The New Version

EASY-ROB™ V8.0
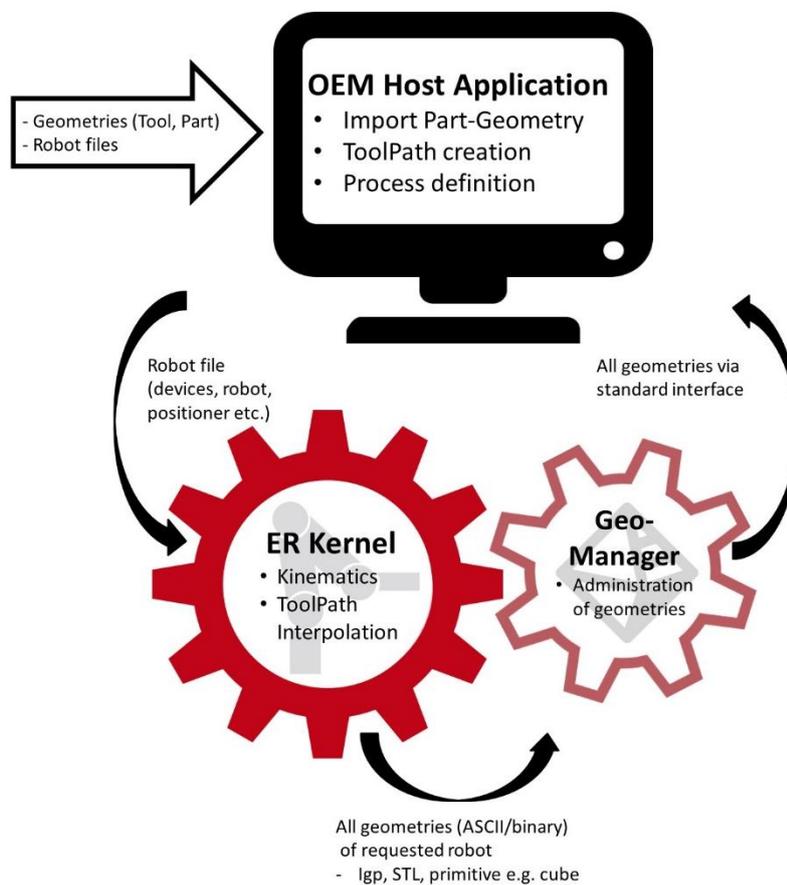
November 2019

Version 1.9

EASY-ROB™

Table of content

EASY-ROB™ V8.0 Update

Dear EASY-ROB™ Community!

We are hAppy to introduce the new EASY-ROB™ version 8.0 and, as always, you will find the highlights here in the quick overview:

- **License Manager does not require a new installation on Major Release Update**
  With version 8.0, the License Manager gains even more flexibility and user-friendliness.
- **EASY-ROB™ AutoPath™**
  Collision-free path planning
  EASY-ROB™ AutoPath™ creates collision-free paths. The automatic calculation greatly simplifies the work of the operator. Let your software benefit from the new way of programming. The Quality Index now lets you compare results.
- **EASY-ROB™ Kernel (ERK) News: GeoManager -Top Topic!**
  Management of geometries via standard interface now directly possible. No more hassle when implementing robotic models thanks to the GeoManager.
- **Calculate custom kinematics with your own solution**
  With API-KIN, the calculation of the forward and inverse kinematics can take place in a separate DLL.
- **EASY-ROB™ Framework (ERF) News**
  New API function "chk_collision_devices_tupel_list ()" brings together individual customer requirements with the well-known, ultra-high-performance collision control.
- **EASY-ROB™ Server**
  New Hardware at EASY-ROB Software GmbH:
  By overhauling the hardware, the EASY-ROB Software GmbH works on a new server. Also, the License Manager is provided as a service to the customers of the EASY-ROB Software GmbH and allows a better monetization for time-limited licenses, since one can map, among other things, an exact consumption of user time.
- **3D-PDF Export**
  New optimization reduces file size by almost 40%!
- **Roboter Bibliothek**
  The EASY-ROB™ robotic library continues to grow
  With version 8.0 again more than 20 new models are published! Not only individual models, but also entire series were integrated by our employees for example from Stäubli the TS-2 series. Also, there is are new manufacturers: Omron Corp. / Techman Robot Inc. and Mecademic.

Effective immediately, all customers with a valid V8.0 license or software maintenance agreement will receive the new EASY-ROB™ Version 8.0 free of charge.

For customers with older versions it is possible to purchase an update. Please contact our sales department under +49 6192 921 70 79 or sales@easy-rob.com.

We would like to thank you in advance for your suggestions.

Many Thanks!

Your EASY-ROB Team

License Manager does not require a new installation at update

With version 8.0 the popular License Manager gets an update, which also concerns the installation:

If the License Manager was already installed and a new version was released by EASY-ROB Software GmbH, the License Manager also had to be reinstalled, although in many cases only the App Professional, the Framework or the Kernel were affected by the update.

During the installation of the License Manager, which was done on a server, the IT department was often involved and complained about this additional effort, because in addition to the EASY-ROB™ products always the License Manager had to be reinstalled, too.

