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# TATL-Tool

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# Input data



- *input_data/conductor_parameters.mat:*
  Contains parameters of various aluminum-steel conductors from IEC EN 50182-2001 and several custom types.
- *input_data/weather_parameters.mat:*
  Contains the weather scenarios used by German transmission system operators (TSO) in 2018.
- *common_parameters.mat:*
  Additional parameters taken from IEEE 738-2012
- all .mat-files contain a *Header table* including symbols, descriptions and units

# Variables Conductor Parameters



| Symbol | Description | Unit |
|---|---|---|
| Spec | Line name | |
| D | Outside diameter of conductor | m |
| R_DC | DC resistance of conductor | Ohm/m |
| R_AC | AC resistance of conductor | Ohm/m |
| M1 | weight of aluminium strands | kg/m |
| M2 | weight of steel strands | kg/m |
| I_r | rated current at standard environment circumstances | A |
| T_max | maximum temperature | °C |

# Variables Weather Parameters



| Symbol | Description | Unit |
|---|---|---|
| Number | weather scenario number according to German TSO specifications | |
| V_w | wind speed | m/s |
| Phi | angle of wind | ° |
| T_a | ambient temperature | °C |
| PATL | factor for increasing rated current | % |

# Variables Common Parameters



| Symbol | Description | Unit |
|---|---|---|
| Cp1 | heat capacity of aluminium | J/(kg*K) |
| Cp2 | heat capacity of steel | J/(kg*K) |
| Epsilon | emissitivity | |
| He | elevation of conductor above sea level | M |
| Q_se | Total solar and sky radiated heat intensity corrected for elevation | W/m^2 |
| alpha | resistance coefficient | 1/K |
| alpha_s | solar absorptivity | |

# Variables in Functions



| Symbol | Description | Unit |
|---|---|---|
| I_PATL | Permanently admissible current at max. conductor temperature | A |
| I | Current through conductor | A |
| I_prefault | Current through conductor before event occurrence | A |
| I_postfault | Current through conductor after event occurrence | A |
| T_s | Conductor surface temperature | °C |
| T_steady | Conductor temperature in steady state | °C |
| T_end | (Desired) conductor temperature at the end of a TATL timeframe | °C |
| T_start | Conductor temperature at the beginning of TATL timeframe | °C |
| T_end_steady | Stationary conductor temperature at I_postfault | °C |
| t_end | Length of TATL timeframe | min |
| T | Timestamp | min |
| idx_line | Row number of conductor type in Leitungsparameter | Integer |
| idx_weather | Row number of conductor type in Wetterparameter | Integer |
| preloading | Loading of conductor before event occurence | Double |

# Main Functions



| Funktion | Eingangsdaten | Ausgangsdaten | Beschreibung |
|---|---|---|---|
| PATLTherm | **T_s**, D, R_ac, V_w, Phi, T_a, Epsilon, He, Q_se, alpha, alpha_s | I_PATL (double) | Determines the permanently admissible current (PATL) |
| TATLTherm | D, R_ac, V_w, Phi, T_a, Epsilon, He, Q_se, alpha, alpha_s, M1, M2, Cp1, Cp2, **I_prefault**, **t_end**, **T_end** | I_TATL (double) | Returns the maximal admissible constant current leading to the desired end temperature at the end of the timeframe. May return NaN if T_end cannot be reached (i. e. too short cool down time frame) |
| SteadyLineTemperature | D, R_ac, V_w, Phi, T_a, Epsilon, He, Q_se, alpha, alpha_s, **I** | T_steady (double) | Returns the stationary conductor temperature |
| TransientLineTemperature | Mandatory:<br>D, R_ac, M1, M2, V_w, Phi, T_a, Cp1, Cp2, Epsilon, He, Q_se, alpha, alpha_s, **T_start**, **I_postfault**, **t_end**<br><br>Optional:<br>'Adiabatic', true | result.T_start (double)<br>result.T_end (double)<br>result.T_steady (double)<br>result.T_s (array)<br>result.t (array) | Returns the time-dependent line temperature for a given timeframe<br><br>Use „‚Adiabatic', true" for fault currents |
| TATL_Zeitreihen | | | Script that returns the TATL and PATL for all conductors, weather situations, preloadings and different TATL timeframes as .mat and .xlsx |

# Auxiliary Functions



| Funktion | Eingangsdaten | Ausgangsdaten | Beschreibung |
|---|---|---|---|
| `GetLineParameters` | `idx_line, Leitungsparameter (table)` | `D`<br>`R_ac`<br>`M1`<br>`M2`<br>`T_max` | Returns the conductor parameters from `Leitungsparameter` table |
| `GetWeatherParameters` | `idx_weather, Wetter (table)` | `T_a`<br>`V_w`<br>`Phi` | Returns the conductor parameters from `Wetterparameter` table |
| `GetPreFaultCurrent` | `idx_line`<br>`idx_weather`<br>`preloading`<br>`Leitungsparameter (table)`<br>`Wetterparameter (table)` | `I_prefault` | Returns the current before event occurence depending on the loading |