

MiCOM Px4x

User Programmable Curve Tool

Px4x/EN UPCT/A11

Software Version P14x (V46 and later) and P24x (V55 and later)

Quick Guide

Note

The technical manual for this device gives instructions for its installation, commissioning, and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics. In the event of questions or specific problems, do not take any action without proper authorization. Contact the appropriate Schneider Electric technical sales office and request the necessary information.

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CONTENTS

Page (UPCT) 1

1	User Interface	3
1.1	Summary of Menu Items	4
1.1.1	File	4
1.1.2	View	4
1.1.3	Graph Options	4
1.1.4	Device	4
1.1.5	Language	5
1.1.6	Help	5
1.2	Curve Selection	5
1.3	Curve Plot	6
1.3.1	Zooming and Panning	6
1.3.2	Scales	6
1.3.3	Grid Lines	6
1.4	Curve Details Pane	7
1.5	Curve Points Pane	8
1.5.1	Entering Values into the Table	8
1.6	Input Table View Pane	8
1.7	Product View Pane	8
1.8	Formula Editor	9
1.8.1	Entering the Constants	10
1.8.2	Saving the Formula	10
1.8.3	Generating the Curve	10
1.8.4	Operations Tab	10
1.9	Send a Curve to a Relay	11

FIGURES

Page (UPCT) 1

Figure 1 - Curve Tool User Interface	3
Figure 2 - Curve selection	5
Figure 3 - Curve Tool desktop with Curve Detail displayed	7
Figure 4 - Formula Editor	9
Figure 5 - Curve Listing	11
Figure 6 - Send Curve Form	11
Figure 7 - Get Curve Ref	12

TABLES

	Page (UPCT) 1
Table 1 - File menu	4
Table 2 - View menu	4
Table 3 - Graph Options menu	4
Table 4 - Device menu	4
Table 5 - Language menu	5
Table 6 - Help menu	5
Table 7 - Curve Plot operations	6
Table 8 - Curve Points pane	8
Table 9 - Available templates	9
Table 10 - Allowed Operators	10
Table 11 - Curves stored in relay	11

1 USER INTERFACE

Before starting, make sure that the RS-232 serial cable is connected to the RS-232 serial port on the front panel of the relay.

To start the User Programmable Curve Tool, double click on the icon installed on the desktop or select **Start > Programs > Schneider Electric > User Programmable Curve Tool**.

The Curve Tool splash screen appears followed by the main screen (see Figure 1).

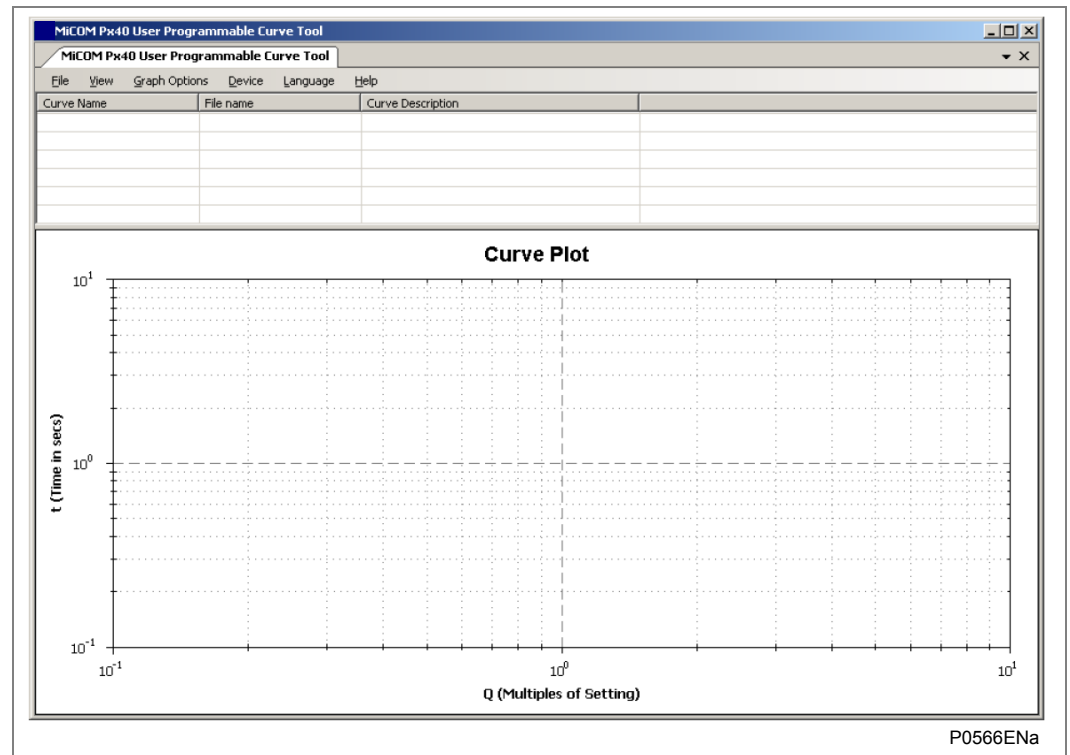


Figure 1 - Curve Tool User Interface

The main screen consists of:

- The main menu bar
- The curve selection table
- The Curve Plot area

These separate items are dealt with in the following sections.

1.1 Summary of Menu Items

1.1.1 File

Menu item	Description
File > New > Formula	Opens up a new formula or new input table
File > New > Input Table	Opens up a new input table
File > Open Curve	Opens up existing curve
File > Close Curve	Closes curve
File > Save > Input Table View	Saves curve file in CSV format
File > Save > Product View	Saves curve file in CRV format
File > Save As > Input Table View	Saves new file in CSV format
File > Save As > Product View	Saves new file in CRV format
File > Save As > Dcc File	Saves new file in CSV format (for Omicron)

Table 1 - File menu

1.1.2 View

Menu item	Description
View > Show Curve Details	Opens up the Curve Details dialog
View > Show Formula Editor	Opens up the Formula Editor dialog

Table 2 - View menu

1.1.3 Graph Options

Menu item	Description
Graph Options > X-Axis Scale > Linear	Selects linear x-axis scale
Graph Options > X-Axis Scale > Logarithmic	Selects logarithmic x-access scale
Graph Options > Y-Axis Scale > Linear	Selects linear y-axis scale
Graph Options > Grid Lines > Logarithmic	Selects logarithmic y-access scale
Graph Options > Grid Lines > Major Grid Lines	Shows grid lines in a course scale
Graph Options > Grid Lines > Minor Grid Lines	Shows grid lines in a fine scale

Table 3 - Graph Options menu

1.1.4 Device

Menu item	Description
Device > Connection Configuration	Configure the communications interface
Device > Send Curve	Send a curve to a relay
Device > Extract Curve	Extract a curve from a relay

Table 4 - Device menu

1.1.5

Language

Menu item	Description
Language > Deutsch	German
Language > English	English
Language > Español	Spanish
Language > Français	French
Language > Deutsch	German
Language > Русский	Russian
Language > 中文	Chinese* * You must ensure your PC is configured for this language

Table 5 - Language menu

1.1.6

Help

Menu item	Description
Help > Help Content	Invokes HTML help system
Help > About	Displays information on software name and version

Table 6 - Help menu

1.2

Curve Selection

The curve selection pane contains a list of available curves. As you import or create more curves, they will appear as row items in this table. The curves are plotted on the graph if their relevant checkbox is checked.

You select a curve for upload or download by clicking on the curve name, whereby it will become highlighted.

Curve Name	File name	Curve Description
<input checked="" type="checkbox"/> Def User Curve 2 (extracted)	New Curve2 (extracted)	Extracted from relay
<input checked="" type="checkbox"/> test	New Curve [Product View].csv	$TMS * (K / (Q^{ALPHA} - 1) + C$

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Figure 2 - Curve selection

1.3 Curve Plot

The **Curve Plot** area is used to display the curves. It displays the time on the y-axis versus Q (multiples of nominal current) on the x-axis. This is the standard method of defining protection relay configuration curves.

You can carry out a range of flexible operations on the curves from the context sensitive menu, invoked by clicking the right mouse button anywhere in the plot area. Operations include copying and saving the image, zooming, panning and printing. These are summarized in Table 7.

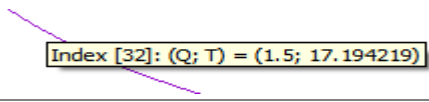
Menu item	
Copy	Copy image to clipboard
Save Image As...	Save image in one of the formats: PNG, GIF, JPEG, TIFF, BMP
Page Setup...	Set up the page for printing
Print Preview	View the page as it will be printed
Print...	Print the page
Show Point Values	This shows the data point (Q & T) on any point of the graph according to where your mouse cursor is positioned. For example: 
Un-Zoom	Un-zooms, last zoom action
Undo All Zoom/Pan	Reverts to original view.
Set Scale to Default	Sets the scale to the default value

Table 7 - Curve Plot operations

1.3.1 Zooming and Panning

To zoom in, click and hold the left mouse button and drag to define the area of interest. To pan, click and hold the left mouse button whilst holding the shift key and move the mouse in the relevant direction.