Only exchange license file required

Thanks to EASY-ROB's clear customer focus, Stefan Anton, Managing Director, decided that a change was needed:

Therefore, as of version 8.0, there will be no need for a new installation for future updates for the License Manager-

Only the convenient and fast exchange of the license file "license.dat" is required.
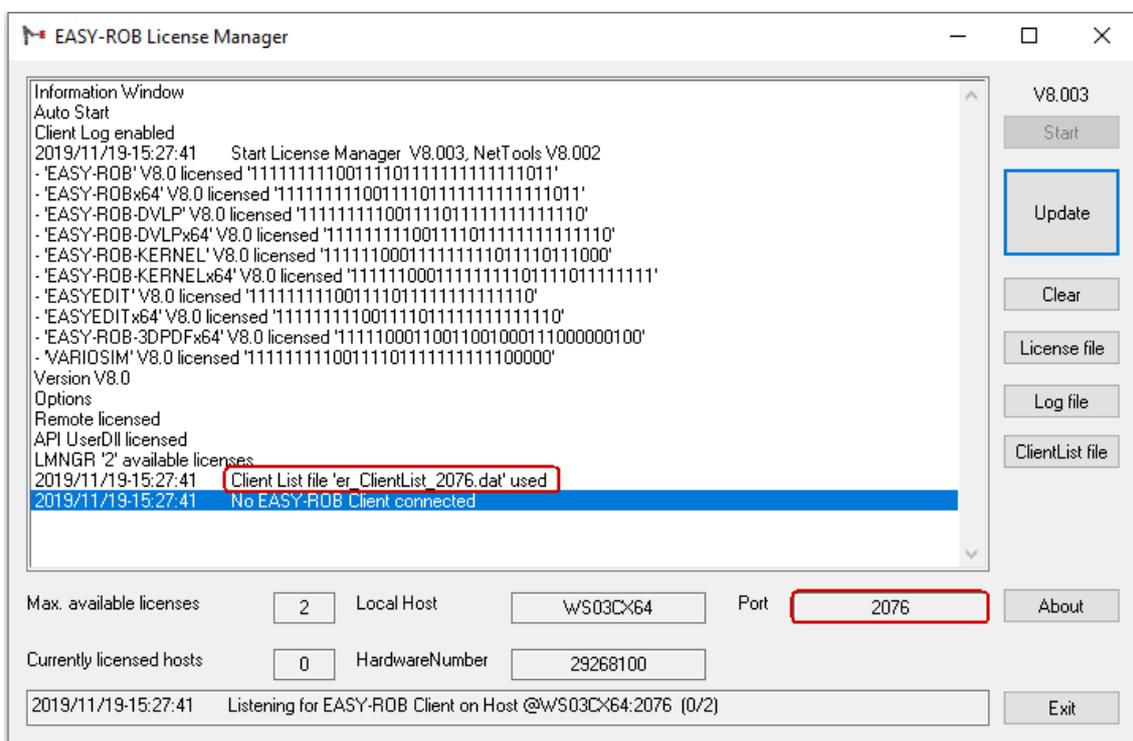
As of version 8.0, only update of the license file is necessary at update

More flexibility and ease of use for OEM partners and end users

For all OEM partners this also means a noticeable gain in flexibility and user-friendliness for their own products.

On the one hand, during the installation, as part of the update, support of OEM partner will no longer have to be provided and, on the other hand, the end customers will be rewarded because their own IT support is no longer involved.

Exchange of "license.dat" = new version.

For customers with older versions it is possible to purchase an update. Please contact our sales department under +49 6192 921 70 79 or sales@easy-rob.com.

Convenient and fast management through ClientLists

A ClientList allows flexible management of clients. It includes all participants as well as assigned products, expire date, etc., to which an EASY-ROB™ license should be made available.

The file name of the ClientList is formed from the assigned valid port number:

```
er_ClientList_ "Port" .dat
```

Another use is the clustering of licenses and clients after for example customers, prospects or trial licenses and for internal employees.

Parameters can be used to differentiate the licenses in the ClientList.

In addition to mandatory parameters that identify the client, such as the host name and hardware number, there are optional parameters for controlling the licenses and the EASY ROB™ products or modules provided:

- Hostname*
  Name of Client PC

- Hardware Nummer*
  Individuelle ID of client PC

- Expiration date
  0 (default) or 00000000 unlimited, else e.g. 20190806 (YYYYMMDD)

- Products
  0 (default) - all products
  EASY-ROBx64   (Approval for ERA)
  EASY-ROB-KERNELx64   (Approval for ERF)
  EASY-ROB-DVLPx64   (Approval for ERK)
  ERA-ERF-ERK-EE-3DPDF-COLL-VISU   (Approval for several products)

- Number of versions
  V0.0 (default) all versions, else e.g. V7.6 or V8.0

- Number of instances
  0 (default) unlimited, else 1 = for one session

- Comment
  # some comment text

*) mandatory parameter

Example:

Port = *2076* --> ClientList = „*er_ClientList_2076.dat*"

```
! File name:
!    er_ClientList_"Port".dat
! Port:    7076
!
! ------------------------------------------------
!Internal
!
WS01   47114712                   # Desktop, Mr.X
WS01   47114712 0 0 v0.0 0        # same as "WS01 29268100", all
                                    optional parameter are default

WS01   47114712 20190820          # license expires on 20 AUG 2019
WS01   47114712 0 EASY-ROBx64     # no expiration, only product
                                    EASY-ROBx64 is licensed
WS01   47114712 0 0 v7.6          # only product up to v7.6 are licensed
WS01   47114712 0 0 v0.0 1        # only one session is allowed
WS01   47114712 0 ERA-ERF         # only products "EASY-ROB APP,
                                    EASY-ROB Framework
! ------------------------------------------------
!Internal
!
...
!
```

Newnesses for the EASY-ROB™ Kernel (ERK)

Here you will find the new developments developed by EASY-ROB Software GmbH for the EASY ROB™ Kernel (ERK) and the associated simplified integration into technology-based software Applications.

Custom kinematics calculated by own solution

The Kernel has been enhanced with an important API function:

API-KIN - Calculation of forward and inverse kinematics in a DLL.

So far, users have been able to mathematically describe and model their own robots / kinematics with EASY-ROB™ Kinematics. With a large number of available Robotics solutions in EASY-ROB™, these are immediately fully available in the Kernel. Customers are thus extremely flexible, especially when creating simple turntables or feeding units.

