System 800xA
800xA for Freelance VB Graphics Extension
Operation

System Version 6.0
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# Table of Contents

General ..............................................................................................................................9
Use of Warning, Caution, Information, and Tip Icons ......................................................9
Document Conventions ...................................................................................................10
Terminology.....................................................................................................................11
Related Documentation .................................................................................................12

## Section 1 - Freelance Faceplates

General ............................................................................................................................13
Faceplate Structure ..........................................................................................................13
Symbols and Buttons .......................................................................................................16
  - Operator Area of the Faceplates ...........................................................................16
  - Display Area of the Faceplates .............................................................................21
  - Alarm Area of the Faceplates ..............................................................................21

## Section 2 - Analog Function Blocks

Analog Input Transformation, AI_TR .............................................................................23
Analog Output Transformation (transient), AI_TR .......................................................25
Analog Output Transformation, AO_TR .........................................................................26
Counter with Analog Input, CT_ANA ............................................................................27
Set Point Controller, C_ANA ..........................................................................................29
Time Scheduler, TS .........................................................................................................30

## Section 3 - Binary Function Blocks

Time Counter, CTT ..........................................................................................................33
Up/Down Counter, CTUD ...............................................................................................35
Operating Time Counter, CT_LT ....................................................................................36
Table of Contents

Pulse Counter, CT_P ................................................................. 37
Frequency/Analog Converter, FAC_D ........................................ 38
Monoflop, MONO_F ............................................................... 39
Binary Output, M_BOUT .......................................................... 40
Timer .................................................................................... 41
  Switch-on/off Delay, TONOF / Switch-off Delay, TOF / Switch-on Delay, TON
  External Input, TIMER .......................................................... 42
  Touch Button, TOUCH ............................................................ 43

Section 4 - Monitoring Function Blocks
Event Message, EVENT .......................................................... 45
Analog, M_ANA ...................................................................... 46
Antivalence, M_BAV ............................................................. 47
Binary, M_BIN ...................................................................... 48
Universal, M_GEN ................................................................. 49
  Display .............................................................................. 49
  Operator interventions ....................................................... 49

Section 5 - Controller Function Blocks
Continuous Controllers ......................................................... 51
  Universal, C_CU / Standard, C_CS / Ratio, C_CR .................. 51
Step Controllers .................................................................... 55
  Universal, C_SU / Standard, C_SS / Ratio, C_SR .................. 55
Two Position Controllers ....................................................... 58
  Universal, C_OU / Standard, C_OS ..................................... 58
Three Position Controllers .................................................... 60
  Universal, C_PU / Standard, C_PS ..................................... 60
Self-tune controller, TUNE ..................................................... 62

Section 6 - Open Loop Control Function Blocks
Individual Drive Functions .................................................. 65
  Unidirectional Units, IDF_1 / Bi-directional Units, IDF_2 / Actuators, IDF_A ........................................ 65
  Dosing Circuits, DOS, DOS_A and DOS_E .......................... 67
Operator interventions ................................................................. 68

Section 7 - Constant Function Blocks
Constant Inputs, CSTBO, ...... , CSTWO .............................................. 69
   Input Boolean, CSTBO / Input Byte, CSTBY ...................................... 70
   Input Double Integer, CSTD1 / Input Date and Time CSTD1 ............... 71
   Input Double Word, CSTDW / Input Integer, CSTIN ......................... 72
   Input floating point, CSTR1 / Input time, CSTR1 ............................. 73
   Input double integer word, CSTUD / Input integer word, CSTUI .......... 74
   Input Word, CSTWO ....................................................................... 75
Constant Inputs, CSTSTR8, ...... , CSTSTR256 ..................................... 76

Section 8 - Batch Function Blocks
Phase X Control, FPX ..................................................................... 79
   Phase X Faceplate ......................................................................... 82

Section 9 - Sequence Control Function Blocks
Sequential Flow Chart, SFC ............................................................. 89
About This User Manual

General

The present documentation describes the operation and display of the functions, function blocks and variables specific to 800xA for Freelance VB Graphic Extension. Further information on the function of the blocks may be found in the Freelance system documentation.

For latest information see also the corresponding Release Notes.

