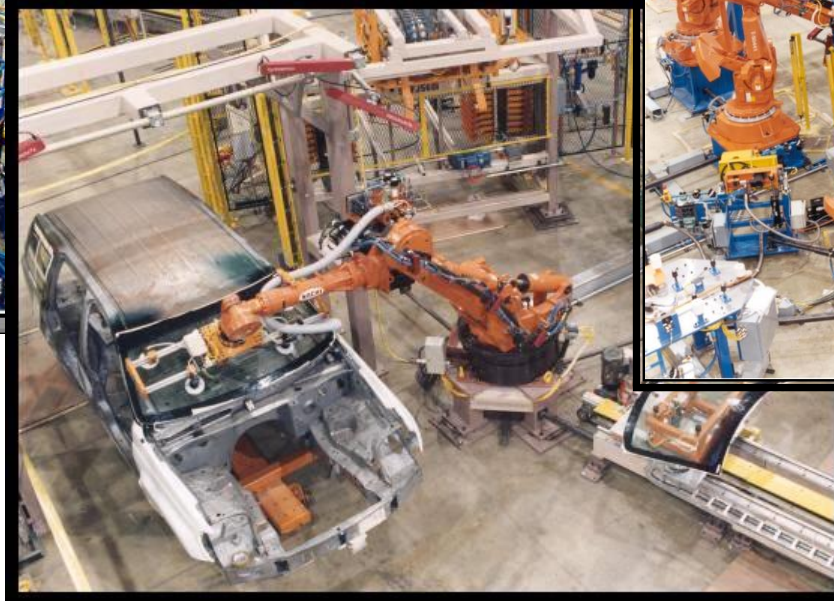
Childhood LEGO:



Engineer's LEGO:

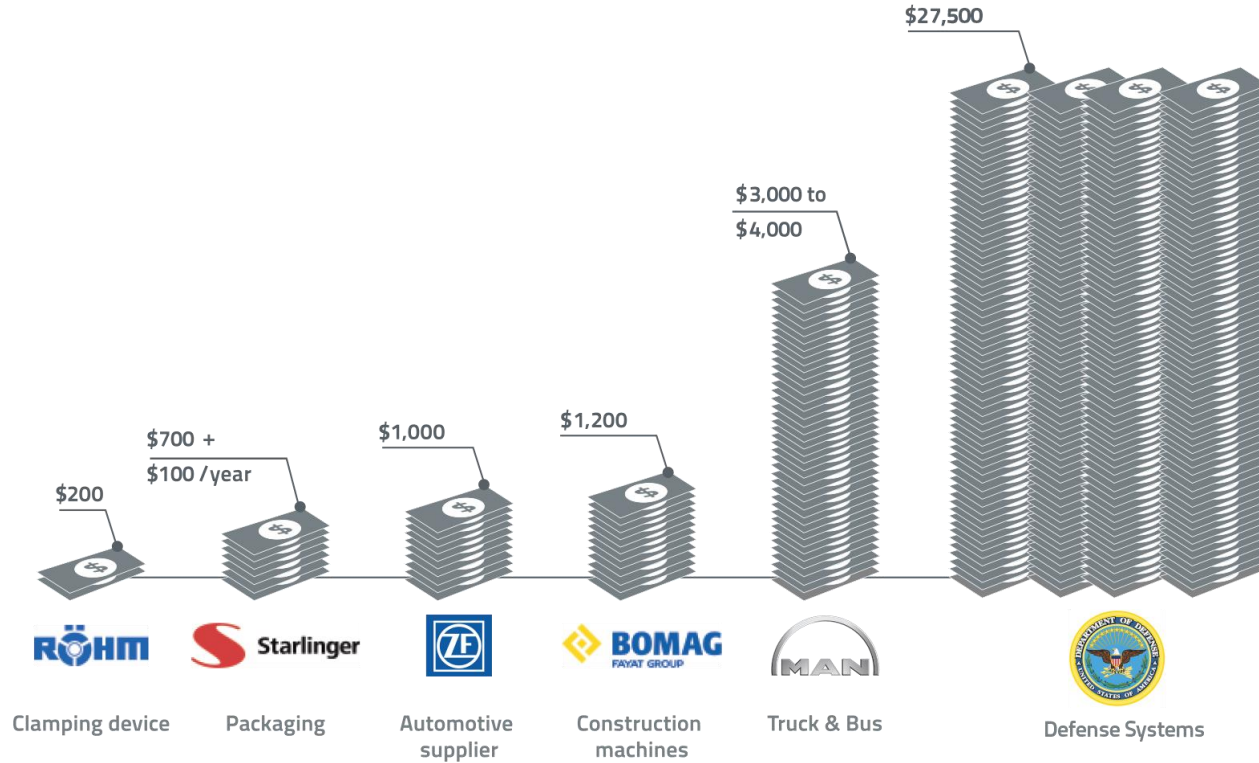


A Typical LEGO Design Problem:

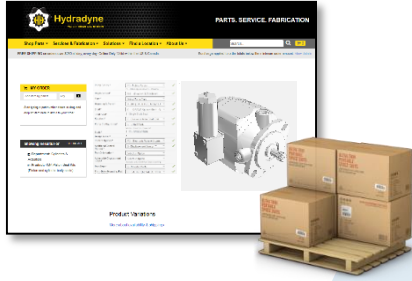


90 % of these parts
are “off-the-shelf”

