

Mr. Lionel Ng, Product Manager, Control Products, Automation Products division, 19-02-2009

Optimising electrical circuit design

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Agenda

- **General characteristics**
  - Features of DOCWin 3.0
- **Working with DOCWin 3.0**
  - Ideal working sequence

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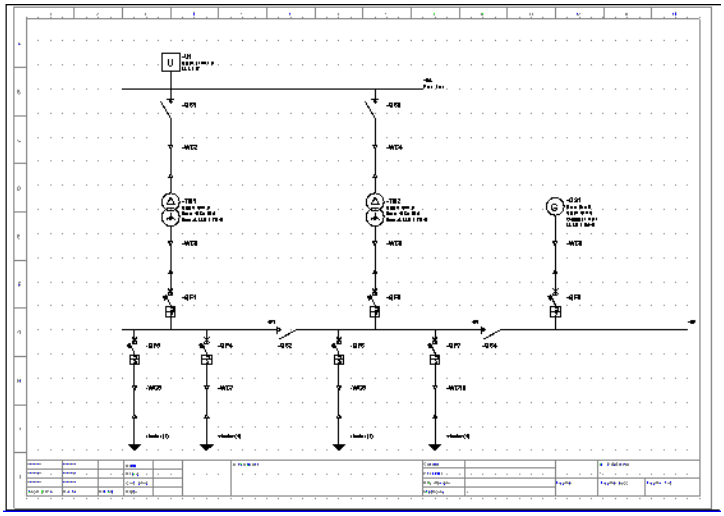
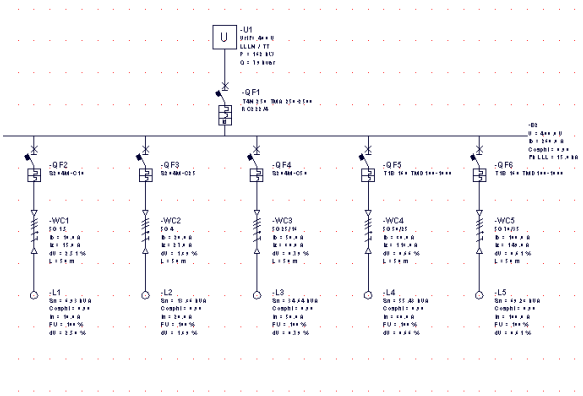
Main Features
Network

- Unlimited number of feeders
- MV\LV calculations
- Meshed and Radial networks
- Different distribution systems-voltages-phases in the same project

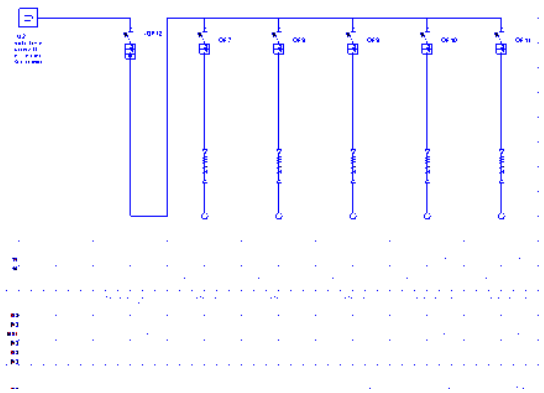


Main Features
Drawing

- **“Free” diagram**

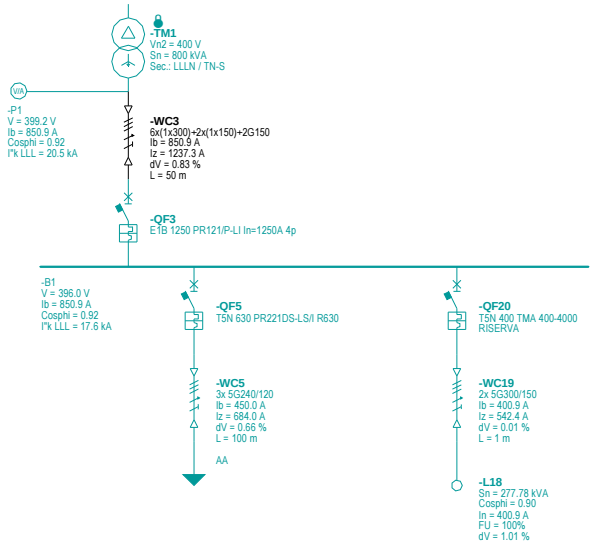


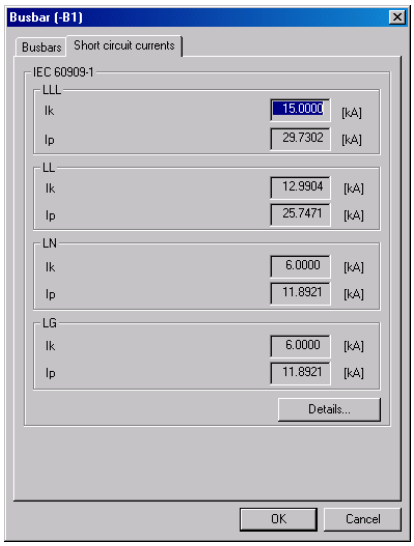
- **“Board” diagram**



Main Features
Calculations

- **Load-flow:** Voltage and Current in every point of the network
- **Short Circuit:** I_k in every point of the network





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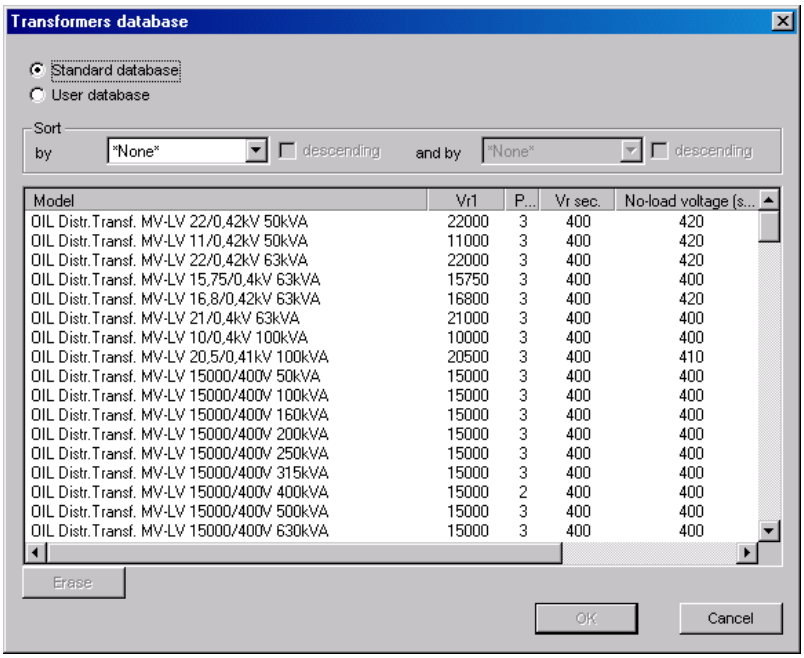
Main Features
Automatic Dimensioning

- **Transformers** (ABB database)



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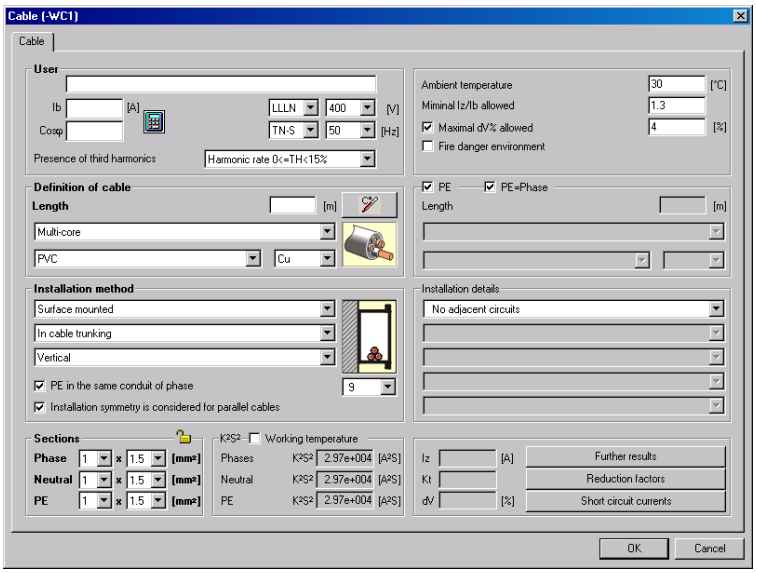
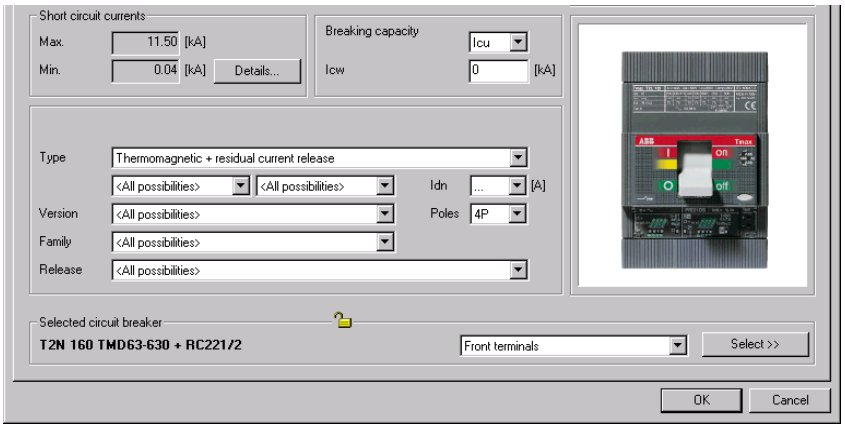
Main Features
Automatic Dimensioning

- **Wiring systems**
  - Cables (from Standards)
  - Busways (Zucchini)