Use of Warning, Caution, Information, and Tip Icons

This publication includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

- Electrical warning icon indicates the presence of a hazard which could result in electrical shock.

- Warning icon indicates the presence of a hazard which could result in personal injury.

- Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment/property.

- Information icon alerts the reader to pertinent facts and conditions.
Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all Warning and Caution notices.

Document Conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are displayed in italics.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click OK.
- The names of menus and menu items are boldfaced. For example, the File menu.
  - The following convention is used for menu operations: MenuName > MenuItem > CascadedMenuItem. For example: select File > New > Type.
  - The Start menu name always refers to the Start menu on the Windows Task Bar.
- System prompts/messages are shown in the Courier font, and user responses/input are in the boldfaced Courier font. For example, if you enter a value out of range, the following message is displayed:
Entered value is not valid. The value must be 0 to 30.

You may be told to enter the string TIC132 in a field. The string is shown as follows in the procedure:

**TIC132**

Variables are shown using lowercase letters.

sequence name

**Terminology**

A complete and comprehensive list of Terms is included in *System 800xA System Planning (3BSE041389*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster’s Dictionary of Computer Terms. Terms that uniquely apply to this instruction are listed in the following table.

<table>
<thead>
<tr>
<th>Term/Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>OPC Alarms and Events</td>
</tr>
<tr>
<td>CBF</td>
<td>Freelance engineering tool Control Builder F</td>
</tr>
<tr>
<td>DA</td>
<td>OPC Data Access</td>
</tr>
<tr>
<td>OPC</td>
<td>OLE for Process Control</td>
</tr>
<tr>
<td>PLC file</td>
<td>Standard file format for Programmable Logic Control</td>
</tr>
<tr>
<td>SFC</td>
<td>Freelance Sequential Function Chart</td>
</tr>
</tbody>
</table>
Related Documentation

A complete list of all documents applicable to the 800xA System is provided in *System 800xA Released User Documents (3BUA000263)*. This document lists applicable Release Notes and User Instructions. It is provided in PDF format and is included on the Release Notes/Documentation media provided with the system. *System 800xA Released User Documents (3BUA000263)* is updated with each release and a new file is provided that contains all user documents applicable for that release with their applicable document number. Whenever a reference to a specific instruction is made, the instruction number is included in the reference.

Table 1.

<table>
<thead>
<tr>
<th>Category</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>800xA for Freelance, Release Notes</td>
<td>2PAA112403*</td>
</tr>
<tr>
<td></td>
<td>800xA for Freelance, Configuration</td>
<td>3BDD011812*</td>
</tr>
<tr>
<td></td>
<td>800xA for Freelance, Installation</td>
<td>3BDD011810*</td>
</tr>
<tr>
<td>VB Graphics Extension</td>
<td>800xA for Freelance VB Graphics Extension, Installation</td>
<td>2PAA108085*</td>
</tr>
</tbody>
</table>
Section 1 Freelance Faceplates

General

The present documentation describes the operation and display of the functions, function blocks and variables specific to Freelance in 800xA Operations. Further information on the function of the blocks can be found in the Freelance documentation.

The operation and display of the function-specific variables in 800xA Operations are through faceplates.

Faceplate Structure

All faceplates are subdivided into the following areas:

Figure 1. Main Faceplate
Header Area

Each faceplate contains a header area consisting of the following parts

- Object lock control (optional)
- Object name (mandatory)
- Object description (mandatory)
- Alarm control (optional)

The **Object Lock** control is optional and only visible in the header area if lock handling is activated. The object lock icon indicates the lock state. All objects that need their lock to be handled by faceplates must have an aspect with the name LockControl.

The **Object Name** area displays the name of the object. Names that are too long are truncated and ‘...’ is appended at the end if the width of the faceplate area is not sufficient to display the full name. A tooltip will always show the complete name of the button/text it is positioned above.

The **Object Description** area displays the description of the object, and the tooltips work the same way as in the name area.

The **Alarm Control** button is optional. It indicates the alarm state of the object and enables the operator to acknowledge the alarms. Alarm control is an aspect of type graphic element. The faceplate framework just reserves space for it in the header area and shows it if the object reports an alarm.

