

# xSpider version 3.2

The xSpider software system is a graphically oriented design system for dimensioning of low-voltage networks fitted with Eaton brand circuit protection equipment. It calculates voltage drops, load distributions and short-circuit currents for radial as well as meshed networks and carries out a subsequent check on the suitability of the cables and protection equipment used. The software is intended primarily for designers and computational engineers.

## General features:

- TN / IT / TT network systems of different voltage systems up to 1000V.
- Design of radial as well as meshed networks.
- Design of networks supplied from one or more different power supplies (supply network, transformer, generator), design of networks supplied concurrently from different power sources.
- Option of simulating various operating states of the network by disconnecting power sources and loads; an operating status manager is available.
- Option of defining simultaneous and utilisation factors.
- Database of components with transparent tree structure allowing user-defined additions.
- Automatic dimensioning of wires, switching and protective devices for standard network configurations.
- All calculations (voltage drops, load distribution, impedance, short circuits) are based on applicable IEC standards.
- Selectivity solutions – functions for working with selectivity spread sheets and functions for working with tripping characteristics.
- Generation of documentation (wiring diagram with calculation results, calculation report, tables of element parameters and of calculation results).

## User interface:

- User-friendly interface allowing quick and easy entry of simple cases while maintaining the maximum variability and open-end character.
- User operation similar to standard CAD systems (AutoCAD).
- Parallel display of wiring diagram + properties of elements + list of errors.
- Parallel processing of multiple projects (MDI interface). Transfer of objects between projects via clipboard.
- The software application is available in a variety of language mutations. Language version can be customised when you first start the programme, and can be changed anytime later.

## Wiring diagram:

- The network wiring diagram (topology) is defined by combining the particular components (power sources, transformers, circuit lines, circuit protection equipment, loads) in the graphics.
- A function is available to insert standard component groups with a single click (power supply groups, couplings, outlets, ...).
- Option of adding free graphics (line, circle, rectangle, text).
- Objects for editing graphic and descriptive characteristics are marked with grips. The grips can be used to perform basic graphic editing – moving or stretching.
- The method of selecting objects for editing can be customised (single selection, multiple selection, combined selection).
- The element characteristics are set through a single property grid similarly to standard CAD systems.
- Standard functions used for graphics editing are available (erase, move, copy, ...).
- Standard functions available for controlling the display (zoom, pan) controlled by the mouse wheel.

## Parameters of network components, database of components

- Parameters of the inserted components (i.e. those components, which cannot be dimensioned within the programme - power sources, loads, and transformers) must be entered immediately after inserting the respective component into the network wiring diagram. Parameters of other components (protective devices, switching equipment, cables) must also be specified.
- A database of standard components is available (generators, transformers, cables, busbar systems, surge arresters, circuit breakers, residual current devices, residual current devices with overcurrent protection, overload relays, fuses, switches, motors, compensations).
- The database contains Eaton products (switching and protective devices). The range of products displayed to the user is dependent on the regional version. The regional version can be customised when you first start the programme, and can be changed anytime later.
- The database contains articles from other manufacturers, necessary to perform the calculation, often used in the given region.
- The database is built as open-ended and the user can add any components into the database that he uses in his projects. The option of adding items to the databases by the user is important in particular with components not supplied by Eaton (generators, transformers, cables, motors, compensation units). The Eaton product database cannot be customised.
- Products can be searched for from the database tree on the basis of technical parameters or data table based on the type designation.

## Calculations

- The calculations based on IEC standards.
- TN, IT or TT systems are considered, depending on the user's selection, for the selected voltage system up to 1,000V (low voltage networks). The medium voltage network only allows power supply via the power transformer.
- Voltage drops in nodal points of the network (a check whether the drop does not exceed the user-defined maximum value set locally for every network component). The utilisation factor is always taken into account. For radial networks, the simultaneous factor is also taken into account.
- Load distribution in the network lines (check on correct dimensioning of the circuit protection equipment and conductors according to IEC 60364-5-52), check on line protection for overload and short circuit according to IEC 60364-4-43. Power factor calculation for meshed networks.

- Three-phase symmetric short circuit, calculation according to IEC 60909 - calculation of the short-circuit current in the selected network point, distribution of short-circuit current flows in the network (check on correct dimensioning of the circuit protection equipment and conductors). The contribution from the motor is taken into account (if the motor is not connected through a soft starter or a frequency converter).
- Resolution of backup protection (cascading) – checking the breaking capacities of the outgoing protective components at the outgoers with respect to the incoming protective components at the incomers.
- Features for the assessment of selectivity of circuit breakers according to the selectivity tables.
- One-phase asymmetric short circuit against the ground, calculation according to IEC 60909 - calculation of the short-circuit current at the selected network point and of the short-circuit current flow in the network, calculation of impedance in the short-circuit point and of contact voltage in non-conductive parts. Calculation of the disconnection time for the short-circuit point and check on compliance with the requirements of IEC 60364-4-41, ed. 2.
- Calculation of the positive and zero sequence components of impedance at the network node (which can be used for the subsequent design of the connected IT network, for instance). Calculation impedance of fault loop  $Z_{sv}$  according to IEC 60364-4-41, edition 2 is also included.
- Calculation of incident energy during short-circuit flash, hazard analysis according to IEEE 1584TM, 2002.
- The calculation results can be displayed either as absolute values or as complex numbers; calculated impedances are not adjusted by any coefficients.

#### **Displaying of results**

- Calculation is followed by a display of the list of non-compliant elements (in parallel with the wiring diagram).
- After the calculation has been performed, the calculated values will be displayed for the individual components in the network wiring diagram. The diagram showing the results can be printed out. It can be printed on any output device, for which a driver is available in Windows (printer, plotter).
- After calculation, it is possible to generate a comprehensive report on the calculation and to print it.

#### **Working with tripping characteristics**

- The dialogue box with the tripping characteristics is shown in parallel with the wiring diagram.
- Selection of a protective device from the database and rendering of its tripping characteristic (including tolerance range if the necessary data are available).
- Selection of protective equipment from the network wiring diagram and drawing of its tripping characteristics - selectivity assessment possible.
- If a circuit protection device is equipped with adjustable releases, it is possible to modify all parameters available. If this was a device from the wiring diagram, the change of the release parameter setting is transferred back into the wiring diagram.
- Print-out of wiring diagram at the output device.
- Export of wiring diagram to DXF (for their subsequent import to CAD systems) or PDF data format.
- It is also possible to work with the tripping characteristics independently without drawing a wiring diagram.

#### **Project: storage, archiving, export:**

- Export of graphics to DXF data format (for their subsequent import to CAD systems). Export of graphics to PDF data format.
- Export of data tables (a list of network components with their parameters, a list of the networks with the calculation results, a list of cables) to XLS format (Microsoft Excel).
- Export of calculation reports to DOC format (Microsoft Word). Export of calculation reports to PDF format.
- Archiving of a project in a data file.
- Backward compatibility - you can import data files from an earlier version of the application.
- Compatibility between different regional and language versions (data file can be opened everywhere regardless of the language and regional version).

#### **Hardware and software requirements (minimum configuration):**

- PC, 1GB RAM or more, graphic card with the minimum resolution of 1024x768, monitor, mouse or other pointing device, an output device for printing.
- Min. 1.0 gigabytes of free hard disk space.
- .NET Framework 4.0 installed (system libraries, a Windows component, available for free from Microsoft).
- Installed Access Database Engine 2010 or higher (system libraries for working with databases, a standard part of Microsoft Office, or available free of charge from Microsoft).
- Operating system: Windows 7, Windows 8, Windows 10.



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