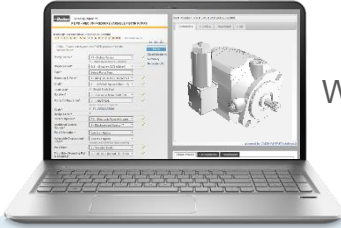
Cost to introduce a new part



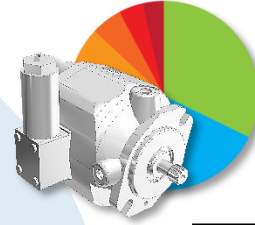
Distributors



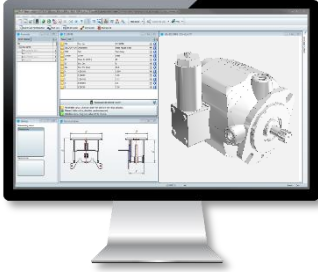
Web Configurators



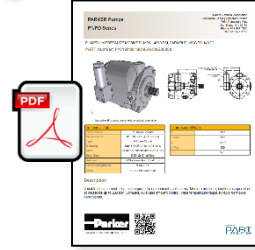
100+ CAD & Graphic Output Formats



OEM Catalogs



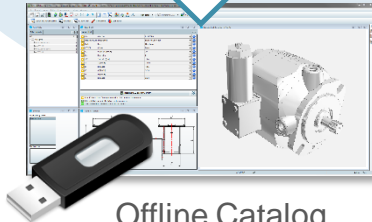
3D PDF Sales Sheets



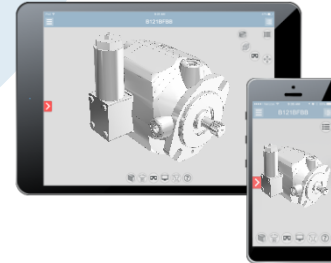
80+ Online Marketplaces

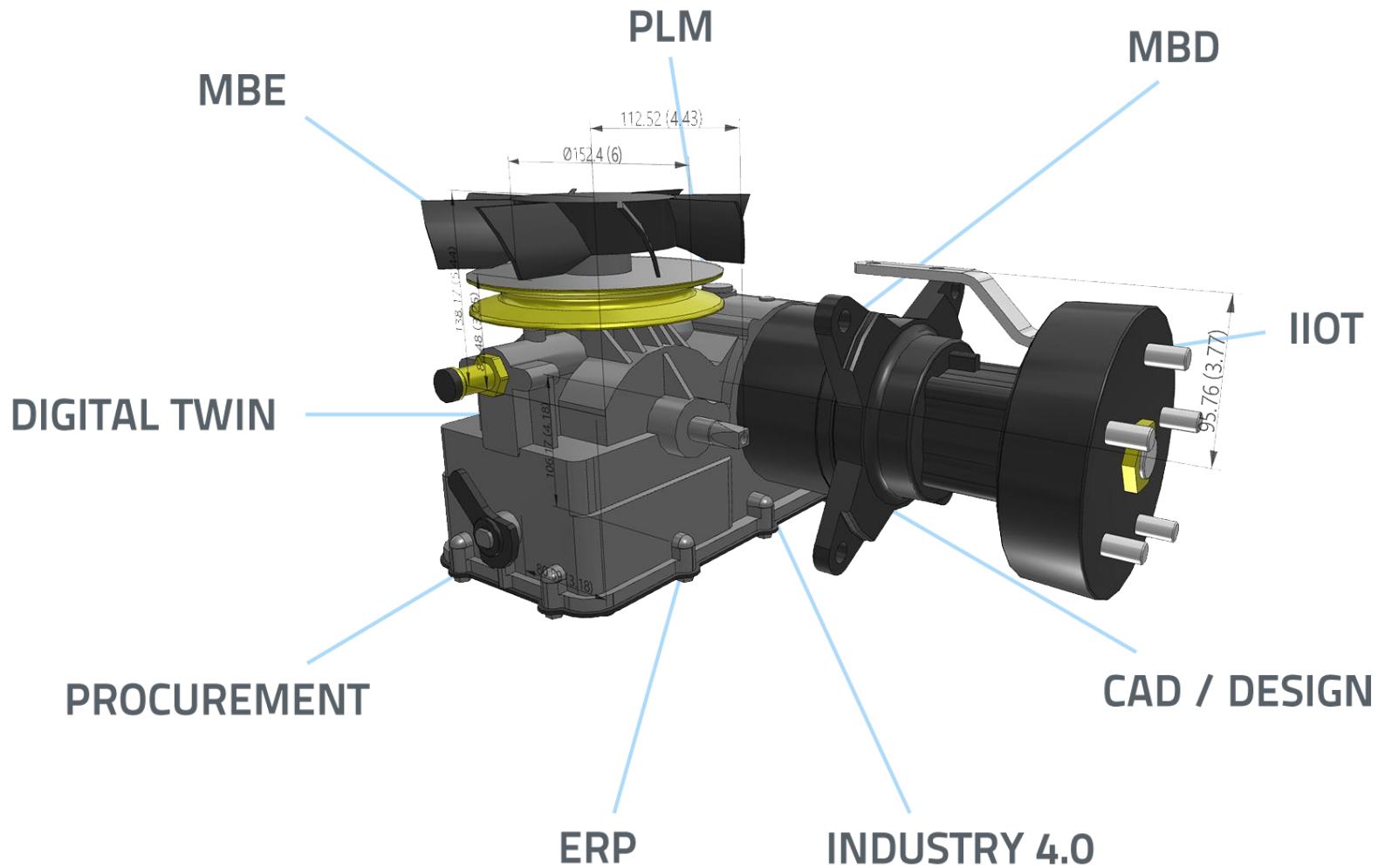


Offline Catalog

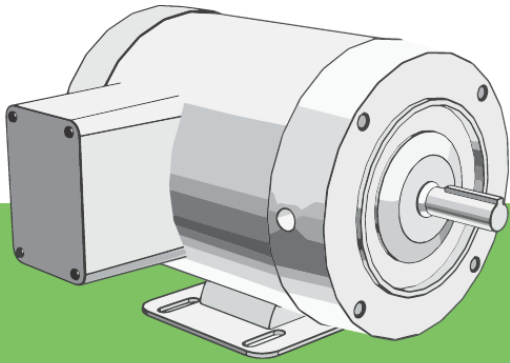


Mobile

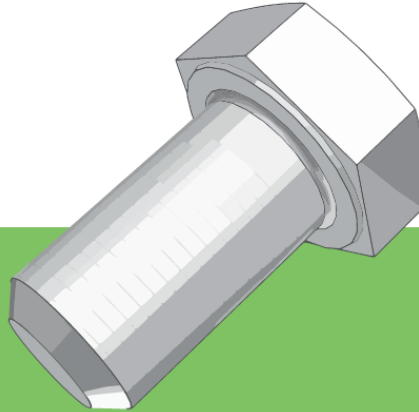




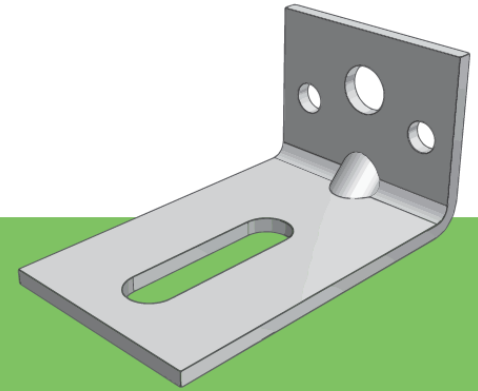
The MBD Inventory