*Figure 2. Function Block Instance*

![Function Block Instance](image)
Indicator and Aspect Link Area

In this area of the faceplate the Indicators and Aspect Links can be allocated.

**Indicators** show a label, or an icon, as the result of a configured expression, which can include one or several object properties subscribed for. The standard icon format is 32x32 (normal Windows icon size).

**Aspect links** are buttons that act as shortcuts to bring up another aspect as an overlap window. The maximum number of indicators and aspect links allowed in the status and navigation bar is controlled by the layout settings in the configuration view of the faceplate. A faceplate view with default configuration settings has space for a total of 6 indicators and aspect links. The amount of rows to be displayed in the status and navigation bar area can also be configured.

Faceplate Element Area

Aspects are displayed in the faceplate element area, either alone or included in tab groups. Primarily, faceplate element aspects are intended to be included in this area. Other aspects may also be included. The orientation of those aspects and/or tab groups can be either horizontal (the default order) or vertical, but not both in the same faceplate aspect.

The faceplate element area in the following figure contains 2 tab groups arranged horizontally. In order to see the **Limits** tab, you have to click to select it, since **Default** is currently the active tab in the left tab group.

![Faceplate Element Area](image)

*Figure 3. Faceplate Element Area*
View Selection Buttons

Select the faceplate view. If a view does not exist, the button representing that view is faded.

![Tab Group 1](image)

*Figure 4. Selection Buttons*

Symbols and Buttons

Operator Area of the Faceplates

The buttons in the operator area of the faceplates are used for operation and signalling. Signalling is realized using different button colors:

<table>
<thead>
<tr>
<th>Status</th>
<th>Signalling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not active</td>
<td>Background color grey</td>
</tr>
<tr>
<td>Active</td>
<td>Background color yellow</td>
</tr>
<tr>
<td>Activated (must be confirmed)</td>
<td>Background color green</td>
</tr>
<tr>
<td>Operable</td>
<td>Symbol color black</td>
</tr>
<tr>
<td>Not operable</td>
<td>Symbol color grey</td>
</tr>
</tbody>
</table>

After a button is activated, it normally has to be confirmed by pressing the Return button (except for continuous controller adjustment with the buttons SpUp, SpDown, OutUp, OutDown).
Buttons in the operator area of the faceplates:

<table>
<thead>
<tr>
<th>Button</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aut</td>
<td>Automatic</td>
</tr>
<tr>
<td></td>
<td>Man</td>
<td>Manual</td>
</tr>
<tr>
<td></td>
<td>Ext</td>
<td>External Value</td>
</tr>
<tr>
<td></td>
<td>Int</td>
<td>Internal Value</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>On/off Command</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Off/on Command</td>
</tr>
<tr>
<td></td>
<td>Stop</td>
<td>Stop Command</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>Reset</td>
</tr>
<tr>
<td></td>
<td>Coarse</td>
<td>Coarsing dosing command</td>
</tr>
<tr>
<td></td>
<td>Fine dosing</td>
<td>Fine dosing command</td>
</tr>
<tr>
<td></td>
<td>ValveClose</td>
<td>Dosing off</td>
</tr>
<tr>
<td></td>
<td>SpUp</td>
<td>Setpoint Up</td>
</tr>
<tr>
<td>Icon</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>![Down]</td>
<td>SpDown</td>
<td>Setpoint Down</td>
</tr>
<tr>
<td>![Up]</td>
<td>OutUp</td>
<td>Output Up</td>
</tr>
<tr>
<td>![Down]</td>
<td>OutDown</td>
<td>Output Down</td>
</tr>
<tr>
<td>![Divider]</td>
<td>Ratio</td>
<td>Ratio controller switchover (controller)</td>
</tr>
<tr>
<td>![Fixed]</td>
<td>SP</td>
<td>Fixed set point controller switchover (controller)</td>
</tr>
<tr>
<td>![Down]</td>
<td>CarryOut</td>
<td>Continue inching (SFC)</td>
</tr>
<tr>
<td>![Selector]</td>
<td>Km1</td>
<td>Select inching mode 1 (SFC)</td>
</tr>
<tr>
<td>![Selector]</td>
<td>Km2</td>
<td>Select inching mode 2 (SFC)</td>
</tr>
<tr>
<td>![Selector]</td>
<td>Km3</td>
<td>Select inching mode 3 (SFC)</td>
</tr>
<tr>
<td>![Selector]</td>
<td>Km4</td>
<td>Select inching mode 4 (SFC)</td>
</tr>
<tr>
<td>![Skip]</td>
<td>Skip</td>
<td>Skip (scheduler)</td>
</tr>
<tr>
<td>![Scroll]</td>
<td>Scroll</td>
<td>Scroll (scheduler)</td>
</tr>
<tr>
<td>![Cycle]</td>
<td>NumCyc</td>
<td>Operation of a certain number of cycles (scheduler)</td>
</tr>
<tr>
<td>Tune</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Perm</td>
<td>Permanent operation/continuous operation (scheduler)</td>
<td></td>
</tr>
<tr>
<td>Tune1</td>
<td>Step response stationary</td>
<td></td>
</tr>
<tr>
<td>Tune2</td>
<td>User defined parameter set</td>
<td></td>
</tr>
<tr>
<td>Tune3</td>
<td>Self tune PID parameter set</td>
<td></td>
</tr>
<tr>
<td>Tune4</td>
<td>Self tune off</td>
<td></td>
</tr>
<tr>
<td>Tune5</td>
<td>Self tune on</td>
<td></td>
</tr>
<tr>
<td>Tune6</td>
<td>Controller dynamics low</td>
<td></td>
</tr>
<tr>
<td>Tune7</td>
<td>Controller dynamics medium</td>
<td></td>
</tr>
<tr>
<td>Tune8</td>
<td>Controller dynamics high</td>
<td></td>
</tr>
<tr>
<td>Tune9</td>
<td>Parameter scheduler off</td>
<td></td>
</tr>
<tr>
<td>Tune10</td>
<td>Parameter scheduler on</td>
<td></td>
</tr>
<tr>
<td>Dec1</td>
<td>Decrement 1</td>
<td></td>
</tr>
<tr>
<td>Dec3</td>
<td>Decrement 3</td>
<td></td>
</tr>
</tbody>
</table>
### Operator Area of the Faceplates

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec10</td>
<td>Decrement 10</td>
</tr>
<tr>
<td>Inc1</td>
<td>Increment 1</td>
</tr>
<tr>
<td>Inc3</td>
<td>Increment 3</td>
</tr>
<tr>
<td>Inc10</td>
<td>Increment 10</td>
</tr>
<tr>
<td>Return</td>
<td>Confirmation/Apply</td>
</tr>
</tbody>
</table>
Display Area of the Faceplates

In the display area of the faceplates, symbols or identifiers (for example SP for set point) are displayed to the left of the numerical display. If the values are operable, the symbols or identifiers appear in the form of buttons. When selecting a button, an input mask appears in which the value can be changed.

Alarm Area of the Faceplates

Symbols in the alarm area of the faceplates:

<table>
<thead>
<tr>
<th>Button</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Operator Log" /></td>
<td>Operator Log</td>
<td>Operator Log</td>
</tr>
</tbody>
</table>
Section 2  Analog Function Blocks

Analog Input Transformation, AI_TR

Figure 5. Analog Input Transformation
Display

Name, short text, scale range.

The converted analog value $Out$ as a bar and as a numerical value as well as the default values $DL$ and $DH$ as numerical values and as horizontal markers to the left of the bar. If a default value is used (undershoot or overshoot) the analog value $Out$ will be output in red.

Outputting the input range $IR$ 0...20 mA or 4...20 mA.

Operator Interventions

Message acknowledgement.
**Analog Output Transformation (transient), Al_TRT**

*Figure 6. Analog Output Transformation*

**Display**

Name, short text, scale range and physical unit.

The converted analog value \( \text{Out} \) as a bar and a numerical value as well as the default value \( \text{DV} \) as numerical value and as horizontal markers to the left of the bar. If a default value is used (undershoot or overshoot) the analog value \( \text{Out} \) will be output in red.