To un-zoom or un-pan, right-click on the Curve Plot to invoke the context sensitive menu and select the relevant menu item.

1.3.2 Scales

You can set the scale of each axis to either logarithmic or linear. You do this from the Graph Options menu.

1.3.3 Grid Lines

You can show or hide grid lines using the Graph Options menu.

1.4 Curve Details Pane

You can bring up further details about the curves by selecting **View > Show Curve Detail**.

The **Curves Points Details** window appears and occupies the left-hand-side of the Curve Plot screen, condensing the Curve Plot screen into the right-hand-side of the screen. You can alter the width of the two areas by positioning the mouse cursor on the vertical border between the two areas and dragging. The Curve Detail dialog can be closed at any time by clicking the cross in the right-hand corner. You can also auto-hide the Curve detail by clicking the icon next to the cross. This will allow you to view the plot in full size, and only show the curve detail when you position the cursor in the marked area in the left-hand margin. Figure 3 shows the User Interface with the Curve Detail displayed.

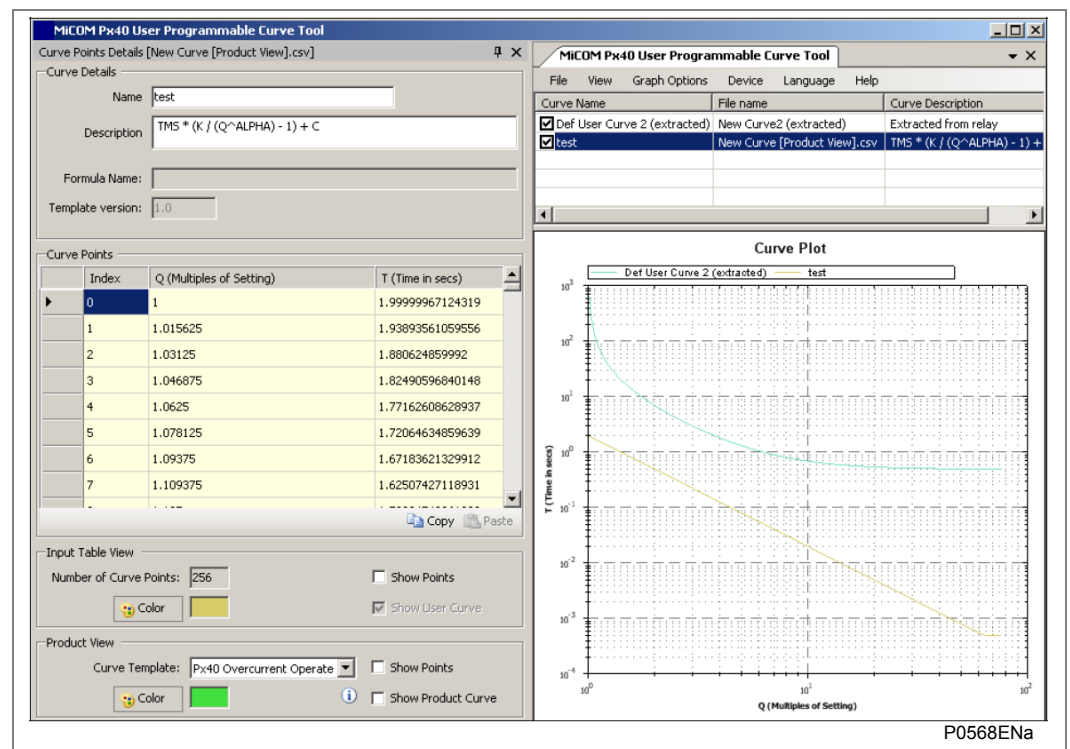


Figure 3 - Curve Tool desktop with Curve Detail displayed

The **Curves Points Details** area consists of four panes, which will now be described.

- Curve Details
- Curve Points
- Input Table View
- Product View

In the **Curve Details** pane you can define the name and description of the user curve. You can enter a string up to 16 standard ASCII characters. If you do not enter a name, the default name **New Curve** will be used.

The formula name and template version are also displayed if applicable.

1.5 Curve Points Pane

The **Curve Points** pane displays consists of three columns as described in Table 8.

Column	Description
Index	Each curve point has a unique index number associated with it, starting at 0, incrementing by 1 and ending with the last curve point.
Q (multiples of setting)	Q, in this context stands for Quantity. It is the secondary current I_s expressed in multiples of the nominal current I_n .
T (Time in secs)	T is the imposed delay time, expressed in seconds.