However, if special kinematics are involved, such as parallel kinematic machines (PKM), then one's own mathematics must also be implementable.

The new API-KIN option allows the user to fully integrate custom kinematics, to implement the mathematical solution for calculating forward and inverse kinematics, and to test and optimize the manipulability of its kinematics during development.

API-KIN - Custom kinematics

Ultimately, customers and OEM partners can use exported functions to directly access the robot data, such as kinematic lengths, direction of rotation, axis offsets, travel ranges or the TCP position. Mathematical functions for handling homogeneous transformation matrices are available as well as trigonometric functions for angle, triangular and trapezoidal calculations.

Internal information remains internal

Thus, the know-how of customers and OEM partners remains in-house, if the solutions should not be shared. Also no service on the part of EASY-ROB Software GmbH is necessary.

Previously, this option was reserved only to customers of the App and the Framework to develop their own inverse solutions and then to use in simulations.

ToolPath - trajectories now possible with tens of thousands of targets!

The ToolPath is a trajectory for robots or devices and consists of target positions (targets) and can be generated in the ERC (method class: ERK_CAPI_TOOLPATH). All targets include attributes such as name, ID, index, speed, acceleration, job data, external axis values, job data and -names, reference coordinate systems, synchronization flags, movement types (PTP, SLEW, LIN, CIRC), instructions, etc.

Performance optimization with extremely many targets

When using the ToolPath, taking into account extremely many targets (> 100,000), a noticeable performance loss was found.

Applications based on CAM and requiring dense point ordering rely on this large number of targets.

One could identify the bottleneck and the reason was the method "Add_TARGET_LOCATION_PATH()", which controls the addition of the target position in the path.

An optimization of the ToolPaths storage by dynamic management in packages has eliminated the bottleneck and significantly improved performance.

ERK with potential for young Applications

The EASY-ROB™ Kernel is not only interesting for customers of classic Applications, but also opens up new processes with its power reserves for example Additive Manufacturing.

ToolBox - new function

The "ERK-ToolBox" functionality is a powerful addition to the EASY-ROB™ Kernel.

Based on a defined ToolPath, various calculations can be carried out using the ERK ToolBox, i.a. in order to be able to calculate external axis values of one- or two-axis positioning as a function of required constraints, e.g. orthogonal tool orientation.

New calculation method

The new solution now calculates the external axis value for the second axis of the positioner ("tilt axis"), if you do not want to have a ToolPath on the outer surface, but wants to create on the face of a cylinder.

The required tool orientation of the targets, in this case z-direction, is orthogonal to the face of the cylinder: z points upwards and x in the radial direction or in other words the positioner is in a singularity, this means both axes are equal to 0.

The second axis is still calculated so that the x-axis of the TCP (red arrow) is always pointing and held in a constant direction, see picture.
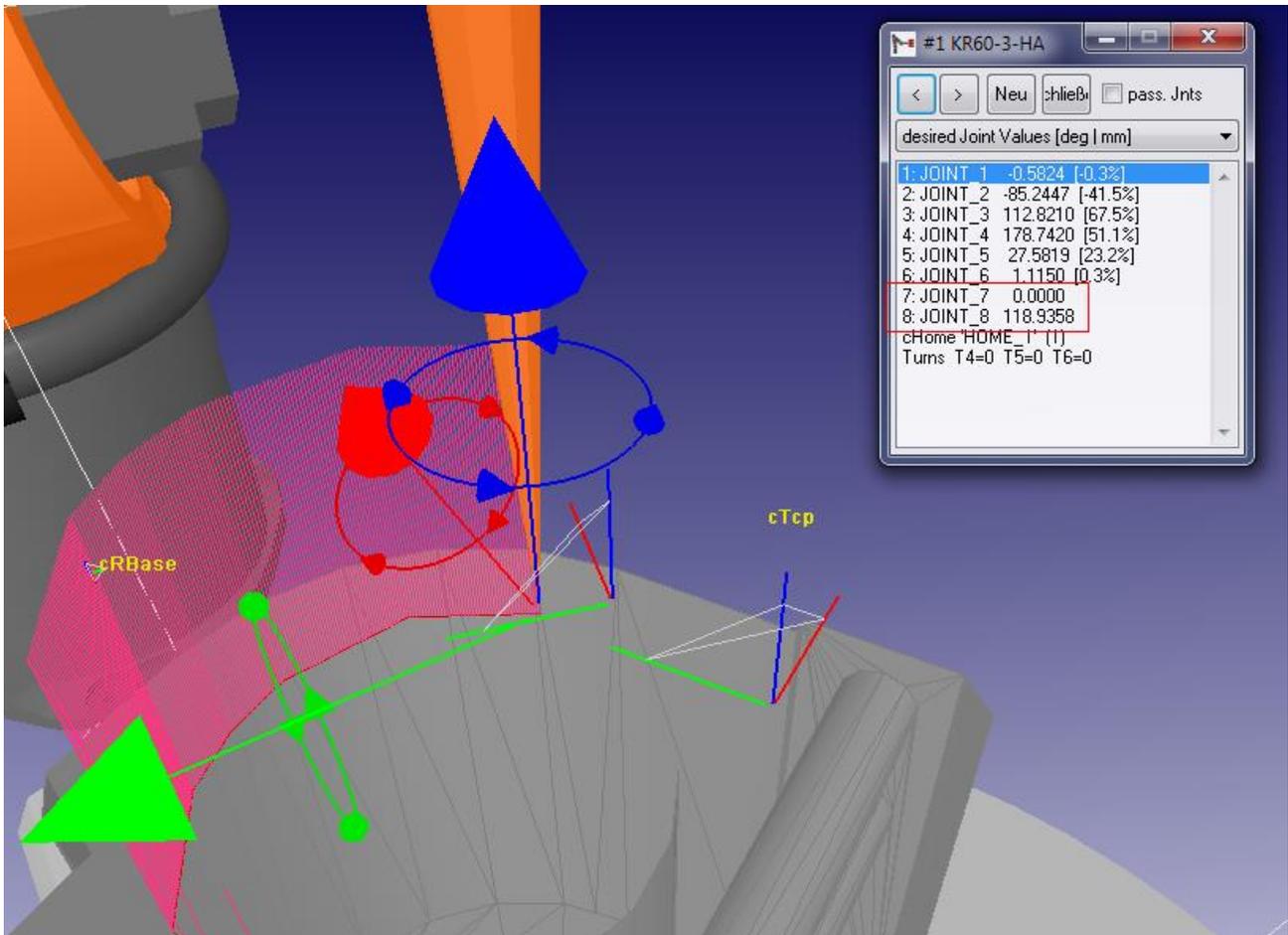
Target orientation