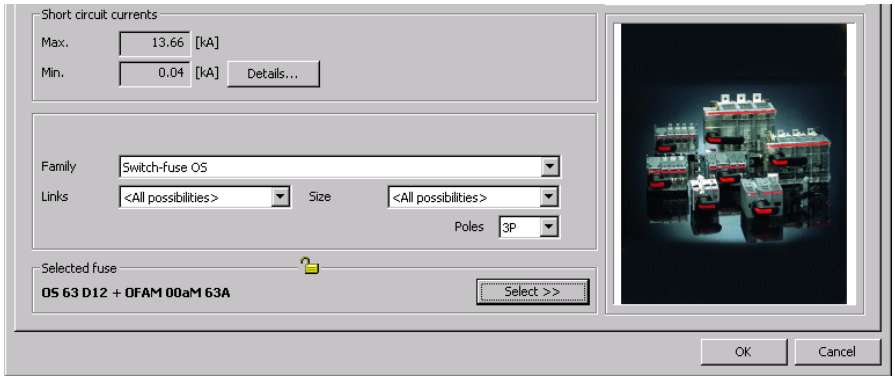
Main Features
Automatic Dimensioning

- **Protection and control devices**
  - **Circuit breakers**
    - **MCB -** Compact, System Pro M
    - **MCCB -** Tmax, Isomax
    - **ACB -** Emax new, Emax



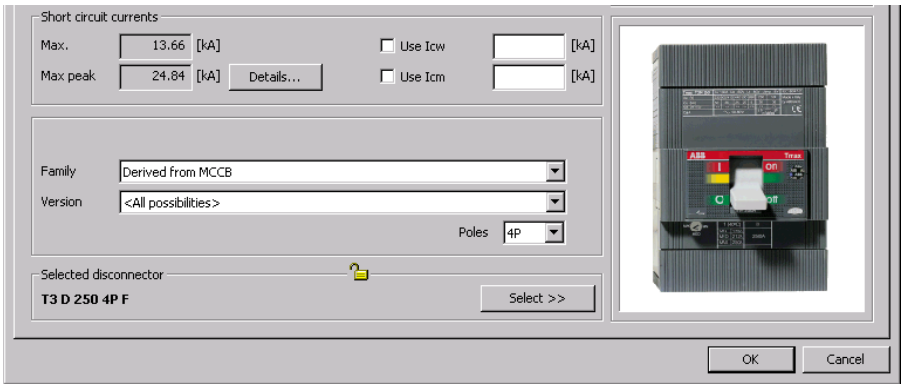
Main Features
Automatic Dimensioning

- **Protection and control devices**
  - **Fuses -** OFAA, OFAM
  - **Switch-Fuses -** OS, OESA
  - **RCCB -** Compact, System Pro M



Main Features
Automatic Dimensioning

- **Protection and control devices**
  - **Disconnectors -** Tmax_D, Isomax_D, Emax_MS, OT, OETL
  - **Contactors -** A, AF



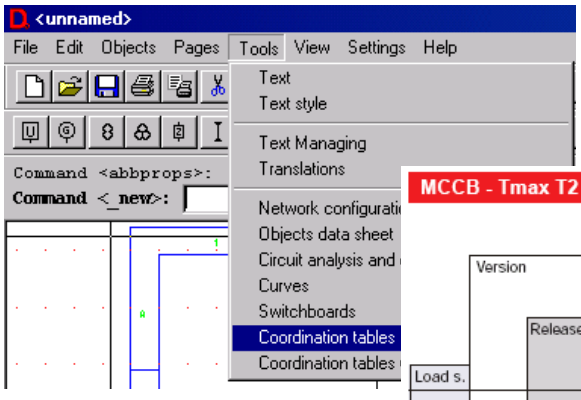
Main Features
Coordination

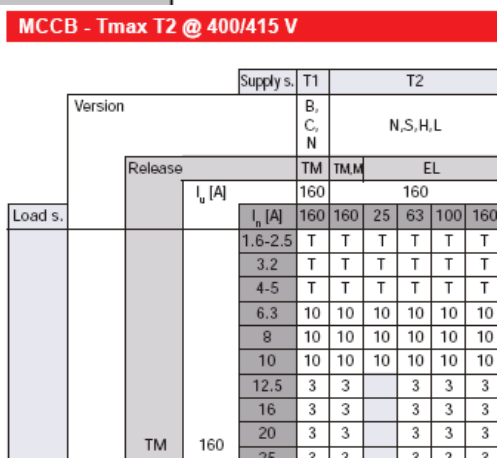
- **DOCWin 3.0 can select circuit breakers for discrimination or back-up according to ABB's coordination tables**
  - **Discrimination**
    - MCB – MCB
    - MCB – MCCB
    - MCCB – MCCB
    - ACB – MCCB
  - **Back-up**
    - MCB – MCB
    - MCB – MCCB
    - MCCB – MCCB
    - MCB – Disconnectors
    - MCCB – Disconnectors



Main Features
Coordination

- **Coordination tables** in .pdf format are available in the "Tools" menu





Main Features
Usability

- **DOCWin helps the designer**
  - Simple and user-friendly interfaces
  - Check and warning of any incorrect behaviour, without interruption in the calculation process
  - Ready for use database of electrical machines (motors – generators)
  - Availability/customization of prototypes (prototype = network template)
  - Dimensioning or choice of every single object

Main Features
Printouts

- **DOCWin 3.0 native printouts**
  - Single line diagram
  - Single object report
  - Curves diagram and releases settings
- **Export in commonly used formats**
  - Single line diagram in .dwg - .dxf (AutoCAD) and .pdf
  - Reports in .rtf (Word) and .pdf
  - Curves and settings in Word, Excel, every paste-copy format

Agenda

- **General characteristics**
  - Features of DOCWin 3.0
- **Working with DOCWin 3.0**
  - Ideal working sequence

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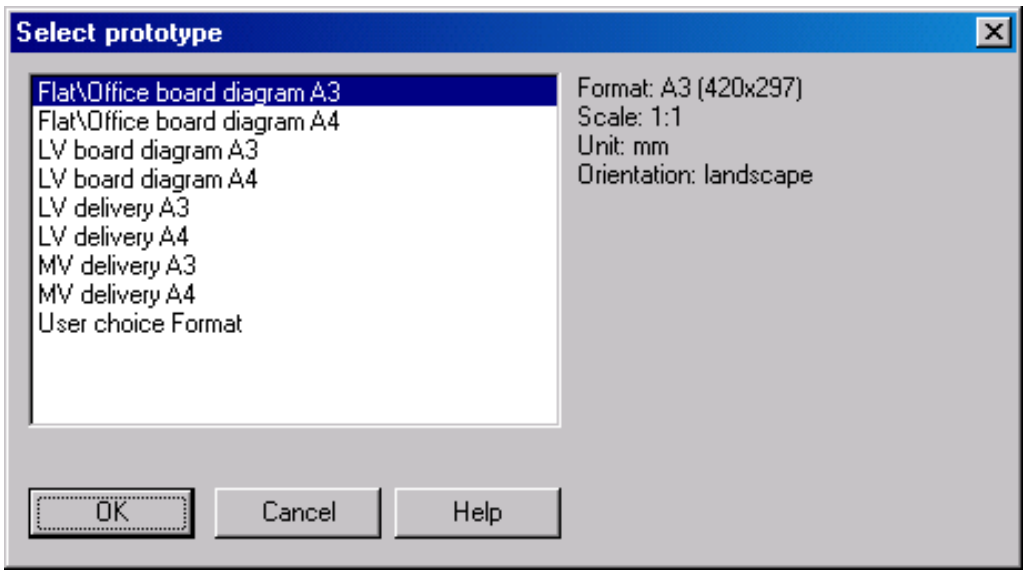
Working with DOC Win 3.0
Prototype (*template*)

Drawing

- At start-up select the **prototype (network *template*)**, according to design needs



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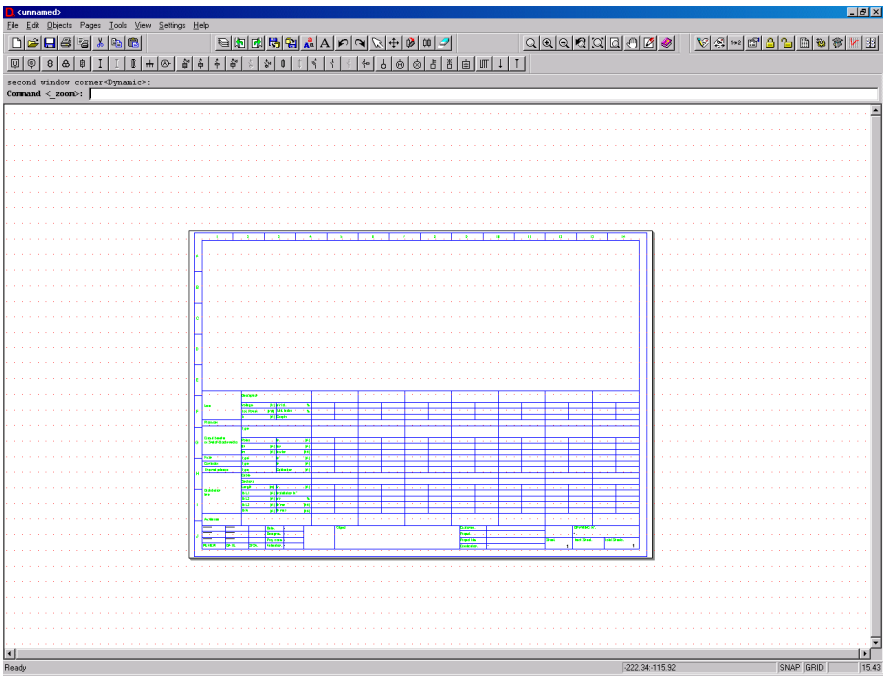
Working with DOC Win 3.0
Paper

