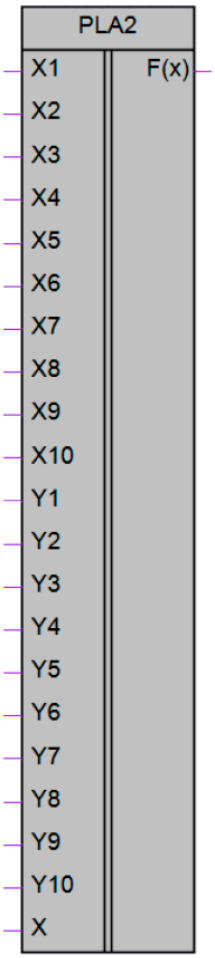
# Piecewise linear approximation PLA



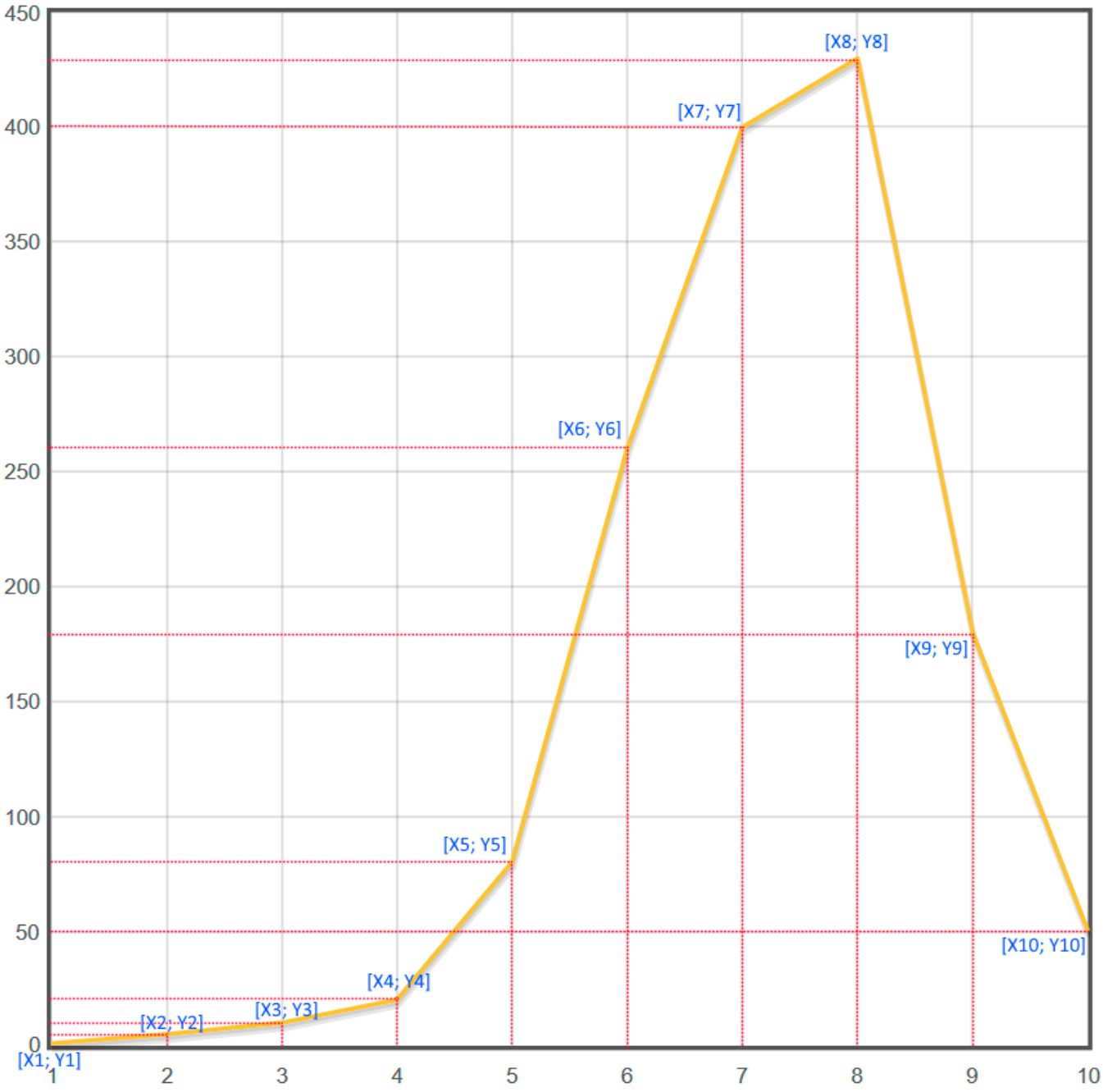

| Inputs | Data type | Description | Area |
|---|---|---|---|
| X1…X10 | REAL | Xi coordinate of the linear characteristic | -999999.9…999999.9* |
| Y1…Y10 | REAL | Yi coordinate of the linear characteristic | -999999.9…999999.9* |
| X | REAL | Current value of the input variable | -999999.9…999999.9* |
| **Output** | **Data type** | **Description** | **Area** |
| F(x) | REAL | Calculation result | -999999.9…999999.9* |

*- since the numbers outside the specified range have not been checked for correct conversion, it is recommended to enter values from the specified range in the macro input.

