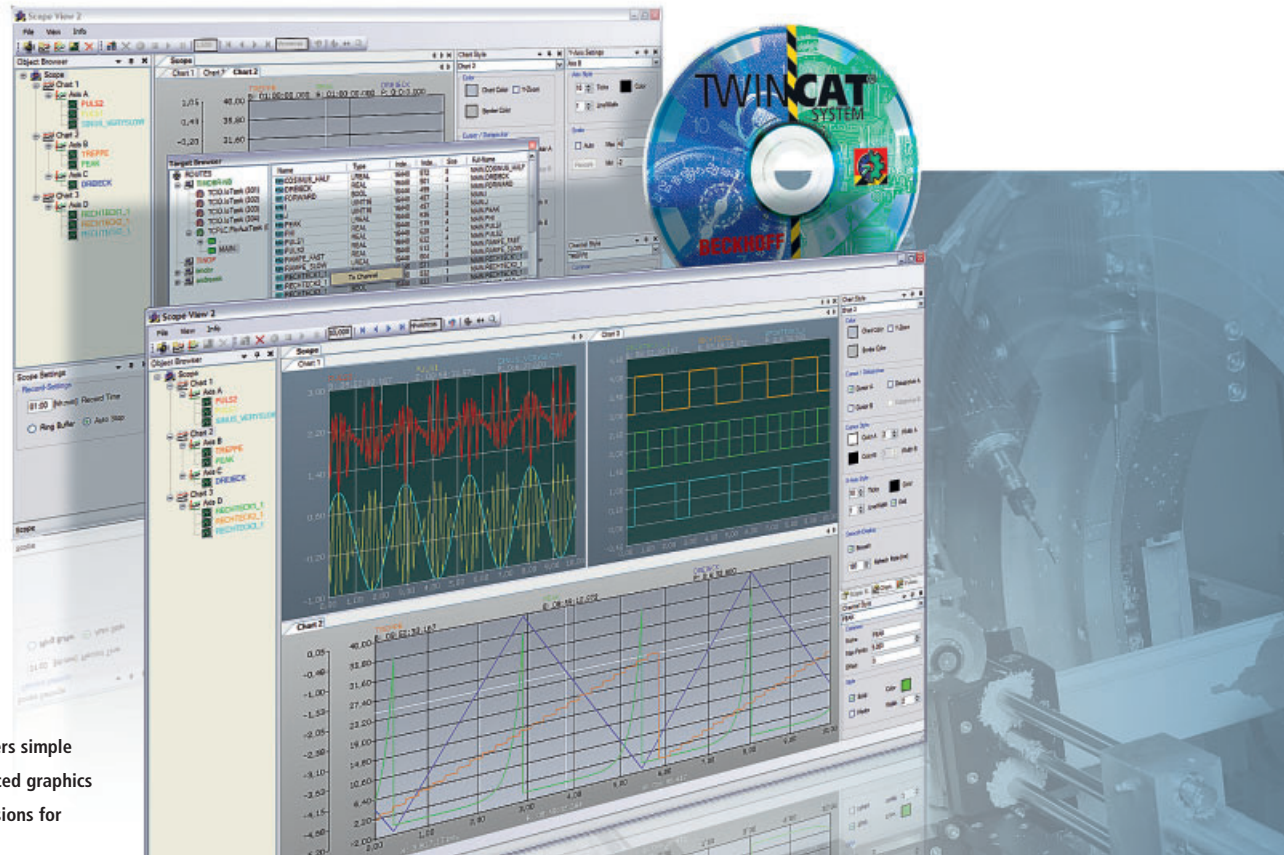
Flexible software tool for automation and measurement technology

TwinCAT Scope 2



TwinCAT Scope 2 offers simple configuration, advanced graphics and functional extensions for measuring tasks.