COMMERCIAL STANDARD PARTS



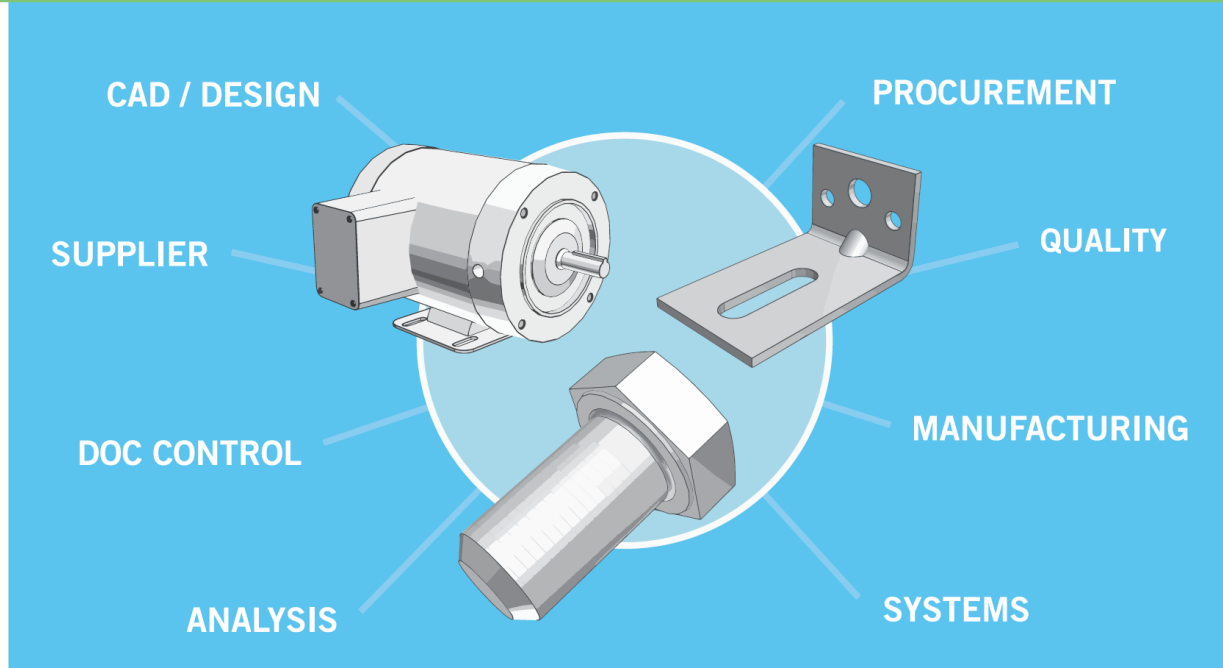
INDUSTRY STANDARD PARTS



COMPANY STANDARD PARTS

The MBE Value Streams

How MBE Powers Your Whole Organization



The MBD Inventory

➕ Add search function: [A# Variables search](#) [Geometric search \(3D\)](#) [Sketch search \(2D\)](#) [Color search](#) [Search for unmachined parts](#) [Partial search](#) [Classification 2.0 search](#) [Topology search](#)

Start search Start Cloud Navigator Cloud Map

Assistant Part selection Part view Part comparison Cloud Navigator Search results

H01540-10-21-7x0.25

Table Vertical

Enter a search term...