Drawing

- **DOCWin** runs on a CAD native engine

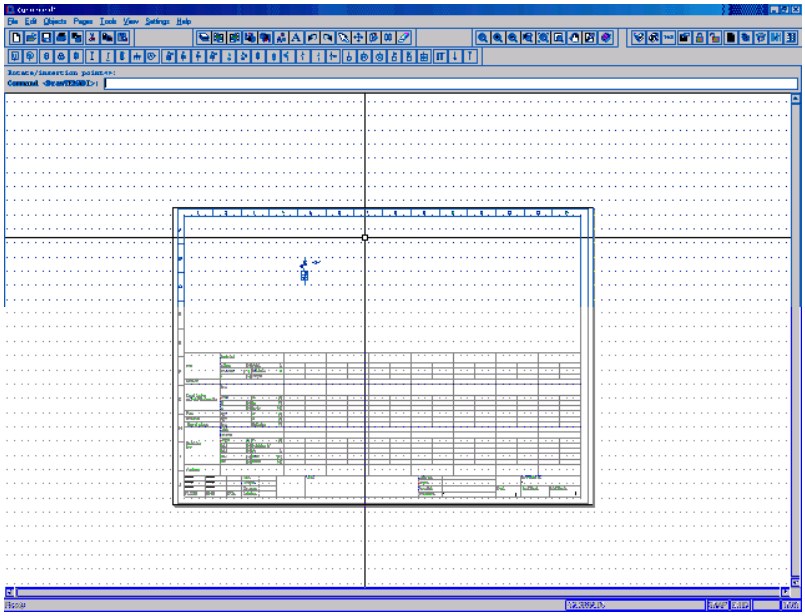


Working with DOC Win 3.0
Drawing the network

Drawing

- Select the needed symbol and place it on the single line diagram

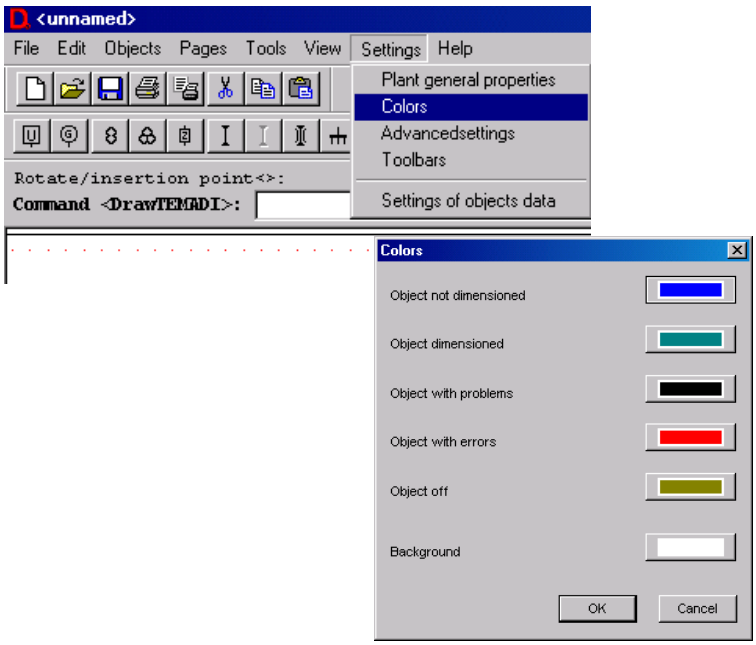




Working with DOC Win 3.0
Settings - Colours

Drawing

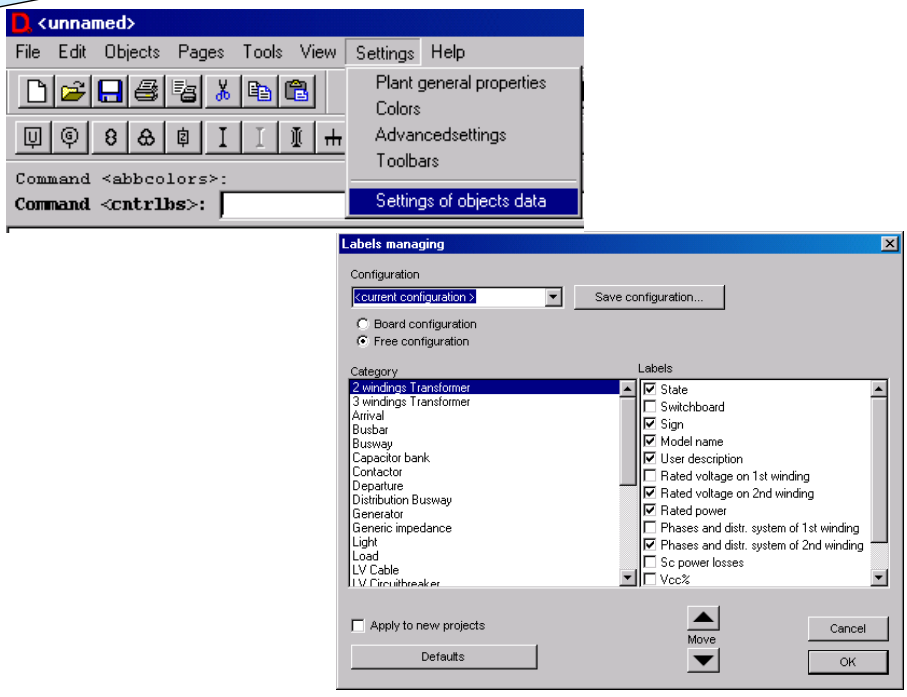
- The color define the status of an object
- All colors are customizable



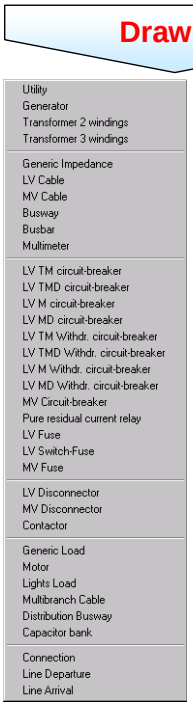
Working with DOC Win 3.0
Settings - Labels

Drawing

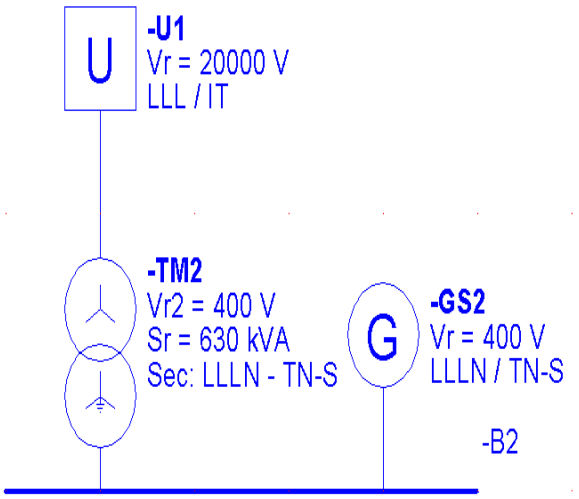
- Choice of the attributes shown on the diagram



Working with DOC Win 3.0
Objects – Power sources



- Utility
- Generator
- Transformer



A Utility (U) or a Generator (G) is required for calculations

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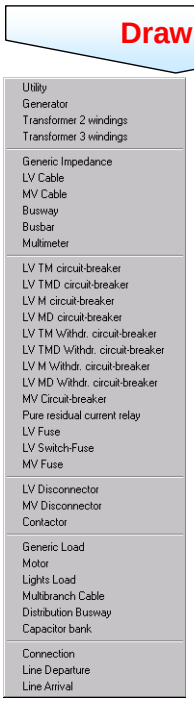
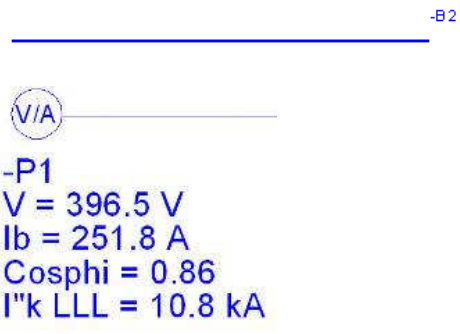
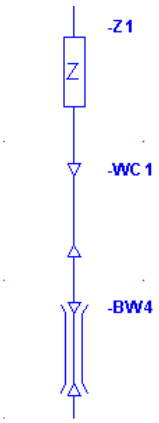
Working with DOC Win 3.0
Objects – Cables & Busbars



- **Generic impedance**
- **LV Cable**
- **MV Cable (managed as a generic impedance)**
- **Busway trunking system**
- **Busbar**
- **Multimeter**





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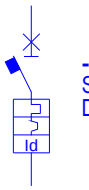
Working with DOC Win 3.0
Objects – Protection Devices

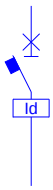
Drawing

- Utility
- Generator
- Transformer 2 windings
- Transformer 3 windings
- Generic Impedance
- LV Cable
- MV Cable
- Busway
- Busbar
- Multimeter
- LV TM circuit-breaker
- LV TMD circuit-breaker
- LV M circuit-breaker
- LV MD circuit-breaker
- LV TM Withdr. circuit-breaker
- LV TMD Withdr. circuit-breaker
- LV M Withdr. circuit-breaker
- LV MD Withdr. circuit-breaker
- MV Circuit-breaker
- Pure residual current relay
- LV Fuse
- LV Switch-Fuse
- MV Fuse
- LV Disconnector
- MV Disconnector
- Contactor
- Generic Load
- Motor
- Lights Load
- Multibranch Cable
- Distribution Busway
- Capacitor bank
- Connection
- Line Departure
- Line Arrival

- Circuit breaker
- RCCB
- Fuse
- Switch Fuse



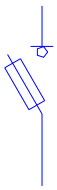
-QF3
S204-C10
DDA204 AC-63/0,1



-QF4
F204 AC-25/0,1



-FU3
OFAM 00aM 4A
OFAX 00 S3
Link: aM
Ir = 4 A
Size: 00



-FU4
OFAM 00aM 4A
OESA 00-32
Link: aM
Ir = 4 A
Size: 00

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Working with DOC Win 3.0
Objects – Switching Devices

Drawing

- Utility
- Generator
- Transformer 2 windings
- Transformer 3 windings
- Generic Impedance
- LV Cable
- MV Cable
- Busway
- Busbar
- Multimeter
- LV TM circuit-breaker
- LV TMD circuit-breaker
- LV M circuit-breaker
- LV MD circuit-breaker
- LV TM Withdr. circuit-breaker
- LV TMD Withdr. circuit-breaker
- LV M Withdr. circuit-breaker
- LV MD Withdr. circuit-breaker
- MV Circuit-breaker
- Pure residual current relay
- LV Fuse
- LV Switch-Fuse
- MV Fuse
- LV Disconnector
- MV Disconnector
- Contactor
- Generic Load
- Motor
- Lights Load
- Multibranch Cable
- Distribution Busway
- Capacitor bank
- Connection
- Line Departure
- Line Arrival