Outputting the input range \( IR \ 0...20 \text{ mA} \) or \( 4...20 \text{ mA} \).
Operator Interventions
Message acknowledgement.

Analog Output Transformation, AO_TR

![Figure 7. Analog Output Transformation](image)

Display
Name, short text, scale range.
The analog value $I_n$ as bar and numerical value. Signal range output OR 0...20 mA or 4...20 mA.
Operator Interventions
None

Counter with Analog Input, CT_ANA

Display
Name, short text, scale range and physical unit.
Current counter reading $CA$, counter reading of last period $CP$ and the basic value $BV$ as numerical values. Also the current counter reading $CA$ as actual value bar chart and the last period counter reading $CP$ as set point bar charts.
Limit values L1 and L2 as numerical values and corresponding marker on the counter reading bar.

Figure 8. Counter with Analog Input, CT_ANA
**Operator interventions**

Reset the counter with the Reset button.

Change the basic value BV and limit values L1, L2. The buttons for the limit values are equipped with corresponding symbols depending on the configured limit value types.

Message acknowledgement.
Set Point Controller, C_ANA

Display
Name, short text, scale range and physical unit.
Output value $Out$, manual value $MV$, ratio $R$ and bias $B$ as numerical values. Output value $Out$ as an actual value bar chart.

Operator Interventions
Switching of the operation mode MAN/AUTO with the Man and Aut buttons.
Switching of internal/external operating mode with the buttons SpInt and SpExt.
Changing the manual value $MV$ (possible only in manual operating mode) and changing the internal values of ratio and bias.
Display

Name, short text, scale range.

In the faceplate of the time scheduler the current output value *Out* is shown as a value bar chart and as numerical values. By selecting Act/Nom it is possible to switch the content of the display between actual and nominal values.

*Figure 10. Time Scheduler*
The actual running status can be seen by means of corresponding signals (colour highlighted button) on the control panel.

### Operator interventions

Switching over the operating mode with the Man/Aut buttons.

Switching over the running mode between permanent (Perm button) and - according to the set number of cycles - the NumCyc button. Setting of the running status OFF, STOP, ON, SKIP, SCROLL with the buttons Off, Stop, On, Skip, Scroll.

If Nom is selected the time scheduler offset Off and the number of run cycles Cyc can be changed.
Section 3  Binary Function Blocks

Time Counter, CTT

Display
Name, short text, the current counter reading $ZL$ and the counter reading of the last period $ZP$ as bar and numerical values. Up to two limit values $L1, L2$ as numerical values and markers on the bar.

Figure 11. Time Counter, CTT
**Operator interventions**

Changing the limit values L1, L2 and Resetting of the time value output to 0.

Message acknowledgement.
Up/Down Counter, CTUD

Display
Name, short text. The analog output signal of the current counter reading $ZL$ as numerical value. Also as numerical values the basic value $BW$ and the limit values $L1, L2$. Also the limit values as markers next to the bar.

Operator interventions
Changing the limit values $L1, L2$ and resetting the counter with the Reset button. Message acknowledgement.
Operating Time Counter, CT_LT

Display
Name, short text, the current counter reading ZL and the counter value of the last period ZP as bar and numerical values. Up to two limit values L1, L2 as numerical values and as markers on the bars.

Operator interventions
Changing the limit values L1, L2 and resetting the counter to 0 with the Reset button.
Message acknowledgement.
Pulse Counter, CT_P

Figure 14. Pulse Counter, CT_P

Display
Name, short text. The analog output signal of the last period $CP$ and the current counter reading $CA$ as numerical values and bar graphs. Additionally, the period length $PD$, the overflow value $RV$ and the limit values as numerical values. The limit values $L1$, $L2$ are also displayed as markers next to the bar graphs.

Operator Interventions
Changing the limit values $L1$, $L2$ and resetting the counter using the Reset button.
Message acknowledgement.

**Frequency/Analog Converter, FAC_D**

![Frequency/Analog Converter, FAC_D](image)

*Figure 15. Frequency/Analog Converter, FAC_D*

**Display**

Name, short text, analog output signal $OUT$ as numerical value and physical unit.