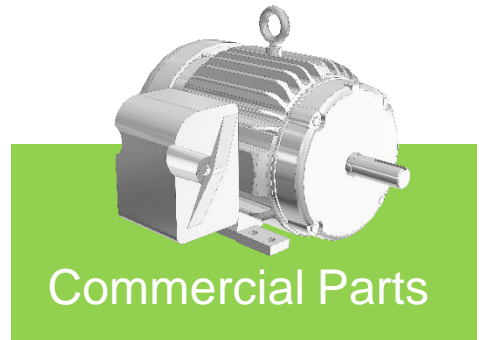
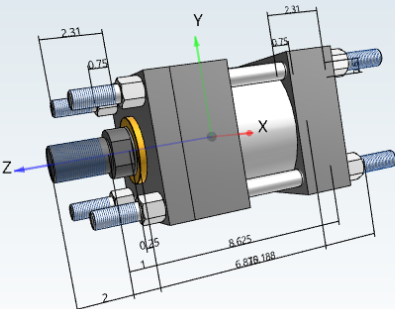
ERP variables Main variables Secondary variables Topology variables

	CT	MT	BORE	SAE	RD	CD	RS	STROKE	ER	LER	ERD	ERDL
	Cylinder Type	Mounting Style	Bore (IN...		Rod Diam...	Cylinder ...	Rod End Style	Stroke (IN...	Extended Rod	Extended ...	Extended ...	Extended ...
5	Single Rod End	10 Tie-Rods Extended Both Ends (MX1)	4	#12	1 3/4	H01540	Standard Male (KK2)	0.25	Without Extended Rod	0	N/A	0
6	Single Rod End	10 Tie-Rods Extended Both Ends (MX1)	5	#12	2	H01550	Standard Male (KK2)	0.25	Without Extended Rod	0	N/A	0
7	Single Rod End	10 Tie-Rods Extended Both Ends (MX1)	6	#16	2 1/2	H01560	Standard Male (KK2)	0.25	Without Extended Rod	0	N/A	0
8	Single Rod End	10 Tie-Rods Extended Both Ends (MX1)	7	#20	3	H01570	Standard Male (KK2)	0.25	Without Extended Rod	0	N/A	0

Part information Topology information H01540-10-21-7x0.25-P1P1NN1-00... Technical details (19) 2D derivation

Language: English

Standard number: Series H
Description: Heavy Duty Hydraulic Cylinders
Company: Milwaukee Cylinder
Last changed: 8/29/2014 1:54:40 AM
Unit: INCH
Path: [C:\cadenas\data\23d-libs\milwaukee\cylinder\h... \parts\h_series_asmtab.pj](#)
Project type: Assembly table



The MBD Inventory

NA0037-100006

Table Vertical

Enter a search term...

ERP variables Main variables Secondary variables Topol

	PN	THD	MAT	HT	FIN	GRIP	LG	SIZE	HEAD	SHANK	B	C	DMAX	DMIN
	Part Number	Thread Size...	Material	Heat Trea...	Finish	Grip +0.2/...	Length +...	Shank Size	Head Undrilled/...	Shank Undrilled/Dri...	B Diamet...	C - Min. [...]	D Diamet...	D Diamet
3	NA0037-080004	MJ8 x 1	Titanium Alloy	1100 MPa	None	4	15.5	Standard Shank	Undrilled Head	Undrilled Threads	12.2	14.3	7.987	7.962
4	NA0037-100006	MJ10 x 1.25	Titanium Alloy	1100 MPa	None	6	20.5	Standard Shank	Undrilled Head	Undrilled Threads	16.0	18.9	9.987	9.962
5	NA0037-120006	MJ12 x 1.25	Titanium Alloy	1100 MPa	None	6	22.0	Standard Shank	Undrilled Head	Undrilled Threads	18.0	21.1	11.984	11.959
6	NA0037-140008	MJ14 x 1.5	Titanium Alloy	1100 MPa	None	8	27.0	Standard Shank	Undrilled Head	Undrilled Threads	21.0	24.5	13.984	13.959

Part information | Topology information

Language: English

Standard number: NA0037

Description: Bolt, Tension, Close Tolerance, Hexagon Head, Titanium Alloy, 1100 MPa Ft_u, Metric

Company: AIA NAS

Last changed: 10/1/2015 12:47:26 AM

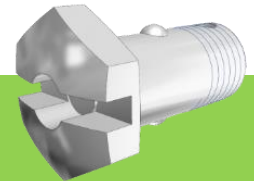
Unit: mm

Path: C:\cadenas\data\23d-libs\aianas\prj\bolts\na0037

Project type: 3D project

NA0037-100006 | Technical details (1) | 2D derivation

The technical drawing shows a bolt with a hexagonal head. Key dimensions include a head width of 16.7 mm, a head thickness of 4.85 mm, a head-to-shank transition radius of 0.25 mm, a shank diameter of 10 mm, a shank length of 6 mm, a total length of 20.5 mm, and a threaded length of 14.5 mm. The shank diameter is also labeled as 16 mm.