- Disconnector
- Contactor



-QS2
OT 45 4P



-K1
A50

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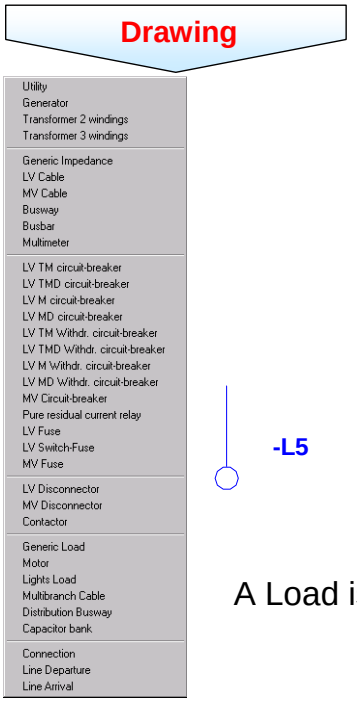
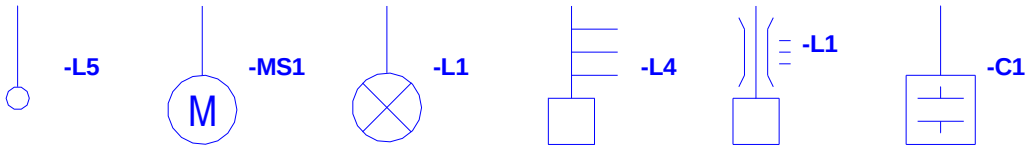
Working with DOC Win 3.0
Objects – Loads

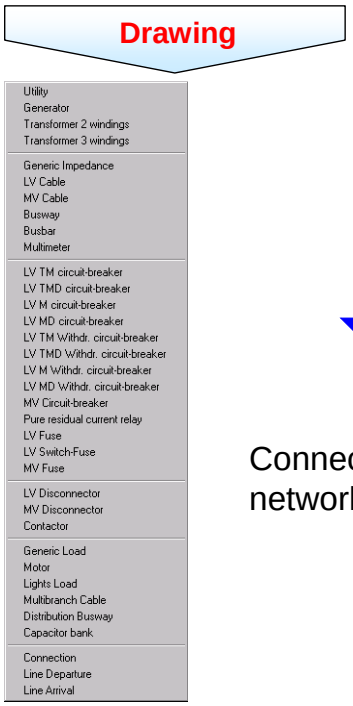


- Generic Load
- Motor
- Lights Load
- Multibranch Cable
- Distribution Busway
- Capacitor bank



A Load is required to complete the network and run the calculations

Working with DOC Win 3.0
Objects – Connections

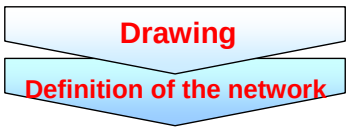


- Connection
- Line Departure
- Line Arrival



Connections are objects; they are used to split & connect the network into more pages & used as a connector for far objects

Working with DOC Win 3.0
Definition of the Network



- DOCWin help define the data
  - With customized interfaces for every object;
  - Using the value stored in prototypes as defaults;
  - With eletrical machines database
  - Asking for missing data during automatic dimensioning

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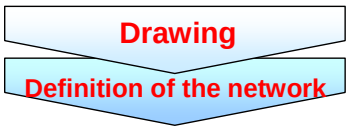
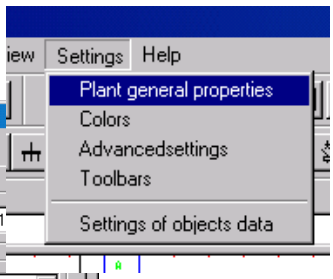
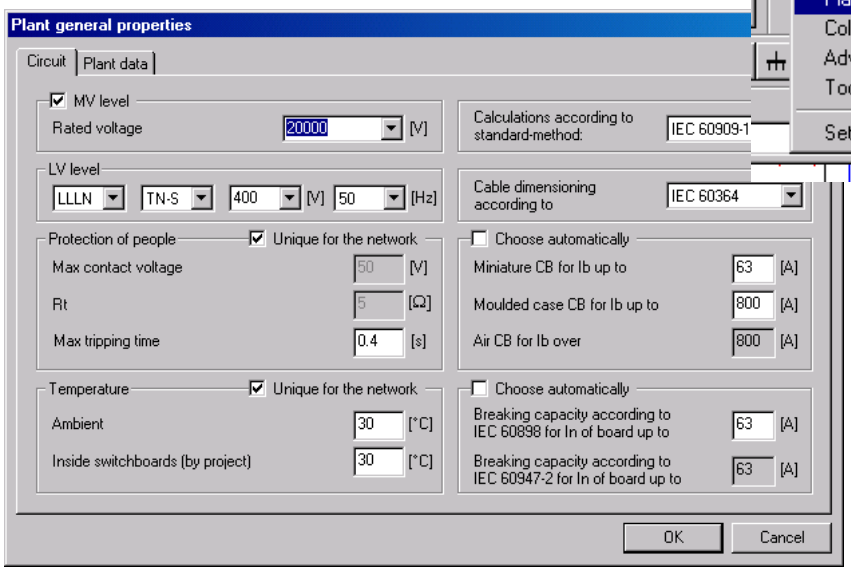
Working with DOC Win 3.0
Common Properties



- Plant general properties





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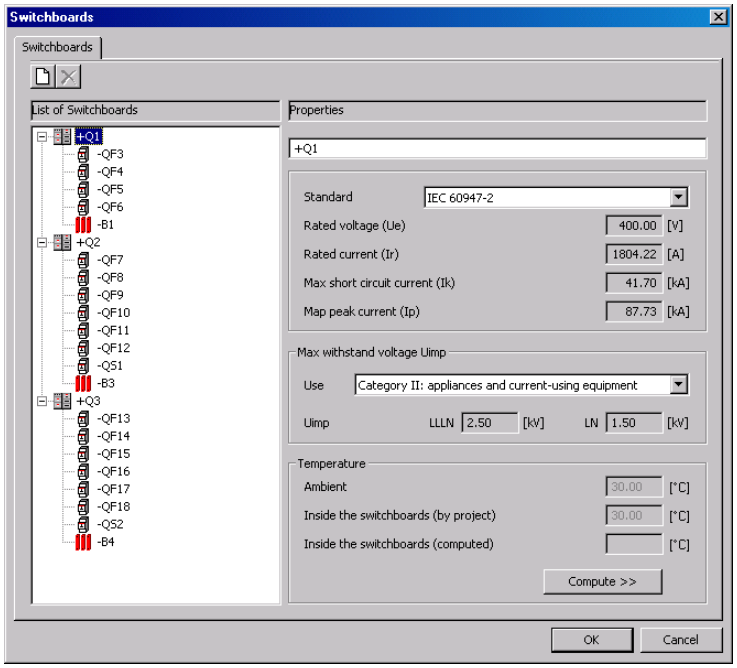
Working with DOC Win 3.0
Common Properties

Drawing

Definition of the network

- Switchboard properties

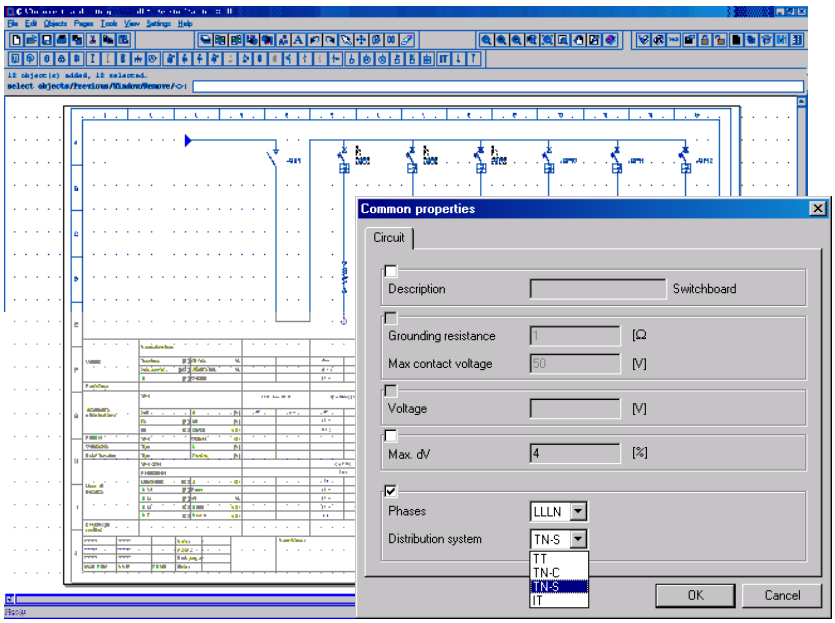


Working with DOC Win 3.0
Common Properties

Drawing

Definition of the network

- Multiple objects

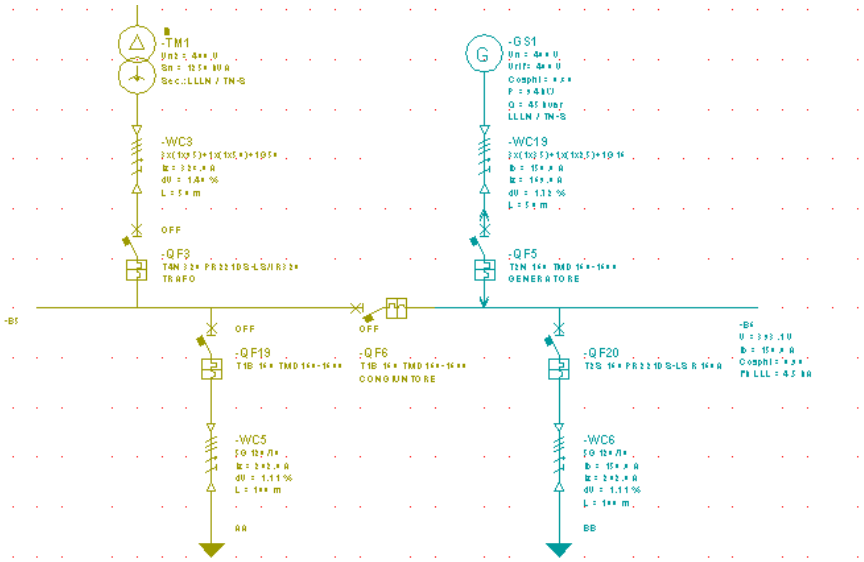


Working with DOC Win 3.0
Network Configurations

Drawing

Definition of the network

- More configuration (standard – emergency) in the same project
- The portion of the network in OFF status won't be considered in the actual dimensioning