**Operator Interventions**

None
Monoflop, MONO_F

Display
Name, short text, the pulse duration DT, and the elapsed time TC as bar and numerical values.
The state of the output, “ON” (logical 1 signal), “OFF” (logical 0 signal).

Operator interventions
Changing the pulse duration PD within the valid scale range and premature abort with the Reset button (Output is set to logical 0 signal).
Message acknowledgement.

Figure 16. Monoflop, MONO_F
Binary Output, M_BOUT

Display
Name, short text, operating mode with Man and Aut buttons and configured state texts. The text for the current state is highlighted yellow.

Operator interventions
Switching over operating mode with the Man and Aut buttons. In manual mode the output can be switched over by the operator using On/Off buttons.
Timer

Switch-on/off Delay, TONOF / Switch-off Delay, TOF / Switch-on Delay, TON

Display

Name, short text, the delay time DT and the elapsed time TC as bar graph and numerical values. The state of the output, “ON” (logical 1 signal), “OFF” (logical 0 signal).

Operator Interventions

Changing the switch-on time DT within the valid scale range and premature abort using the Reset button (output is set to logical 0 signal).
Message acknowledgement.

**External Input, TIMER**

![External Input, Timer](image)

*Figure 19. External Input, Timer*

**Display**

Name, short text, switch-on or delay time DT and the elapsed time TC as bar and numerical values and the timer type.

Display of the timer behaviour Typ.
Operator Interventions

Changing the switch-on and delay time with the DT button, premature abort with the Reset button and switching over the setpoint operating mode (internal/external) via the SpInt/ SpExt buttons.

Message acknowledgement.

Touch Button, TOUCH

Display

Name, short text, status texts for on/off.
Operator Interventions

The touch button can be activated by using the On button.
Section 4  Monitoring Function Blocks

Event Message, EVENT

*Figure 21. Event*
Analog, M_ANA

Display name
Name, short text, input signal $I_n$ as bargraph and numerical value.
Message display for changing speed limit values.
Limit values L1..L4 as markers and numerical values.

Operator interventions
Changing limit values with the buttons L1...L4. The buttons are dependant on the configured limit value types provided with respective symbols.
Antivalence, M_BAV

Message acknowledgement.

**Antivalence, M_BAV**

*Figure 23. Antivalence, M_BAV*

**Display**
Name, short text and message status text, the current state with yellow background.

**Operator interventions**
Message acknowledgement.
Binary, M_BIN

Display
Name, short text and message status text, the current state with yellow background.

Operator interventions
Message acknowledgement.

Figure 24. Binary, M_BIN
Universal, M_GEN

**Display**

Name, short text and message status text, the current state with yellow background.

**Operator interventions**

Message acknowledgement.
Section 5  Controller Function Blocks

Continuous Controllers

Universal, C_CU / Standard, C_CS / Ratio, C_CR

Figure 26. Universal, C_CU / Standard, C_CS / Ratio, C_CR
Display

Name, short text, scale range and physical unit.

Set point SP, process value PV, output variable OUT and ratio RV (C_CR) as numerical values and as bar graphs. The set point bar graph encloses the process value bar graph with the output variable to the right.

C-CR: Ratio R and bias B as numerical values.

Limit values L1 to L4 as numerical values (Lmts selected) and corresponding markers on the process value bar graph.

Tracking in signalling field with the TRACK symbol (not with C_CS).
C_CR: The controller display in the faceplate can take place as media display (Abs selected) or as ratio display (Ratio selected). The table shows the bar chart in the faceplate.

<table>
<thead>
<tr>
<th>Fixed value controller</th>
<th>Display</th>
<th>Process value bar chart</th>
<th>Set point bar chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>PV</td>
<td>$W_{\text{internal}}$</td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td>RV = (PV-B) / ($W_{\text{ext}}$ * L)</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ratio controller</th>
<th>Display</th>
<th>Process value bar chart</th>
<th>Set point bar chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>PV</td>
<td>$W_{\text{ext}}$ * R * L + B</td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td>RV = (PV-B) / ($W_{\text{ext}}$ * L)</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>

**Operator Interventions**

The set point SP can be changed in automatic and manual modes.

The output variable OUT can only be changed in manual mode.