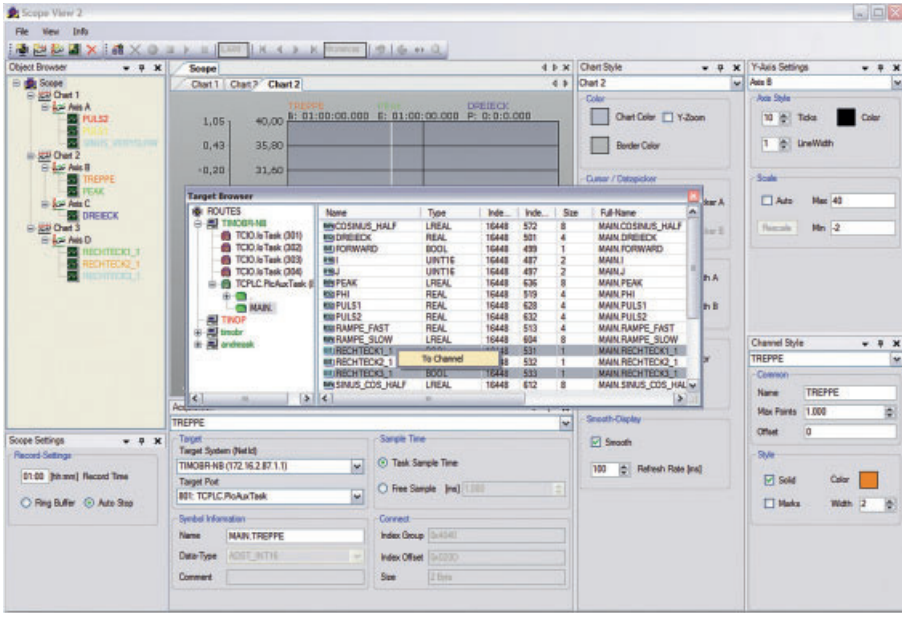
Using the TwinCAT Scope 2 software oscilloscope, time profiles down to µs resolution can be displayed graphically. User-friendly operation makes configuration simple; defined interfaces facilitate simple operation from the TwinCAT PLC. In combination with Beckhoff I/O terminals and the ability to easily integrate filters, the Scope 2 is also ideally suited to measurement applications, such as Condition Monitoring.

The oscilloscope is naturally one of the most useful tools for an engineer. Through visualization it is easier to quickly detect and evaluate complex signal states. Modern oscilloscopes also provide sophisticated analysis routines and triggers that make it even easier for the user to identify problems and resolve them. Due to the large amount of time required for computing, oscilloscopes are usually PC-based and run on a standard operating system. The algorithms and display are managed in software. Beckhoff brought a dynamic software tool onto the market 10 years ago with the original 'TwinCAT ScopeView,' which offers the capabilities of a hardware-based scope, but is seamlessly integrated into Beckhoff's software-based PLC and Motion Control solution. This system is less expensive and easier to integrate into the PC controller when compared with conventional oscilloscopes. With the new 'TwinCAT Scope 2' performance, handling, the potential for easy expandability, as well as analysis capabilities at runtime have been significantly improved.

Modern operation with modular design

Modern operation with dockable toolbars and comfortable browsers in a .Net-based tool were some of the requirements for TwinCAT Scope 2. Of course, modern graphics capabilities had to be supported as far as DirectX in order to properly display rapid signal sequences.

TwinCAT Scope 2 is modular in structure, enabling the convenient re-use of components as well as flexible use of the system



Convenient configuration

on small platforms. The two main programs in the solution include the ScopeServer for recording data and the ScopeView for displaying the data and configuring the recording functions. Server and Viewer communicate with each other via the Beckhoff communication standard, 'Automation Device Specification' (ADS). This can take place locally on a system, but works just as well in a distributed system using TCP/IP.

A major advantage of the distributed architecture is the load distribution. By pre-processing the data in the Server, the amount of communication between the devices can often be reduced or take place at non-critical times.

The Server has an interface to the PLC and can be easily controlled remotely via PLC function blocks. The Viewer in turn has several interfaces that can be integrated in proprietary applications. A special feature of TwinCAT Scope 2 is its expandability to provide additional analysis functions and tools. This enables not only raw data to be displayed, but also, for example, the Fourier-transformed spectrum or the cepstrum of a signal curve.