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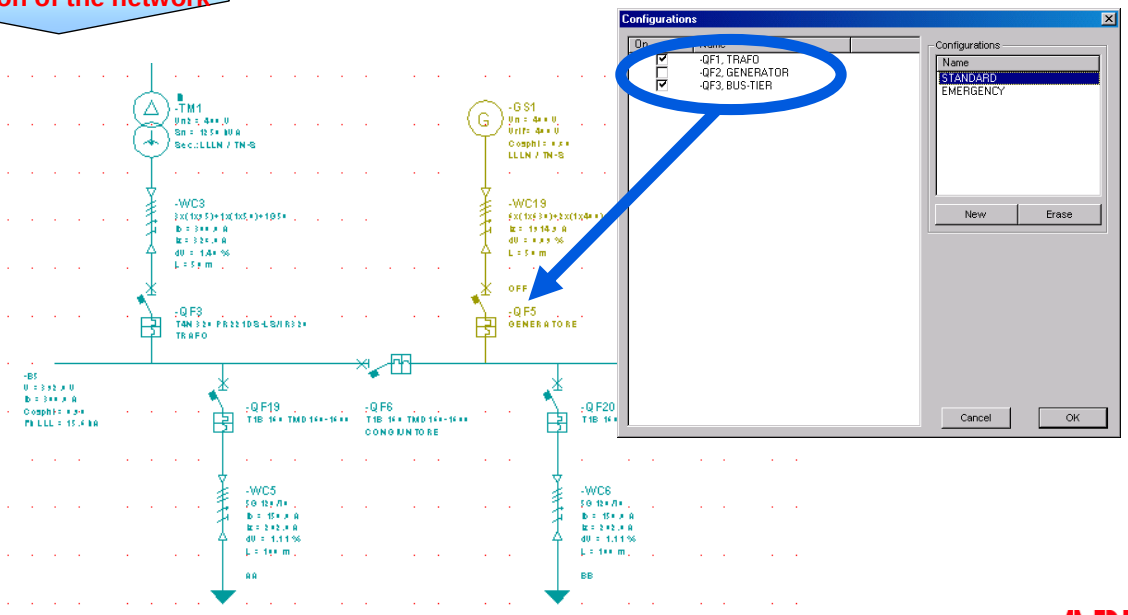
Working with DOC Win 3.0
Network Configurations

Drawing

Definition of the network

- **STANDARD** configuration (power source is the utility):

Generator circuit breaker is OFF



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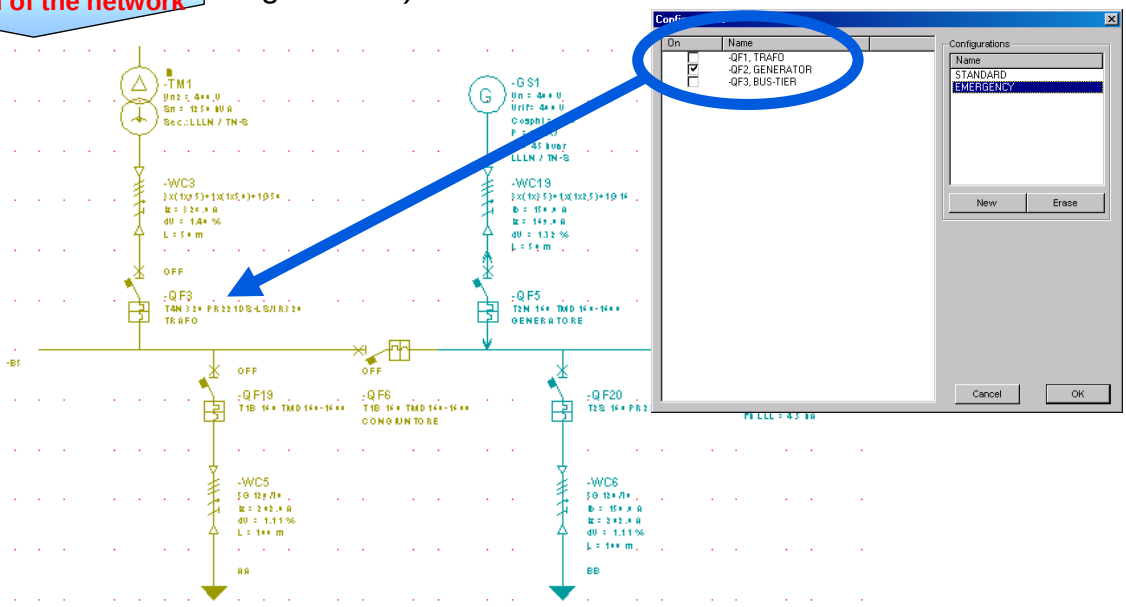
Working with DOC Win 3.0
Network Configurations

Drawing

Definition of the network

- **EMERGENCY** configuration (power source is the generator): Transformer circuit breaker is OFF



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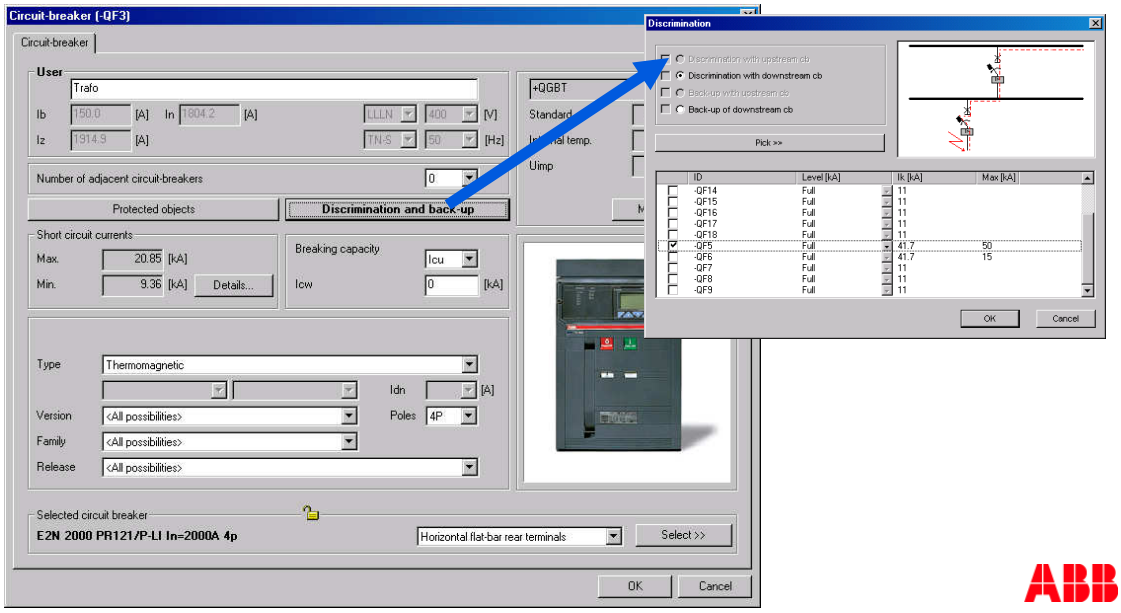
Working with DOC Win 3.0
Discrimination / Back-Up

Drawing

Definition of the network

- Discrimination with upstream / downstream circuit breaker
- Back-up with upstream / downstream circuit breaker



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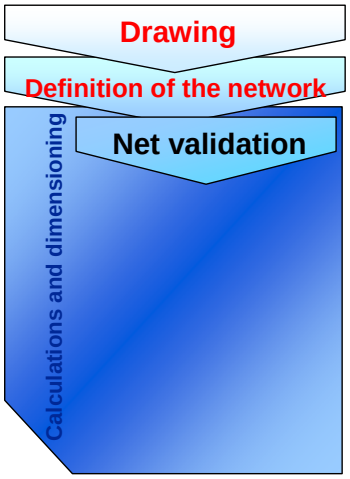
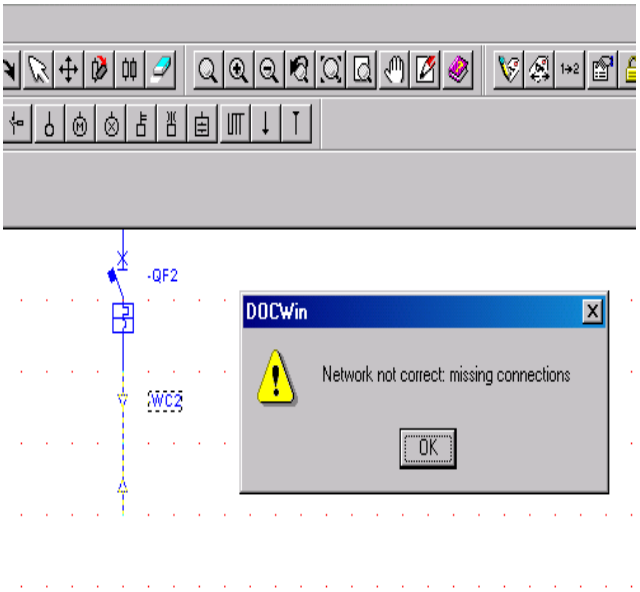
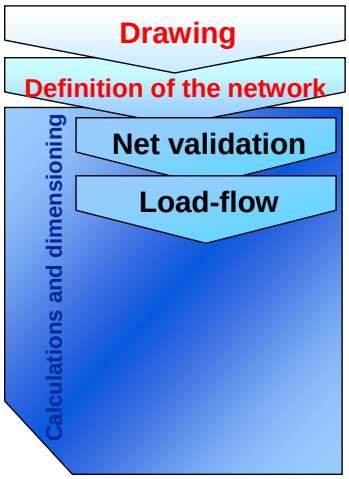
Working with DOC Win 3.0
Calculations & Dimensioning