Table 8 - Curve Points pane

1.5.1 Entering Values into the Table

You can input values for Q and T to define a table. You do this by selecting **File > New > Input Table**. You insert the values for Q and T accordingly. You can insert up to a maximum of 256 curve points (index 0 to 255). If fewer points are inserted, the tool automatically interpolates points using a linear interpolation method.

The tool instantaneously updates the graph view as points are entered.

You can also copy and paste an entire table from Excel or other compatible table formats. You do this by copying the table to the clipboard, positioning the cursor in the top left-hand Q cell and pasting.

1.6 Input Table View Pane

In this pane, you can elect to show the user curve and/or its associated points or not. It also allows you to choose the color of the plotted user curve.

1.7 Product View Pane

In this pane, you can select a curve template from the Px40 product range. You can also choose whether to plot the product curve and/or its points or not. It also allows you to choose the color of the plotted product curve.

1.8 Formula Editor

You open up the Formula Editor by selecting View > Show Formula Editor.

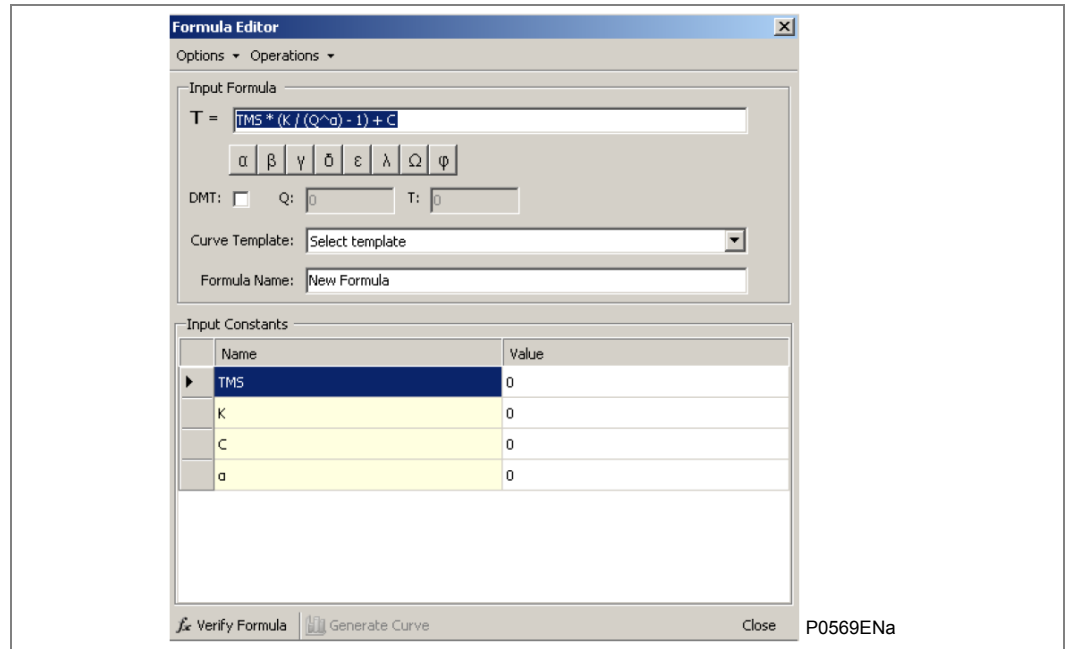


Figure 4 - Formula Editor

The **Formula Editor** dialog allows you to define your own formula. You enter the formula into the **T=** field. The operators available to you are described in Table 10. The formula is case sensitive. You may use only upper-case letters.

The curve you are creating with the formula must be associated with a predefined template, which is one of four curves stored in the relay. You select the required template from the **Curve Template** dropdown box.

Available templates are:

Template	Description
Px40 Overcurrent Operate	IDMT curve for operating relay in overcurrent condition
Px40 Overcurrent Reset	IDMT curve for resetting relay in overcurrent condition
P24x Thermal Overload Operate	Curve for operating relay in thermal overload condition
P24x Thermal Overload Reset	Curve for resetting relay in thermal overload condition

Table 9 - Available templates

You enter the formula name into the **Formula Name** field. This can be any combination of standard ASCII characters up to 32 characters.

If you require a Definite Time characteristic check DMT (Definite Minimum Time) checkbox. This enables the Q and T value entry fields, into which you can enter fixed values for the tripping current and the delay time.

You can enter whatever constants you like into the formula. For your convenience, the first eight letters of the Greek alphabet have been included on the formula editor as buttons. Click on a button to enter the character in the formula field.