The ScopeServer component

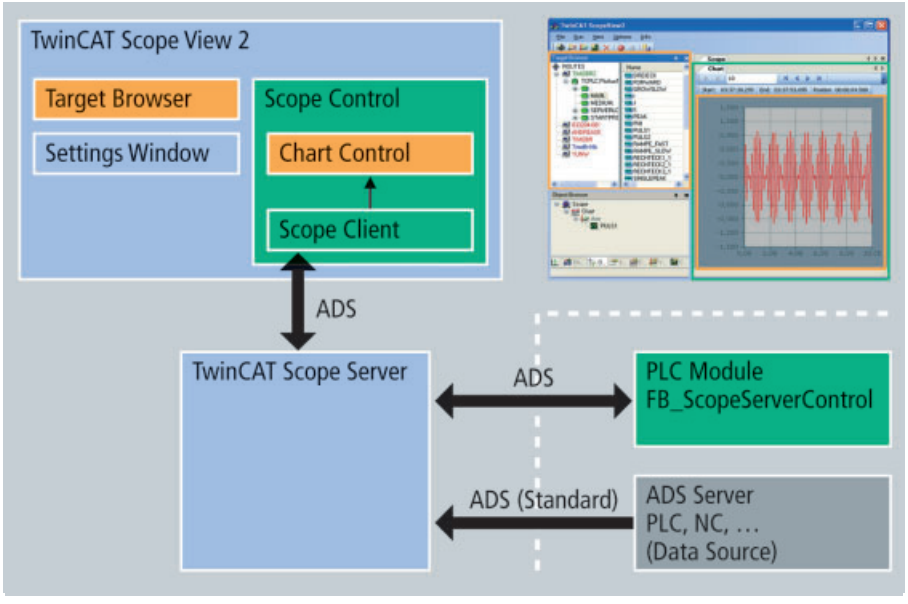
The main task of the Server is the collection of data; it is a data logger with a communication interface. The configuration specifies which data is to be collected from which devices and servers, and in which time unit. The wide variety of Beckhoff I/O terminals can be utilized here, for example, to record data from the so-called EtherCAT oversampling terminals. All data is placed in a file depository once it has been pre-processed. The main memory can also be used for data collection if no file system is available. The starting and stopping of the logger can be controlled by a PLC block. This allows data to be collected for a certain length of time, invisible to the user, at a point in time as triggered by the PLC. This can be especially helpful for the analysis of errors that occur only on rare occasions.

If data are to be recorded from a system on which ScopeServer is not or cannot be installed, it is possible to configure the Server on the local system for remote recording.

The ScopeView component

Using the Viewer component, several Scopes can be configured simultaneously in a quick and clear way. Since each Scope can be started separately, several simultaneous recordings are possible. An arbitrary number of Scopes, consisting of charts, axes and channels, can be parameterized in a clear, hierarchical system. The charts represent a visualization screen with size and position that is freely selectable and to which a variable time segment is assigned. The axes form the next hierarchical unit in a Scope and represent the Y-axes of the channels. In this way, several channels can be summarized with free or automatic scaling. The relationship between graphic and physical size is made known in the channels. Among other things, an individual sampling rate can be set for each channel in the so-called acquisition parameters.

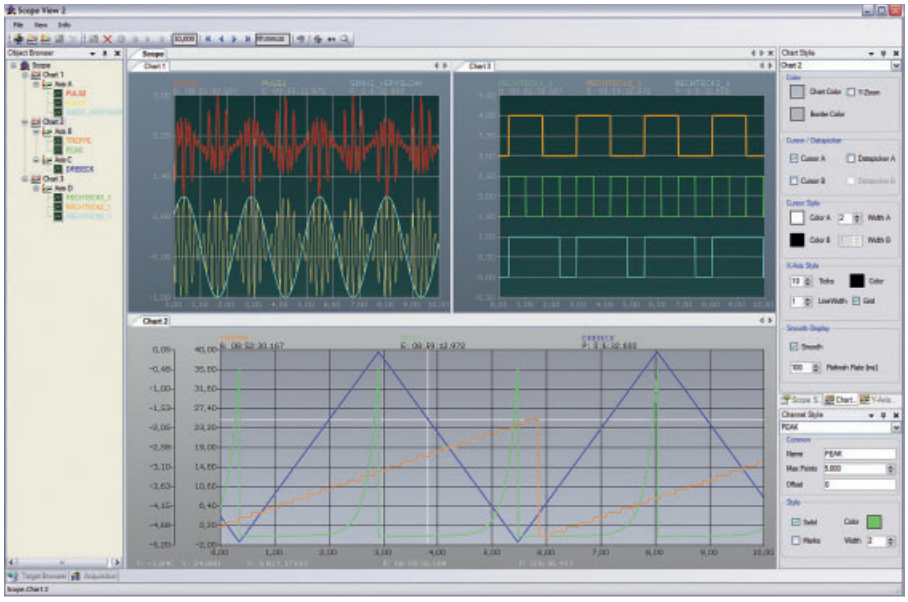
The acquisition is very much simplified by the browser integrated in the Scope. The device in the network from which variables are to be recorded is selected here. Then a data source is chosen,



Scope 2 architecture: structure of the components

i.e. a software device that makes data available – for example, the PLC – in which the different variables and data types are in turn arranged hierarchically. A few simple mouse clicks are sufficient in order to generate one or more channels.

There is a choice of GDI or DirectX to display the channels on the Scope. GDI display is recommended for simple devices; however, if a platform supports DirectX, the scope can transfer valuable computing time for rendering to the graphics card.



Logging with TwinCAT Scope 2

Several clear functions are available for the navigation of the charts over the time range: of course, scrolling or zooming in one direction only or in the X and Y directions are possible. Using the so-called panning function, a current view can be moved with the mouse, similar to a map. The viewing area can be varied quickly using the mouse wheel or by means of input fields, so that all the details can still be recognized and reviewed even in a larger recording.

A good scope should also feature a powerful and easily configurable trigger. In TwinCAT Scope 2 there is an option to configure multiple triggers, sorted into groups for different tasks. Besides the choice of channels to be triggered on, it is possible to link the individual conditions with logical operators.

Since Scopes are now displayed in many applications, care was taken in the development of TwinCAT Scope 2 to allow for easy implementation. Various interfaces are available on the Viewer page. The entire Viewer can be integrated in a .Net or C++ application with a client acting in the background.

In this way, all display capabilities of the Scope are available in the application. For customers who only want to collect data via TwinCAT Scope, there is an option to integrate the Scope client. Thus, an interface is available with which data is imported into the applications, but is perhaps not displayed, or is displayed differently.

Nowadays Scopes facilitate process monitoring in many applications and for machine visualizations. Therefore, particular importance during development of TwinCAT Scope 2 was placed on the ease of integration. Interfaces for .NET and COM, for example, allow an individual implementation of the viewer in the shortest time. Configuration then takes place either through the interface itself or by means of a standard file that can be easily created by the viewer. This reduces the programming effort to a minimum.

Analysis options in TwinCAT Scope 2

It is often desirable to begin with signal analysis even during a running recording, because certain kinds of behaviors have been observed and one wishes to learn the reasons for them. However, the current recording, which may need to be archived, should not be interrupted. This is possible with TwinCAT Scope 2, because a difference between start/stop recording and start/stop display is explicitly made here. Thus, it is possible to stop the display and analyze signals without having to stop the recording, which continues to run in the background. Furthermore, it is useful in signal analysis to be able to move individual channels at will. Different signals can be superimposed on and compared with one another on a time axis. It is also possible to stack all of the Y axes in a chart under each other in order to improve the overview. The cursor function implemented in the Scope 2 rounds off the standard analysis options.

For some measurement applications, or in the field of Condition Monitoring, it is often necessary to display and analyze not the pure time values, but the spectrum or the cepstrum, for example. These options are included in the new TwinCAT Scope 2. This means that the calculation of the spectrum via a Fast Fourier Transform (FFT) can be performed directly in the Viewer. Complex routes through other software components can be eliminated since everything is integrated in the TwinCAT Scope 2 tool. Additional algorithms can also be integrated without problem.

Outlook

TwinCAT Scope 2 is the new standard in measurement tools for automation engineers. Time sequences down to µs resolution can be displayed. Convenient operation makes the configuration of a Scope very easy. Convenient interfaces for PLC programmers allow the ScopeServer to be operated easily from the PLC program.

However, individual Scope components can also be used in their own visualizations. This can save costs and effort in the field of process monitoring and process documentation.

TwinCAT Scope 2 is also an exciting new tool for measurement technicians. The inexpensive hardware and the option to easily integrate filters in the Viewer make the Scope 2 well-qualified for measurement applications as well as for Condition Monitoring.

www.beckhoff.com/TwinCAT_Scope_2