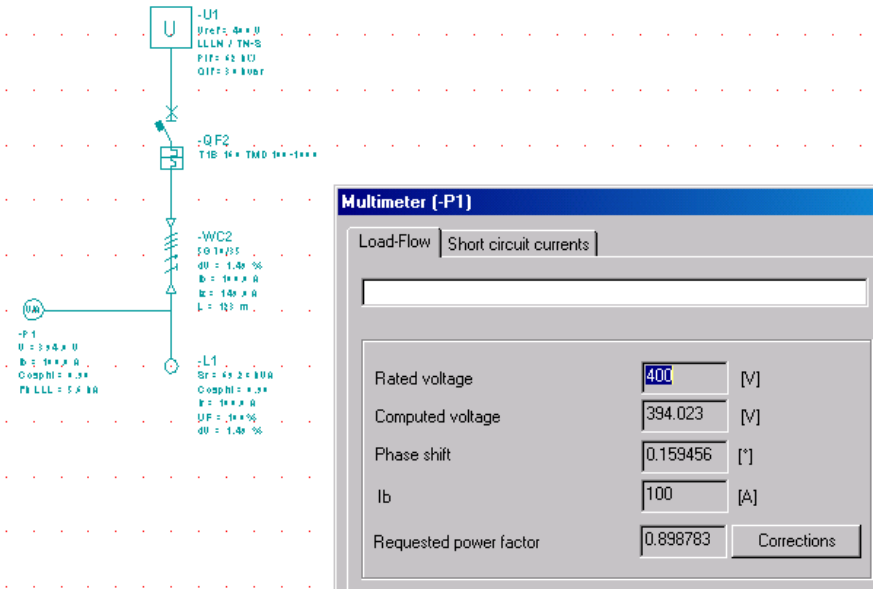
- DOCWin 3.0 verifies the design & interconnection of the network and advise of any incorrect situation



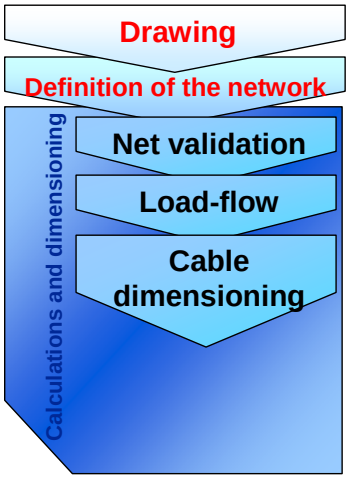
Working with DOC Win 3.0
Load-Flow



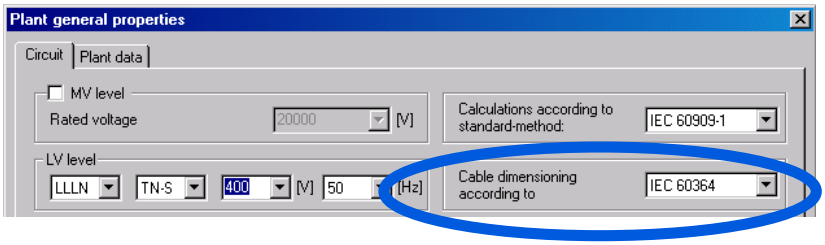
- DOCWin 3.0 calculates load current and voltage drop in every point of the network



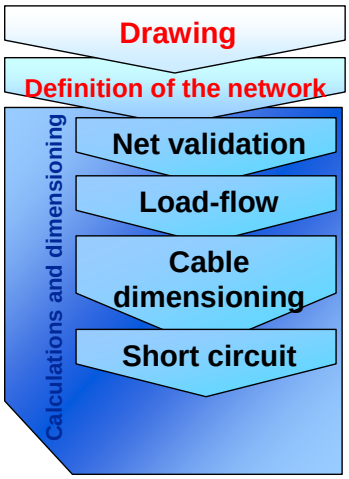
Working with DOC Win 3.0
Cable Dimensioning



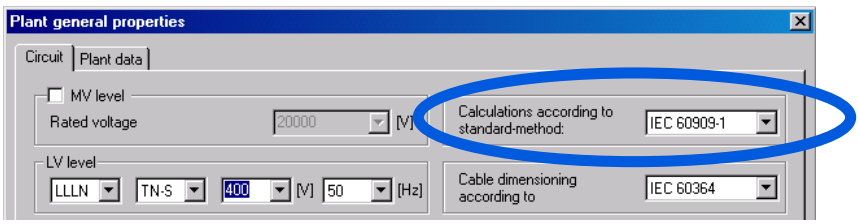
- DOCWin 3.0 dimensions and verify the cables according to these standards:
  - **IEC 60364-5-23 (Similar for SS CP5)**
  - IEC 60092(for naval installation)
  - CEI 64-8 Italian standard
  - VDE 298-4 German standard
  - NFC 15-100 French standard
  - UNE 20460 Spanish standard



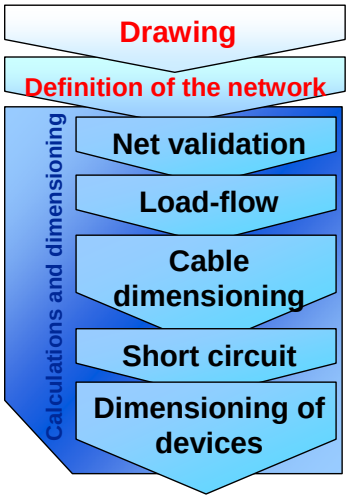
Working with DOC Win 3.0
Short Circuit



- DOCWin 3.0 calculates Ik max and Ik min according to:
  - IEC 60909-1 LV\MV network, AC, 50-60Hz
  - IEC 61363-1 naval
  - Symmetrical components
  - NFC 15-100 French national standard

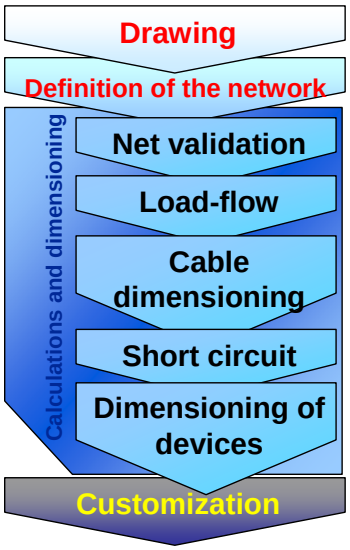


Working with DOC Win 3.0
Dimensioning of Devices

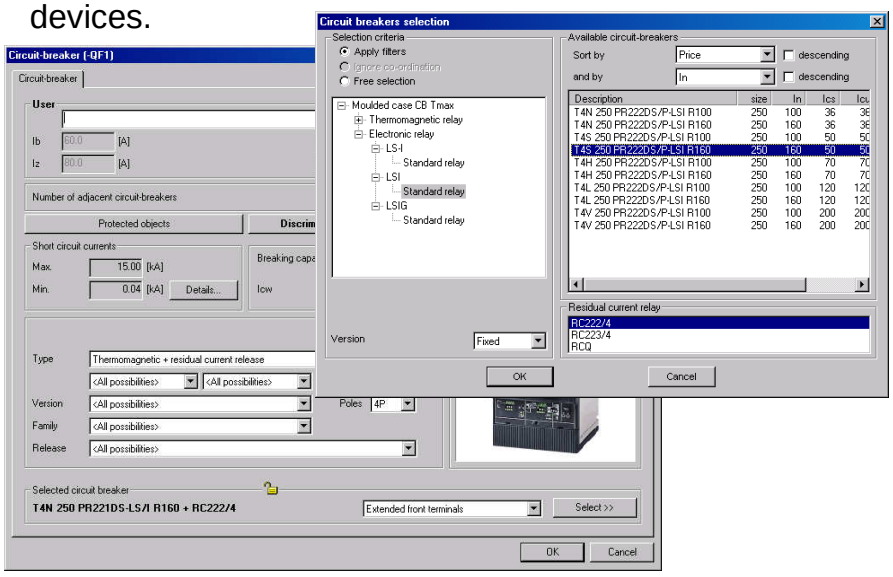


- DOCWin 3.0 dimensions the electrical devices according to the network needs:
  - Protection of cables - BTS
  - Protection of people
  - Discrimination and back-up chain links

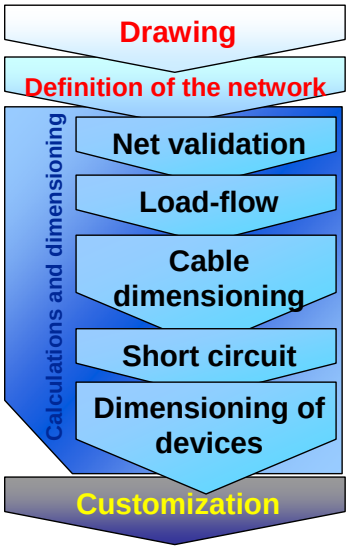
Working with DOC Win 3.0
Customization



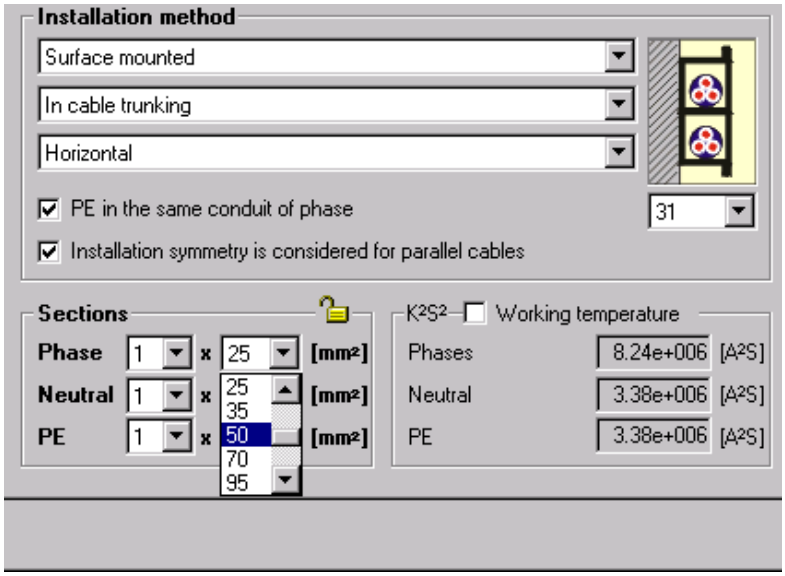
- After calculations, the user can overwrite the choice of the software with his peculiar needs.
  Specifically, it is possible to manually select the devices.