The allowed operators are summarized in Table 10

Operators	Description
+	Plus
-	Minus
*	Multiply
/	Divide
^	Raise to the power of
sqrt()	Square Root
ln()	Natural logarithm
Sin	Sin function
Cos	Cos function
Tan	Tan function

Table 10 - Allowed Operators

To validate the formula, click the **Verify Formula** button at the bottom left corner of the screen. The names of the constants used in the formula are displayed in the **Input Constants** table. The formula verifier checks that the operators are valid, but does not check that the formula itself is valid or whether the results will be out of range.

1.8.1 Entering the Constants

You input the formula constants in the **Value** column.

1.8.2 Saving the Formula

To save the formula, select the **Options** tab then click **Save As...**

Choose a file name. The file is saved in XML format. You can enter up to 16 standard ASCII characters.

1.8.3 Generating the Curve

Once the constants have been entered and the file has been saved, the **Generate Curve** button (next to the **Verify Formula** button) becomes enabled. Click this button to generate a curve.

The curve is generated in the **Curve Plot** window.

1.8.4 Operations Tab

The Operations tab provides exactly the same functionality as the **Verify Formula** button and the **Generate Curve** button.

1.9 Send a Curve to a Relay

Select the curve to be downloaded by clicking in the relevant row. It will become highlighted in blue.

Curve Name	File name	Curve Description
<input checked="" type="checkbox"/> Def User Curve 2 (extracted)	New Curve2 (extracted)	Extracted from relay
<input checked="" type="checkbox"/> test	New Curve [Product View].csv	$TMS * (K / (Q^{ALPHA}) - 1) + C$

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Figure 5 - Curve Listing

Click the **Device** tab and select **Send Curve**. The Send Curve Form appears.

The screenshot shows the 'SendCurveForm' dialog box. It contains a 'Curve Name' field with 'Data_Example' entered, a 'Curve Characteristic' dropdown menu set to 'Curve1', and a 'Get Curve Ref' button. Below these is a table with columns 'PC Curve Value' and 'Relay Curve Value'. The table has rows for 'Reference' (Data_Example) and 'Version' (1.0). Callouts point to the 'Curve Name' field, the 'Get Curve Ref' button, the 'Reference' cell, and the 'Relay Curve Value' column.

Display the curve name to be downloaded

Extract curve reference from relay (Selection : Curve 1, Curve 2, Curve 3 and Curve 4)

Displays the curve reference as selected from the tool

Displays the present curve reference in the relay

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Figure 6 - Send Curve Form

The relay stores four curve characteristics as summarised in Table 11. Select which curve you wish to overwrite from the **Curve Characteristic** dropdown box.

Curve	Description
Curve 1	Px40 Overcurrent Operate
Curve 2	P24x Thermal Overload Operate
Curve 3	Px40 Overcurrent Reset
Curve 4	P24x Thermal Overload Reset

Table 11 - Curves stored in relay

Click Send to download the curve to the relay.

Click **Get Curve Ref** for verification.

If the download was successful, the PC Curve Value will be the same as the Relay Curve Value, because it will have overwritten the existing Relay curve value, (see Figure 7).

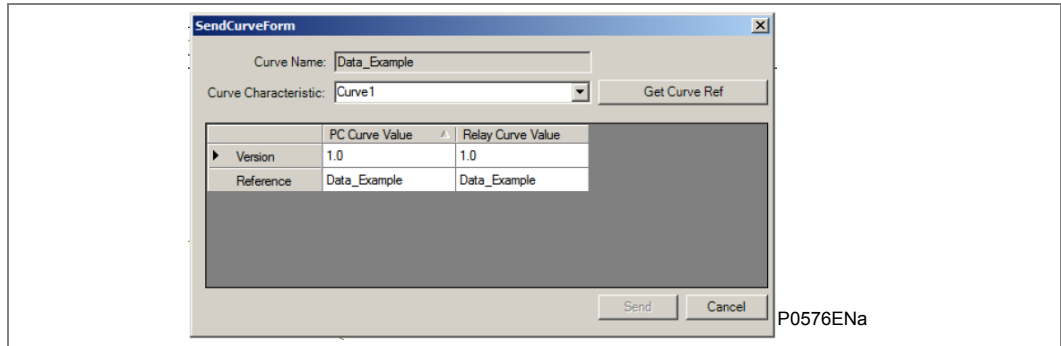


Figure 7 - Get Curve Ref

Extract curve from relay and save it on computer in CSV format or CRV format.



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