**Function**

The macro is a piecewise linear approximation algorithm with the ability to set up to 10 approximation points. The nonlinear function is divided into several sections, each of which is replaced by a linear function (a line that conforms to the law y = kx) that approximates the original "piece" of the nonlinear function as closely as possible. The mean values of the function are calculated using the formula of the straight line on the corresponding segment.

The illustration of the linear approximation algorithm is shown below.

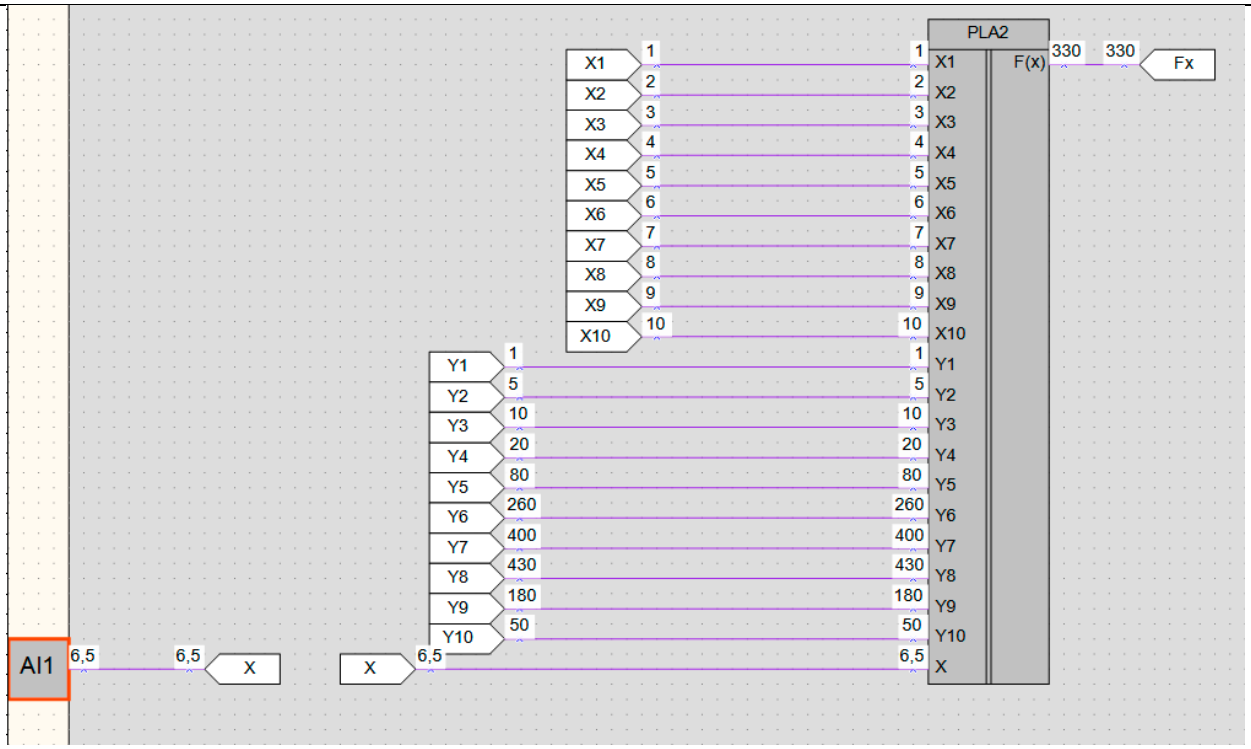



The X and Y coordinates values for each section are shown in the table.

| X | Xi | Yi | F(x) |
|---|---|---|---|
| 1.0 | 1.0 | 1 | 1 |
| 2.0 | 2.0 | 5 | 5 |
| 2.7 | | | 8.5 |
| 3.0 | 3.0 | 10 | 10 |
| 4.0 | 4.0 | 20 | 20 |
| 5.0 | 5.0 | 80 | 80 |
| 6.0 | 6.0 | 260 | 260 |
| 6.3 | | | 302 |
| 7.0 | 7.0 | 400 | 400 |
| 8.0 | 8.0 | 430 | 430 |
| 9.0 | 9.0 | 180 | 180 |
| 9.1 | | | 167 |
| 10.0 | 10.0 | 50 | 50 |

**Sample project**

The figure below shows an example of how the macro with 9 linearization section works.




**Macro application area:**

1) In algorithms where it is necessary to use non-linear characteristics, such as: weather-dependent automation, gas-air mixture calculation, etc.

| | |
|---|---|
| Devices | PR200, SMI200 |
| Version | 1.0 |
| Last modification | 06.06.2020 |