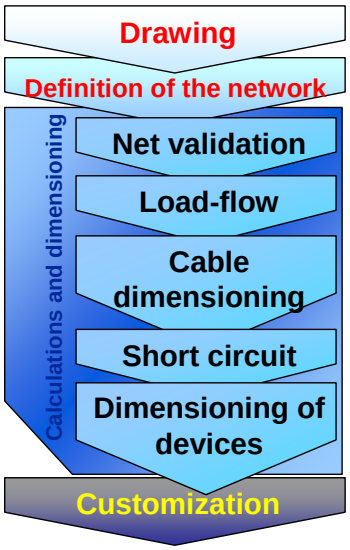
Working with DOC Win 3.0
Customization



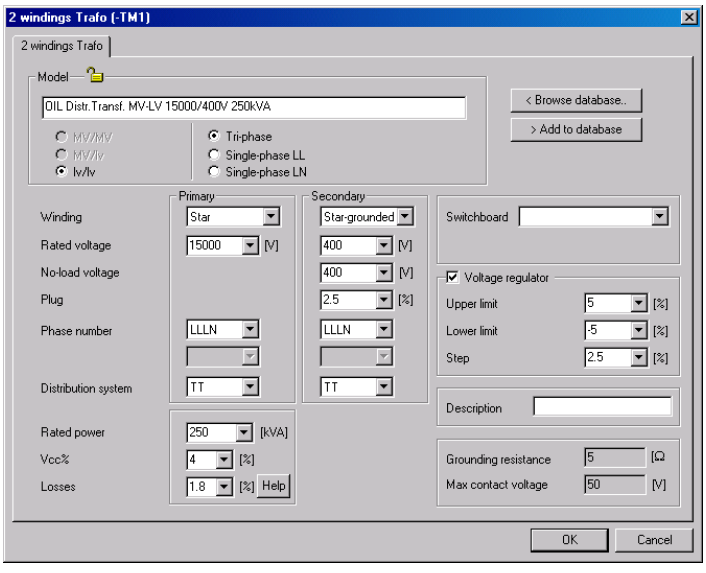
- After calculations, the user can overwrite the choice of the software with his peculiar needs.
  Specifically, it is possible:
  - Oversize the cables



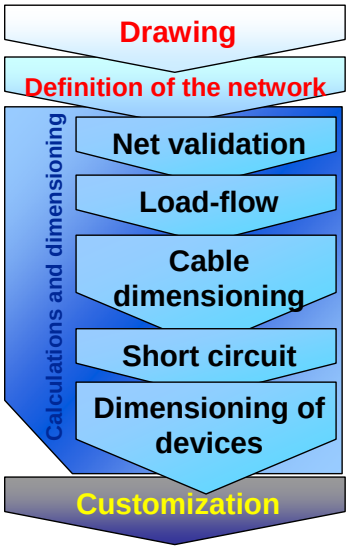
Working with DOC Win 3.0
Customization



- After calculations, the user can overwrite the choice of the software with his peculiar needs.
  Specifically, it is possible:
- Adjust the voltage drop with the voltage regulator of the transformer

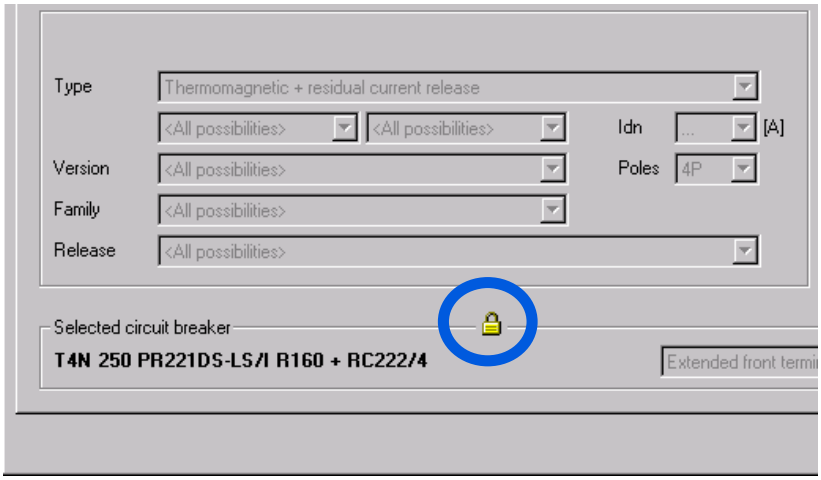


Working with DOC Win 3.0
Customization

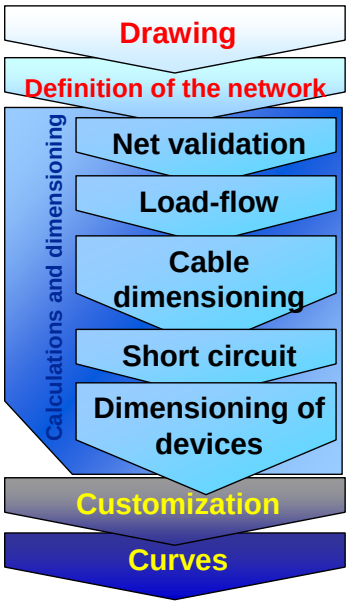


- To confirm the customization, it is mandatory to lock the newly defined objects

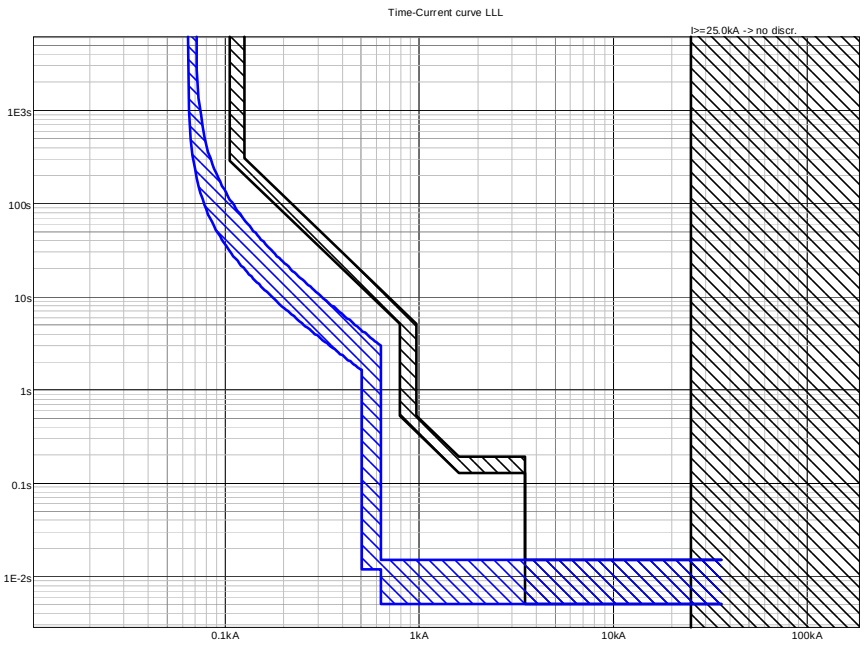




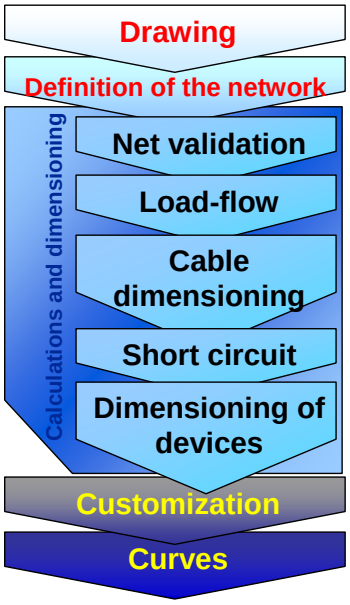
Working with DOC Win 3.0
Curves



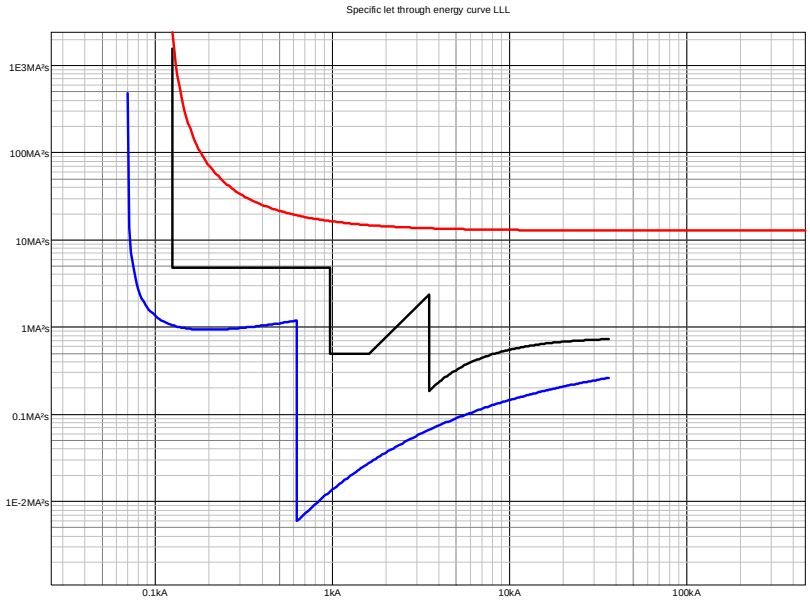
- Time-current



Working with DOC Win 3.0
Curves



- Time-current
- Let-through energy



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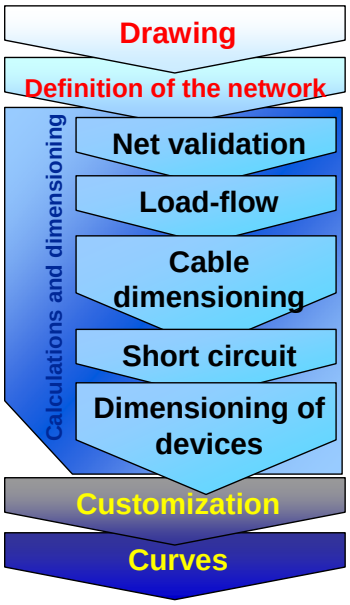
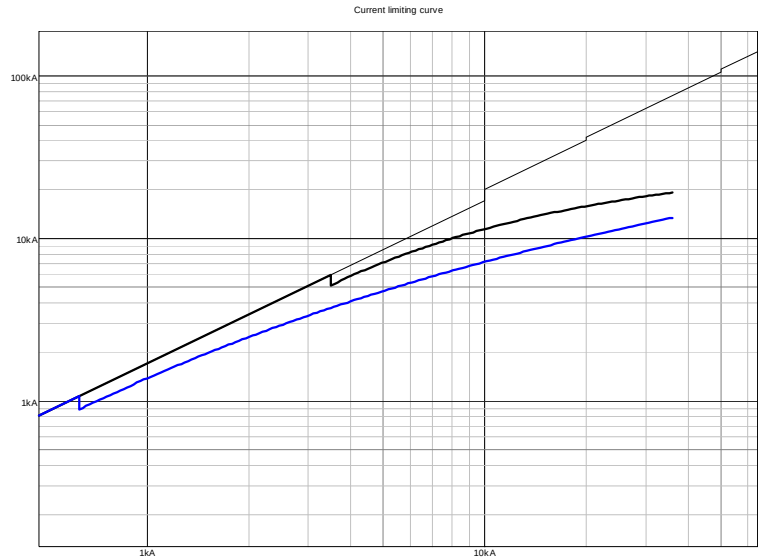
Working with DOC Win 3.0
Curves