For a viewer, it Appears that the TCP is not moving, although it is a synchronized movement between the robot and the positioner, since both movements, rotation of the positioner and feeding of TCP cancel each other out.

GeoManager

The GeoManager is a new interface of the EASY-ROB™ Kernel (ERK) for managing geometries and to render rob files in the Host Application or their visualization easier and, above all, "faster" (without much implementation effort).

Instead of writing tedious import filters for the Host Application, only one standard interface needs to be addressed in the future. Previously there were several filters for example for the own IGP format (ascii, binary), STL format (ascii, binary, colored, uncolored), primitive geometries, etc.
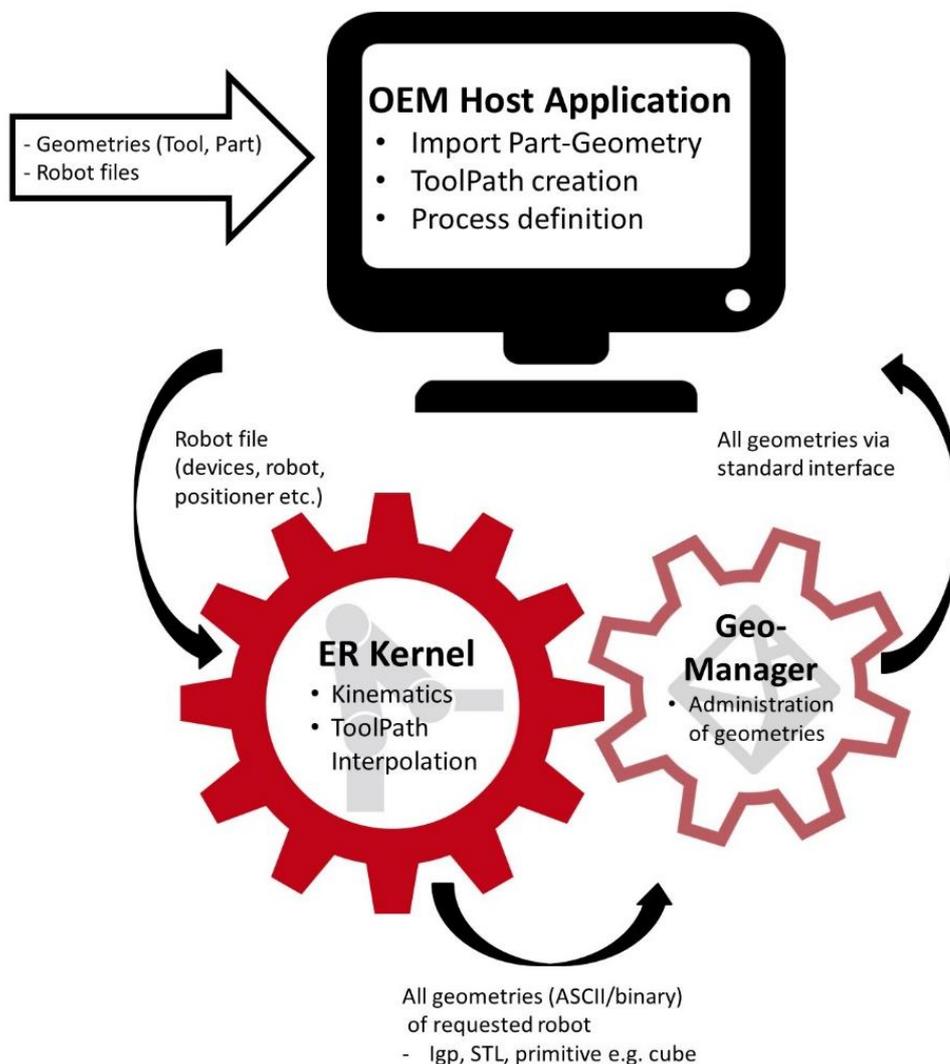
Workflow of the GeoManager/ERK with Host-Applikation

With the GeoManager, the Host Application no longer has to differentiate, whether it's an IGP or STL file or if it's a primitive, among other things like cuboid, cones, etc.

Management of geometries via standard interface

Using the standard interface, the Host Application retrieves the necessary geometries of the robot models and feeds them into its own data structure. Afterwards they can be deleted again from the GeoManager.

Not only does the Host Application access a simplified and clear interface to import the geometry files, but the Kernel or GeoManager also manages / organizes all geometries.

The GeoManager also provides attribute information for all geometries. These include, for example, file name, geometry name, color, transparency, render type, collision properties with tolerance, xyz scaling, position, and axis membership.
The axis assignment describes to which axis coordinate system the geometry is "attached". The position calculation of the axis coordinate systems is done by the Kernel. Thanks to the slim standard interface, a uniform administration is realized.

Of course you can clone geometries, this means once a geometry has been loaded into the GeoManager you can directly access the attributes and reuse them in the visualization of the Host Application. Reloading via the interface is no longer necessary and brings performance.

Better Time-to-market

The GeoManager gives you even faster access to the robot libraries and more than 1000 robot models per se.

> "Especially the simplification for fresh users was in focus" says Patryk Lischka, Senior Product Manager. "New customers just have to do the drawing in their own OpenGL window, the rest of the work, from administration to transformation of the coordinate systems, is done and already works".

Thus, with EASY-ROB™ modules, a better time-to-market is achieved, which is crucial for the success of their own products.

Concentration on core tasks

Also, the development teams can focus on their actual tasks / Application.

Rather than worrying about the implementation, employees can deal with the Host Application itself, for example implement processes, process customer concerns or be responsible for the next release.

Newnesses for the EASY-ROB™ Framework (ERF)

Also for the Framework there are novelties.

Define collision lists

EASY-ROB™ has an internal collision mechanism that detects dependencies on and between devices / geometries, thus performing a high-performance collision check.

In order to meet the individual requirements of our users, collision lists can be created. Thus, only "desired" devices are checked for collision, resulting in significant performance gains in individual cases. This enables a more targeted collision check to check individual devices for collision.

New API-function "chk_collision_devices_tupel_list()"

The new method takes as parameter a list of COLL_DEVICE_TUPELs, where a device tuple consists of a COLL_DEVICE. The method checks whether the specified device tuples collide. In the event of a collision, the pairs can be retrieved using the 2 methods "get_number_of_collision_pairs ()" and "get_collision_pairs ()".

```
static ER_DllExport int
ER_CAPI_SIM_COLLISION::chk_collision_devices_tupel_list    ( int                    n_dev_tupel_list,
                                                             COLL_DEVICE_TUPEL *     dev_tupel_list,
                                                             int                     setting = 0
                                                           )                                          static
```

Check for collision in device tupel list
To get more detailed collision results, use get_collision_pair() and get_number_of_collision_pairs()

Parameters

    [in] **n_dev_tupel_list** number of device tupels COLL_DEVICE_TUPEL

    [in] **dev_tupel_list**   list of device tupels, a set of COLL_DEVICE pairs

    [in] **setting**   =0 tbd, to control functionality

Return values

    1 - collision occured in device tupel list

    0 - no collision

    -1 - error

The structures **COLL_DEVICE** and **COLL_DEVICE_TUPEL** and methods are described in the header files "ER_CAPI_TYPES.h" and "ER_CAPI.h" and in the doxygen documentation.

```
typedef struct _COLL_DEVICE {
 int grp_type;
 int dev_idx;
 int geo_idx;
} COLL_DEVICE;

typedef struct _COLL_DEVICE_TUPEL {
 COLL_DEVICE device_A;
 COLL_DEVICE device_B;
} COLL_DEVICE_TUPEL;
```

Optimization of ReAttach devices on extremely many devices (also Applies to ERA)

If a large number of devices were used in a 3D scene to create a hierarchical structure, the performance was considerably impaired during ReAttach.

Especially in the range of 100, 1000 or more devices a significant performance loss was noticed.

By optimizing the ReAttach method, several hundred devices can now be treated in one 3D scene.

Nevertheless, the EASY-ROB Software GmbH recommends a meaningful and thus also hierarchical structure of devices and robots, alone to offer the users a possibility to manage the devices meaningful, filter, etc.

AutoPath™ - new Quality Index

AutoPath™ creates collision-free pathways for devices and robots.

When it comes to how a robot moves from position A to position B, simulation systems offer a collision check, but no strategy for a collision-free path is proposed. The operator now has the problem, manually, with a lot of Robotics know-how, to generate several intermediate points and then to check the movement repeatedly. This is grueling and, above all, very time consuming.

The automatic calculation considerably facilitates the work of the operator

The AutoPath™ software module now automatically generates so-called WayPoints (intermediate points), which are Approached by the robot in the PTP interpolation mode, so that from point A to point B a collision-free travel is created for the robot. This clearly relieves the operator of his work.

Here, not only collision and traveling ranges are checked, but also individual restrictions (constraints) can be defined by means of the callback function, for example a Cartesian space or also orientation restrictions. Constraints depend on the Application and can therefore be adapted individually to the respective incidents.

Communication: Host Application - ERK with AutoPath™
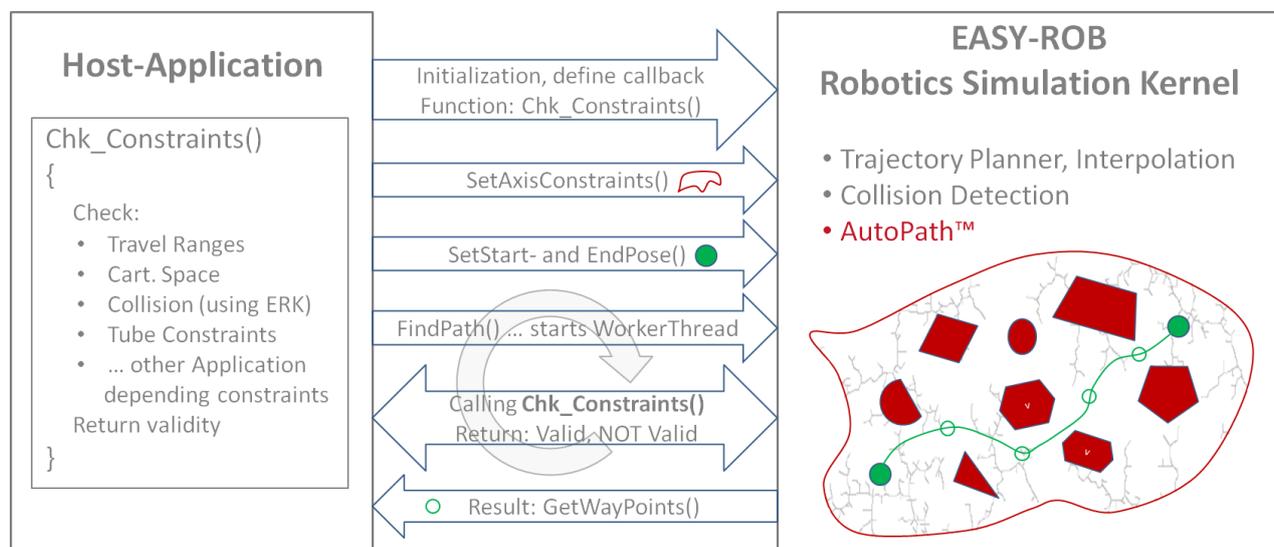
Quality Index provides comparability

Different runs can be simply compared by means of the "Quality Index" to repeat the best possible movement by means of "seed number" and to integrate it into the entire movement sequence of the robot.

Advantages and Application Possibilities

Advantages

- Automatic calculation of TagPoints and axis configurations
- Callback functions
- Easy integration into technology driven software solutions
- API available

Application Possibilities

- Industrial robots
- Service robots
- Animation and simulation
- Motion planning
- Assembly tests
- Offline programming
- Measurement protocols
- Autonomous driving
- Industry-independent

Feature Overview

Automatic calculation of TagPoints

- Due to the automatic calculation of TagPoints obstacles are going to be avoided
- with a sophisticated RRT search algorithm

Callback Functions

- Cartesian Space
- Collision
- Tube Constraints
- Travel Ranges
- Let your individual constraints be taken into account

Calculation of axis configurations

- also supplies the axis configuration for each TagPoint

Specification of travel ranges

- Axis constraints for the travel ranges can be defined via API

API

- C/C++ and C# Method class ERAuto_CAPI

Integration

- Detailed doxygen documentation
- Programming examples for MS Visual Studio® C/C++ and C#

EASY-ROB™ products are certified

Code Signing Certificates are used by developers on all platforms to digitally sign the developed Applications and software products. Signed code is provided with the name of the publisher and provides protection against malware and other adulteration since the code has not been changed since it was signed.

On the user and customer side, the same security arises as when buying in the store, so to speak trust as if one acquires "sealed" software.

Since security plays a central role in the present day, because malware and viruses cause great damage, EASY-ROB Software GmbH has decided to offer this security to all OEM partners and end customers.

EASY-ROB™ products and modules are now certified.

Confidence of end customers and IT is increasing

Security warnings that Appear with unsigned code are replaced with information about the publisher of the software. This prevents users or IT departments from canceling the installation.

Because the signing shows that the software comes from a well-known, listed software manufacturer and is genuine.

Signing code adds an important level of trust to the installation process, as well as allowing your software products to benefit from this added security.

Hash code to determine the unique identity

A hash code determines the unique identity of the publisher. In the cooperation between OEM partners and EASY-ROB Software GmbH one can also use this connection to prevent misuse.

OEM partners can easily use the hash code to make sure that their own Host Application communicates with only the certified EASY-ROB™ Dlls, that it has not sneaked in any malicious software and ultimately harms the end customer.

EASY-ROB™ Server

At the beginning of the year, the server hardware of EASY-ROB Software GmbH was renewed.

In addition to a static IP to reach the server from the outside, new storage space in the terabyte range was realized.

With this investment, one reacts to the increasing data volumes of many customers. In addition, a professional backup service ensures that in the case of a system failure always a backup copy is provided and no data is lost.

License Manager offers „Lightning-Licensing"

The server has enough power to serve not only the internal staff.
This is how several EASY-ROB™ License Managers run from outside.

Lightning-Licensing is the fastest licensing method

With the new licensing method "Lightning-Licensing" a license can be provided for customers / clients in a very short time.

This not only Applies to the direct customers of EASY-ROB Software GmbH, but also to the end customers of all OEM partners who operate worldwide.

Significant advantages in administration, but also for customers and prospects

Licensing is greatly simplified and requires the use of:
only the hardware number of the client. This is then completed by the employees of EASY-ROB or by OEM partners in the ClientList.

Thus, the licensing and management of global users is very easy and relieves the own administrators considerably.

Another bonus is that all customers work with one and the same license file!

Basically, you could already ship your software products with this special license file, so that end customers can start working immediately after installation.

In a world of networked production can now be licensed networked.

Software monetization as a contingent model

Sophisticated mechanisms expand the range of licensing models.

So you can now offer customers of EASY-ROB Software GmbH, in addition to the well-known license models, also a time-limited and very accurate billing.

It is for example possible for customers to buy time quotas, and then to settle only the time units actually used: if usage is at a standstill, consumption is also at a standstill.

License Manager as SaaS

If you have spared the initial and, above all, the follow-up costs, EASY-ROB now offers you a low-cost alternative for a License Manager server as a service, of course for all products like the App, the Framework and the Kernel.

If interested, simply contact EASY-ROB™ Sales

Are you interested in the new licensing method or server service?

For customers with older versions it is possible to purchase an update. Please contact our sales department under +49 6192 921 70 79 or sales@easy-rob.com.

3D-PDF Export with Animation as SDK

Locate a robust 3D PDF export for your software with Animation and have so far not found?

Then we have exactly the right solution for you:
Expand your product by our successful 3D PDF export!

Applications of 3D-PDF Export SDK

- Quick and easy presentation to third parties
- Disclosure of interactive simulation concepts
- Installation and maintenance instructions
- Documentation of difficult information
- Universal education and training material
- Interactive sales documentation for an improved understanding at customers

The EASY-ROB™ 3D-PDF SDK allows you easily to implement the functions required for the above-mentioned Applications in your software.

Save motion sequences with animation in 3D-PDF

In the Adobe® Reader, you can use the navigation bar to start, pause, stop, fast-forward, rewind, and change the speed (x1 / 64x to x64x). The time specifies the real process time.

The layout is freely definable.

Navigation Bar in the Adobe® Reader

Optimization reduces file size by almost 40%

With the update version 8.0 a powerful optimization of the 3D-PDF export is provided by the EASY-ROB Software GmbH.

By internally cloning geometry files and more efficiently compressing the keyframes, the file size of the generated 3D PDFs can be reduced by almost 40%!

Especially simulations with large CAD data benefit from this optimization. With the in-depth reduction of the file size, the performance of Adobe Reader is improved immediately, as the file size has a noticeable influence on playback.

Extension of the 3D-PDF SDK

The 3D-PDF SDK has also been improved inter alia now orthogonal camera views are supported and the doxygen documentation is completed.

For customers with older versions it is possible to purchase an update. Please contact our sales department under +49 6192 921 70 79 or sales@easy-rob.com.

Complete robot libraries

EASY-ROB™ provides complete libraries for the integration of all major types of robots of the market. These include ABB, b + m, Comau, Denso, Eisenmann, Fanuc, Guedel, igm, Kawasaki, KUKA, Mitsubishi, OTC-Daihen, Rice, Stäubli, Tricept, Unimation, Universal Robots and Yaskawa.

The robot libraries of ABB, KUKA, Comau, Fanuc, Stäubli and Yaskawa are almost complete and constantly maintained by us.

Currently more than 1000 robots, positioners and external tracking axes are available of various manufacturers.

Further information:

https://easy-rob.com/en/robot-libraries/

Detail overview of new added Robot Models

As since the last release a lot more robots have been added, you will find a detailed list of the new models at the end of each manufacturer's page.

Important notice:

Non-existent robots, handling systems, machines, tools or even special kinematics can be easily and quickly "reconstructed virtually" in EASY-ROB™

ABB

IRB-910SC-3-45
IRB-910SC-3-55
IRB-910SC-3-65

KUKA

KR-6-R700-2   KR-10-R900-2   KR-10-R1100-2

| KUKA	KR-6-R700-2 KR-6-R900-2	KR-10-R900-2	KR-10-R1100-2

Mecademic- new brand!
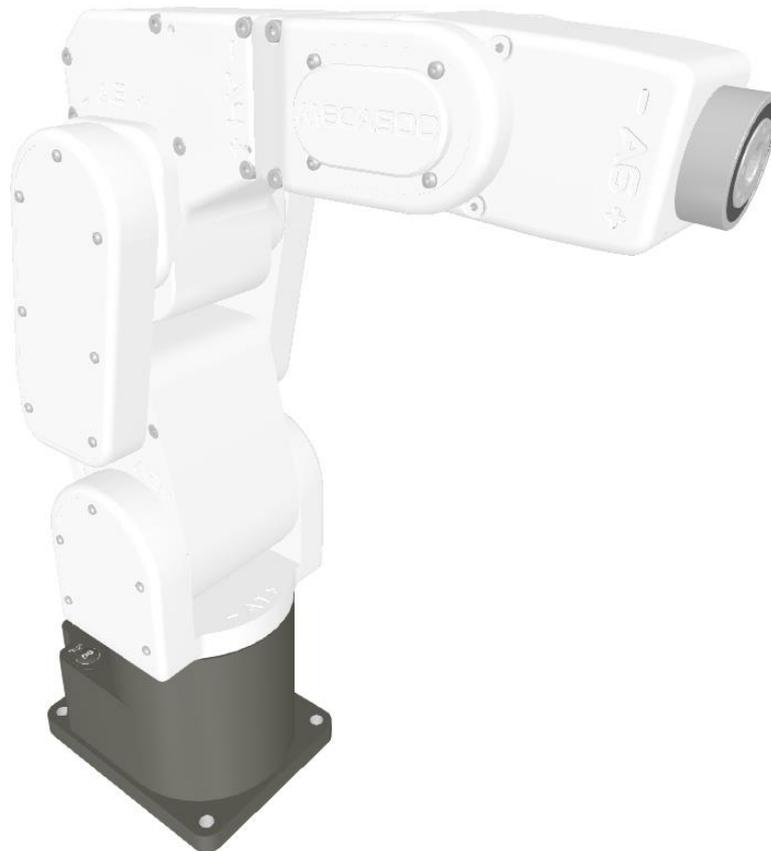
Meca500

OMRON / Techman- new brand!
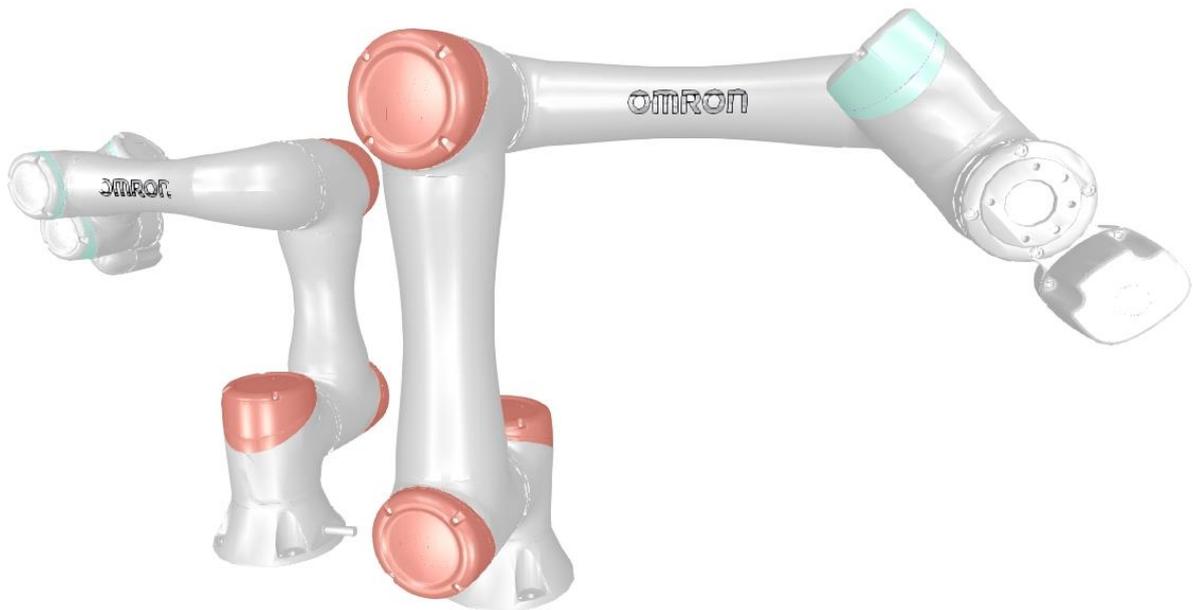
OMRON **TM ROBOT**   TM5-700   TM5-900

Stäubli - new TS-2 series with CS9 controller

TX2-100   TX2-80   TX2-60   TX2-40

|	
TS2-40 200er Hub	TS2-40 400er Hub
TS2-60 200er Hub	TS2-60 400er Hub
TS2-80 200er Hub	TS2-80 400er Hub
TS2-100 200er Hub	TS2-100 400er Hub

Universal Robots - brandnew!

UNIVERSAL ROBOTS

UR16e

Yaskawa / Motoman
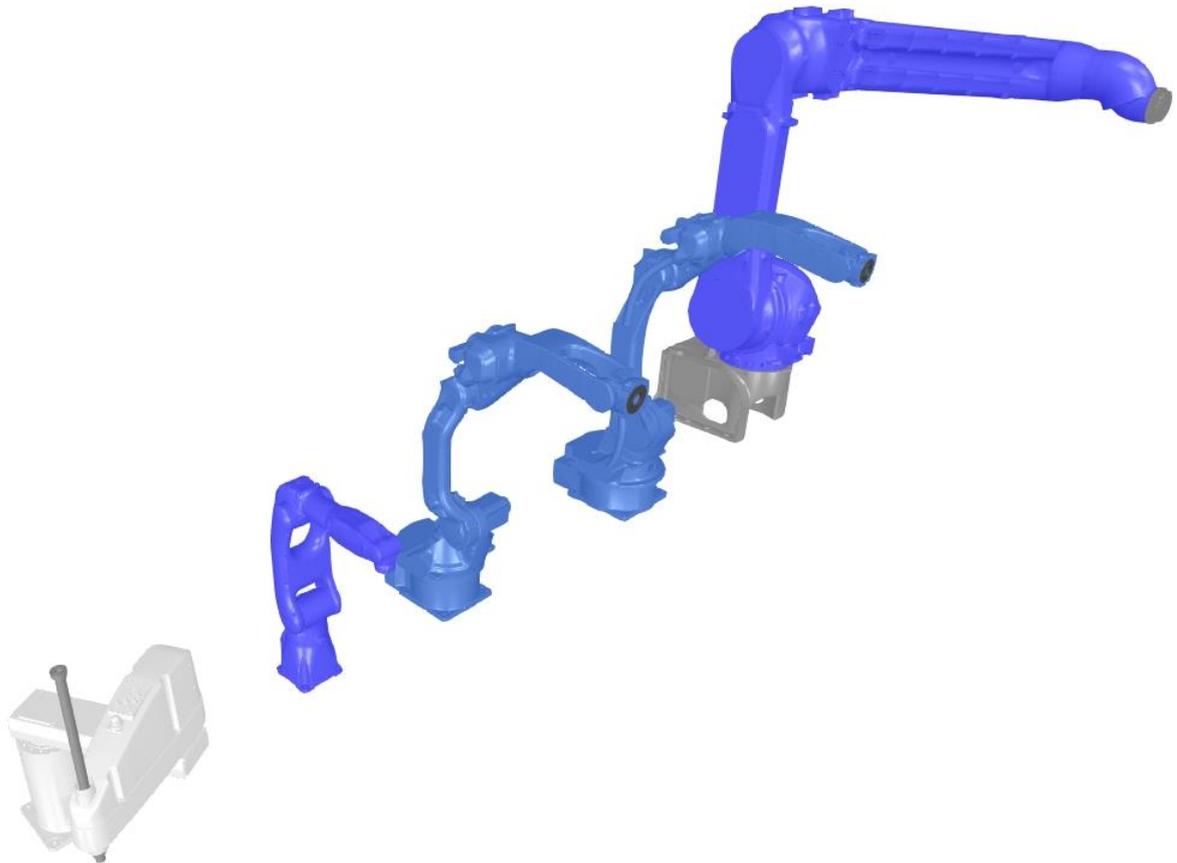
MYS850L   GP7-AR900 MH-12F   MH-24   MPX-3500-0 L

YASKAWA

MYS850L	GP7-AR900	MH-12	MPX-3500-0 L
MYS850LF	GP8-AR700	MH-12F	MPX-3500-0 R
		MH-24	MP010 S-Typ

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EASY-ROB customer area

Content: Program updates and robot libraries

Web: https://easy-rob.com/en/downloads-2/client-area/

Log in details:

                User name: customer
                Password: **********

Own notes