The set point can be switched to internal or external operating mode with the SpInt/SpExt buttons. The output variable can be set to manual or automatic mode using the Man/Aut buttons.

C_CR: Switching over between ratio controller (Ratio button) and the fixed value controller (Sp button). Ratio R and bias B can also be changed.

The up to four limit values L1 ...L4 may be changed if parameterized.

Message acknowledgement.

**Display**

Name, short text, scale range and physical unit.

Set point SP, process value PV and position feedback signal FB as numerical values and bar graphs. The set point bar graph encloses the process value, with the position response to the right.

With feedback switched on, the position feedback signal FB appears as a bar graph and as a numerical value. If the feedback is not switched on or interrupted, i.e. if the FBF signal is logical 1, an empty field appears instead of the numerical value.
The current direction of motion of the output variable is displayed using arrows next to the position feedback signal bar graph.

*Arrow right* means: Output OP active

*Arrow left* means: Output ON active

Limit values L1...L4 as numerical values (*Lmts* selected) and the corresponding marker on the process value bar graph.

**Operator Interventions**

The internal set point SP can be altered in automatic and manual modes. The output variable FB can only be set in manual mode. If an external feedback has been configured and is switched on, the output variable can be adjusted as an absolute percentage. Without an effective external feedback, only an incremental input of the output variable can be achieved using the OutUp or OutDown buttons.

The set point can be switched to internal or external operating mode with the SpInt/SpExt buttons. The output variable can be set to manual or automatic mode using the Man/Aut buttons.

The up to four limit values L1...L4 can also be altered.

Message acknowledgement.
Step Controllers

Universal, C_SU / Standard, C_SS / Ratio, C_SR

Figure 28. Step Controllers
Display

Name, short text, scale range and physical unit.

Set point SP, process value PV, position feedback FB and ratio RV (C_SR) as numerical values and as bar graphs. The set point bar encloses the process value. On the right-hand side, the bar graph for the position feedback signal is shown.

C-SR: Ratio R and bias B as numerical values.

With feedback switched on, the position feedback signal FB appears as a bar graph and as a numerical value. If the feedback is not switched on or interrupted, i.e. if the FBF signal is logical 1, an empty field appears instead of the numerical value.

The current direction of motion of the output variable is displayed using arrows next to the position feedback signal bar graph.

Arrow right means: Output block OP active
Arrow left means: Output block ON active

Limit values L1...L4 as numerical values (Lmts selected) and the corresponding marker on the process value bar graph.

Tracking in signalling field with the TRACK symbol (not with C_SS).

C_SR: The controller display in the faceplate can take place as media display (Abs selected) or as ratio display (Ratio selected). The table shows the bar chart in the faceplate.

<table>
<thead>
<tr>
<th>Display</th>
<th>Process value bar chart</th>
<th>Set point bar chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed value controller</td>
<td>Media</td>
<td>PV</td>
</tr>
<tr>
<td></td>
<td>Ratio</td>
<td>RV = (PV-B) / (W_{ext} * L)</td>
</tr>
<tr>
<td>Ratio controller</td>
<td>Media</td>
<td>PV</td>
</tr>
<tr>
<td></td>
<td>Ratio</td>
<td>RV = (PV-B) / (W_{ext} * L)</td>
</tr>
</tbody>
</table>

**Operator Interventions**

The internal set point SP can be changed in automatic and manual modes. The output variable FB can only be set in manual mode. If an external feedback has been configured and is switched on, the output variable can be adjusted as an absolute percentage. Without an effective external feedback, only an incremental input of the output variable can be achieved.

The set point can be switched to internal or external operating mode with the SpInt/SpExt buttons. The output variable can be set to manual or automatic using the Man/Aut buttons.

C_SR: Switching over between ratio controller (Ratio button) and the fixed value controller (Sp button). Ratio R and bias B can also be changed.

The up to four limit values L1...L4 may also be changed if parameterized.

Message acknowledgement.
Two Position Controllers

Universal, C_OU / Standard, C_OS

Display
Name, short text, scale range and physical unit.

Set point SP, process value $PV$ and internal output variable OUT as numerical values and bar chart. The set point bar encloses the process value bar, with the internal continuous output variable to the right of the bar.