- Time-current
- Let-through energy
- Current limiting



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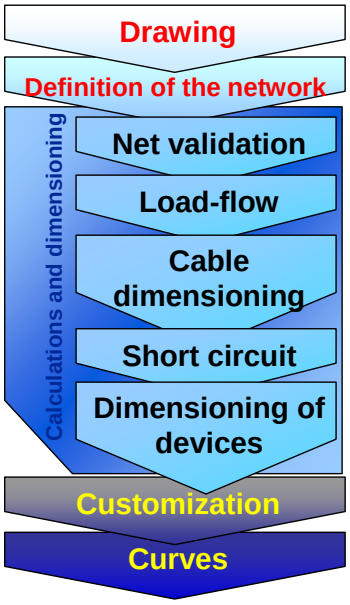
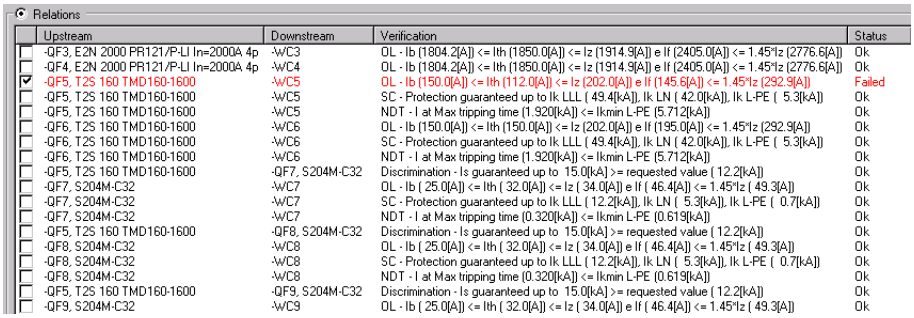
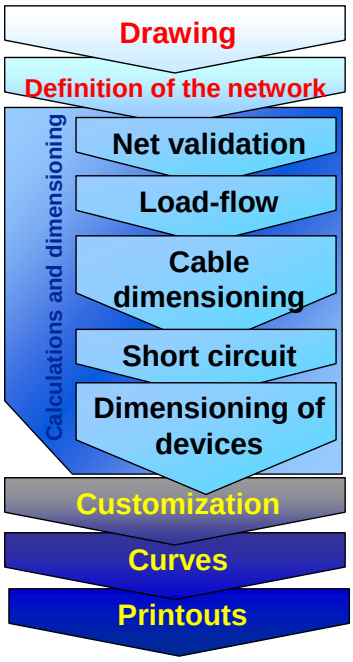
Working with DOC Win 3.0
Curves



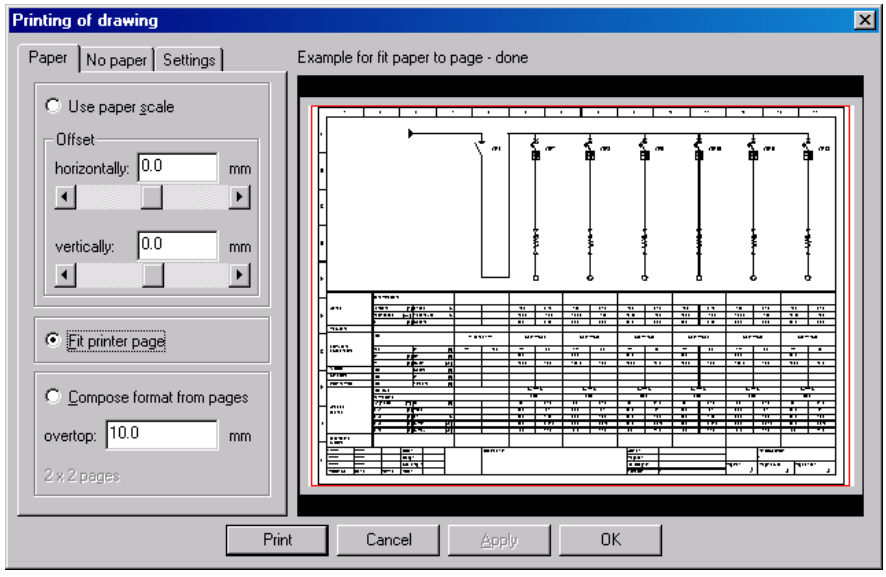
- Time-current
- Let-through energy
- Current limiting
- Verification of the overall co-ordination (i.e. discrimination and back-up protection)



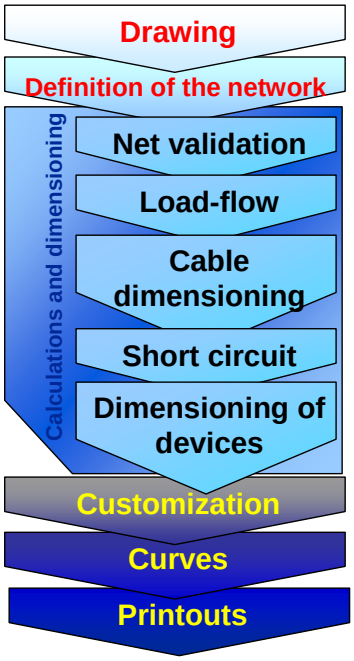
Working with DOC Win 3.0
Printouts



- Single line diagram



Working with DOC Win 3.0
Printouts

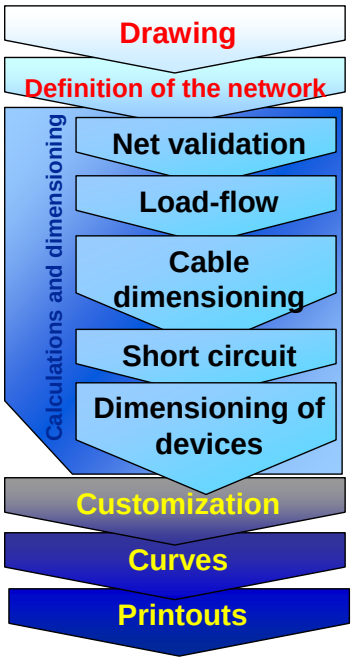


- Single line diagram
- Reports

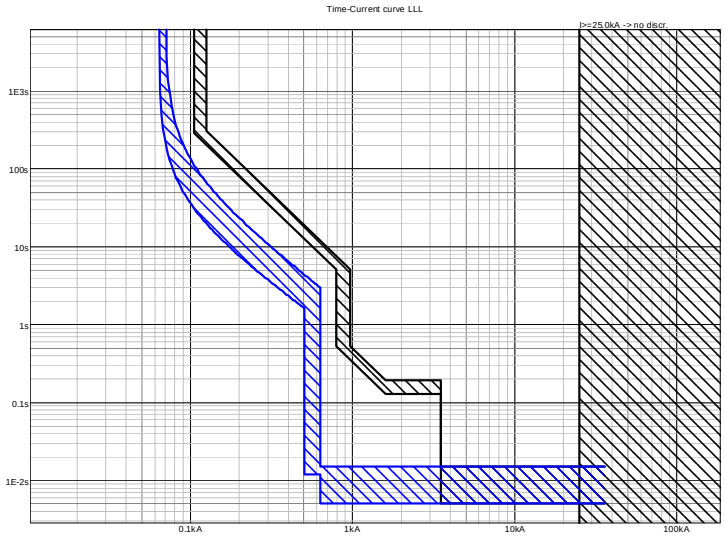
Protection of cables

Cable				Circuit-breaker				Overload			Short Circ. [kA]		
Sign	User	L. [m]	Formation	Sign	Description	Ith [A]	Im [A]	Ib [A]	Iz [A]		Max	Min	
-WC3		50	6x(1x630)+2x(1x400)+2G400					150,0	1915	Ok	26,3	9,363	Ok
-WC4		50	6x(1x630)+2x(1x400)+2G400					150,0	1915	Ok	26,3	9,363	Ok
-WC5		100	5G120/70	-QF5	T2S 160 TMD160-1600	150,0	1600	150,0	202	Ok	41,7	5,672	Ok
-WC6		100	5G120/70	-QF6	T2S 160 TMD160-1600	150,0	1600	150,0	202	Ok	41,7	5,672	Ok
-WC7		50	5G6	-QF7	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC8		50	5G6	-QF8	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC9		50	5G6	-QF9	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC10		50	5G6	-QF10	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC11		50	5G6	-QF11	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC12		50	5G6	-QF12	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC13		50	5G6	-QF13	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC14		50	5G6	-QF14	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC15		50	5G6	-QF15	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC16		50	5G6	-QF16	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC17		50	5G6	-QF17	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok
-WC18		50	5G6	-QF18	S204M-C25	25,0	188	25,0	34	Ok	11,0	0,619	Ok

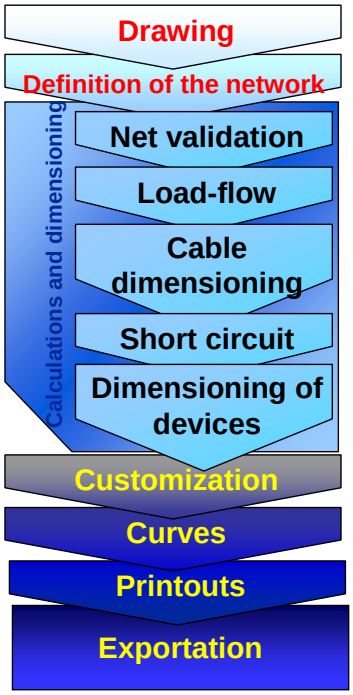
Working with DOC Win 3.0
Cable Dimensioning



- Single line diagram
- Reports
- Curves



Working with DOC Win 3.0
Compatibility & Efficiency



- DOCWin 3.0 can export:
  - ABB codes list to CAT5 for the quotation of the devices;
  - Curves and release settings into most common formats (Word, Excel, etc.)
  - Report in *.rtf and *.pdf format
  - Single line diagram in Autocad format

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