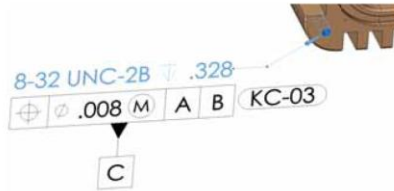
Industry Standards

The MBD Inventory



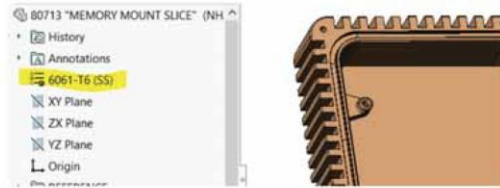
Geometry:

The 3D shape of a product.



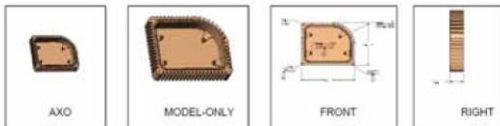
Annotations:

Visible dimensions, tolerances or notes about a design. Priority on machine readable geometric tolerances is preferred, over human-only readable basic dimensions.



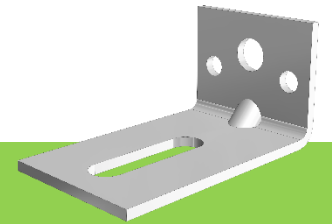
Attributes:

The "hidden information" such as metadata. e.g. part number, description, and revision. This information is not visible (or displayed, but is available upon interrogation of the annotated model.



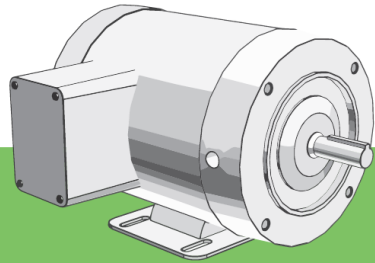
Presentation:

A combination of saved views (snapshot of orientation and zoom) of the model and groupings of selected annotations (displayed tolerances and notes).

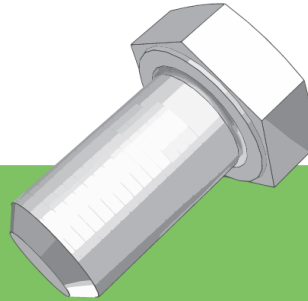


Company Parts

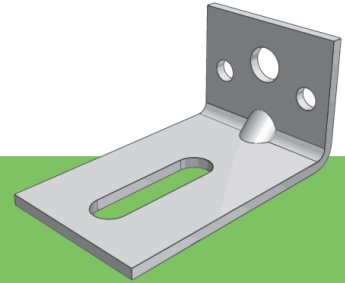
MBD/MBE Inventory Summarized



COMMERCIAL STANDARD PARTS



INDUSTRY STANDARD PARTS



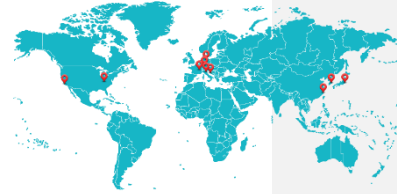
COMPANY STANDARD PARTS

GEOMETRY	✓	✓	✓
ANNOTATIONS	LIMITED USE		✓
ATTRIBUTES	✓	✓	✓
PRESENTATION			✓

Achieving Digital Twin.....

PARTsolutions Integration with
SIEMENS Mechatronics Concept Designer
using ACE CADENAS eCATALOG

Call to Action!



- Focus on “Value-Added” Activities
- Analyze the 3 part types for “process centric” requirements
- Require vendors to support your “Digital Twin” requirements
- The landscape of requirements for “Full Fidelity” Native data is constantly changing, follow it

Worldwide Corporate Standard for:

