

Engineering Notebook Powered by PTC Mathcad

Available with PTC Mathcad Prime 3.1 F000 and PTC Creo Parametric 3.0 M030

Features

- Embed PTC Mathcad worksheet directly inside PTC Creo Parametric part or assembly
- Make PTC Mathcad math region results available inside PTC Creo Parametric parameters table
- Make PTC Creo Parametric parameters available inside PTC Mathcad worksheet
- Use the PTC Creo relations editor to link PTC Mathcad inputs & outputs with PTC Creo parameters
- Units intelligence

Use Cases

- Document Design Intent
 - Use PTC Mathcad to document design choices, assumptions, questions, etc.
 - No calculations required
- Analysis Driven Design
 - Use PTC Mathcad calculations to drive PTC Creo Parametric geometry
- Verification and Validation
 - Use PTC Creo Parametric parameters in PTC Mathcad to mathematically validate the design meets initial requirements

Bi-directional Workflow

- PTC Mathcad Prime 3.1
 - Tag PTC Mathcad regions as either input or output regions
 - Save and Push – save worksheet within PTC Creo model and send input/output regions to PTC Creo parameters table
 - Update Inputs – update PTC Mathcad input regions to display current value in PTC Creo
 - Save as .mcdx – save embedded PTC Mathcad worksheet as standalone .mcdx file

Note: Connection between model and worksheet is lost if PTC Mathcad sheet is saved outside PTC Creo part
- PTC Creo Parametric 3.0
 - View PTC Mathcad input/output regions inside Embedded PTC Mathcad parameters table dropdown
 - Use Embedded PTC Mathcad parameters as you would a standard PTC Creo parameter
 - Reference Embedded PTC Mathcad parameters inside relations

Note: Units sensitivity must be enabled when referencing Embedded PTC Mathcad parameters that have units

 - Notification Center alert for outdated PTC Mathcad worksheet

PTC Windchill

- When checking a PTC Creo model into PTC Windchill, the embedded PTC Mathcad worksheet goes with it automatically

Software Development Kit (SDK)

The **PTC Mathcad Prime Software Development Kit (SDK)** is a combination of documentation, scripts and applications including source code and many years of API experience to help customers achieve their goals of building PTC Mathcad Prime into other applications or systems, abstracting PTC Mathcad Prime or simply automating PTC Mathcad Prime tasks. Perhaps the best example of what is possible by communicating with the PTC Mathcad API is the Engineering Notebook Powered by PTC Mathcad, where the PTC Mathcad API and PTC Creo API interact, passing variable names, values, and units bi-directionally.

API General Information

- COM-based API
Note: COM is a well-known Microsoft technology which makes code modules available to .NET developers as well as scripters.
- Utilize Units Management System through API

Within the PTC Mathcad customer base be listening for the following:

- IT departments – those who manage and deploy PTC Mathcad
- Engineering Managers – looking to streamline **workflow**
- End User/Engineers – looking to **automate** tasks and **integrate** with other products
- Keywords – **integration, automation, headless PTC Mathcad, PTC Mathcad Prime runtime, code generation**

Contents of SDK

Inside the SDK, there are 10 examples that demonstrate a variety of applications that can be built to communicate with the PTC Mathcad API. Each example contains documentation, scripts, applications, PTC Mathcad worksheets, and source code. Users can walk through each pre-built external application to experience first-hand a small sample of the endless possibilities. More importantly, possessing the source code that defines each sample application enables users to rapidly learn how to communicate with the PTC Mathcad API so they can begin building custom applications of their own.

- SDK Examples
 - PTC Mathcad SolidWorks Integration Language: VB.NET
 - Bi-directionally pass values between Mathcad and SolidWorks
 - Events Language: C++.NET, C#.NET, & VB.NET
 - Events include: start PTC Mathcad, open worksheet, save worksheet, & close worksheet
 - Worksheet Management Language: vbscript & javascript
 - Set titles and icons
 - Code Generation Language: VB.NET
 - Export PTC Mathcad algorithm as C++
 - Send S-Expression Language: C#.NET
 - Rewrite PTC Mathcad function programmatically
 - HTML Language: javascript
 - Use webpage to drive PTC Mathcad
 - Stress Analysis Language: VB.NET
 - Application to drive PTC Mathcad stress analysis worksheet
 - PTC Mathcad Matrix Utilization Language: C#
 - Plot PTC Mathcad matrix via Google graphing in external application

Custom Functions

CAD Tools

- Curve Generator – IBL
 - Create 2D & 3D curves mathematically in PTC Mathcad and open them inside PTC Creo
 - Example: define curve of spring with equations and bring 3D plot curve into PTC Creo
 - Turn 2D and 3D Creo curves into physical geometry using revolves, sweeps, and blends
- 3D Printing – WriteSTL
 - Create 3D models using equations and write to STL format
 - STL format is the standard for 3D printing and understood by PTC Creo
- CAD Data interoperability – WriteDXF
 - Create 3D models mathematically and save them as DXF files
 - DXF is a CAD file format developed by Autodesk enabling data interoperability between AutoCAD and other CAD programs

Chemical Engineering

- Steam Tables - Prode Physical Properties
 - Development of this was assisted by [Dr. Harvey Hensley](#)
 - Comprehensive library of 200-plus Prode chemical functions
 - Applications include: phase change (gas to liquid/liquid to solid), thermal and physical properties of pure fluids and mixtures, phase diagrams, and heating/cooling curves
- Steam Tables – CoolProps
 - Open-source (source code made freely available) chemical database
 - Properties include fluids, humid air, incompressible liquids, refrigeration applications, heat transfer fluids

Data Formats

- Data Formats – ReadHDF5 and WriteHDF5
 - HDF5 is an standard file format used in scientific applications
 - Read MATLAB files and data in PTC Mathcad to assist MATLAB users migrating to PTC Mathcad

Data Sources

- Database Connectivity – ODBCread and ODBCwrite
 - Read from and write to ODBC compliant databases
 - Analyze data stored in databases
 - Export calculation results to databases