The current status of the control of the output is shown with the *arrow on the right* under the position feedback signal bar.
Limit values L1...L4 as numerical values and corresponding markers on the process value bar.

C_OU: Tracking in signalling field with the TRACK symbol.

**Operator interventions**

The internal set point SP can be altered in automatic and manual modes with the SP button.

In the manual operating mode the continuous internal output variable Y can be altered and with it the binary output OB in accordance with the configured pulse width modulation.

The set point W can be switched to internal or external operating mode with the SpInt/SpExt buttons, he output variable operating mode to manual or automatic with the Man/Aut buttons.

The four maximum limit values L1...L4 can also be altered.

Message acknowledgement.
Three Position Controllers

Universal, C_PU / Standard, C_PS

Display

Name, short text, scale range and physical unit.

Set point SP, process value PV and internal output variable OUT as numerical values and bar chart. The set point bar encloses the process value bar, with the internal continuous output variable to the right of the bar.

The current status of the control of the binary outputs OB1, OB2 are shown by the arrows on the right under the position feedback signal bar.

*Arrow right* means: Output OB2 is active.

*Arrow left* means: Output OB1 is active.
Limit values L1...L4 as numerical values and corresponding markers on the process value bar.

C_PU: Tracking in signalling field with the \textit{TRACK} symbol.

**Operator interventions**

The internal set point SP can be altered in automatic and manual modes with the SP button. In manual operating mode the continuous internal output variable OUT can be changed and with it the control of the binary outputs OB1 and OB2 according to the configured split range characteristic and pulse width modulation.

The set point W can be switched to internal or external operating mode with the SpInt/SpExt buttons, he output variable operating mode to manual or automatic with the Man/Aut buttons.

The four maximum limit values L1...L4 can also be altered.

Message acknowledgement.
Display

Name, short text, scale range and physical unit. Current process value PV and correction value PIV as numerical values and in bar chart form. Minimum and maximum process value as corresponding markers on the process value bar and on the right is the bar with the correction value.

The display can be switched over between the current values and the PID parameters.

Values selected: Correction value PIV, current test step duration Time, current status of selftune Stat and and error status Err as a text display.

PID selected: Proportional coefficient CP, reset value TR, rate time TD and the derivative action gain CD.
**Operator interventions**

Start (R button) and stop (S button) for the selftune parameter. Switching over the parameter control with the Off button (without coincidence points) and On (with coincidence points).

Exchange of the PID parameter set between selftune (TP button) and the user defined parameters (UP button).

Set controller dynamics with the Lo button (low) No button (normal) and Hi (high). Set stationarity with the ST button.

Message acknowledgement.
Section 6  Open Loop Control Function Blocks

Individual Drive Functions

Unidirectional Units, IDF_1 / Bi-directional Units, IDF_2 / Actuators, IDF_A
**Figure 33. Individual Drive Functions**

**Display**

Name, short text. Two state fields (IDF_1) or three state fields (IDF_2, IDF_A) with the configured command texts, which indicate the switch state of the individual drive modules. The text of the active switch state is displayed on a yellow background, the text of the non-active state on a dark-grey background. When the control command is disabled, texts are displayed in grey and the non-active switch state on a grey background.

An arrow shows the current direction of motion of the control element. The direction-of-motion arrow flashes when the control element is “moving”. In the
event of an end-position error or a run-time error, the end position to be attained is indicated by a static direction-of-motion arrow in the faceplate.

The monitoring time configured is indicated by RT.

A past safety intervention is indicated by black text on white background. This display will be reset in automatic mode or after an operation intervention.

Message texts can be allocated within the parameter mask depending on the following signals and statuses:

- during a fault signal,
- when run time is exceeded,
- on leaving the end position without control command,
- during safety intervention signals,
- during local intervention signal.
- during blocking (IDF_A)

**Operator Interventions**

Changing the operating mode between manual and automatic using the Man and Aut buttons.

IDF_1: In manual operating mode the control command can be changed with the On and Off buttons.

IDF_2, IDF_A: In manual operating mode the control command can be changed for two directions, and a stop command can be entered using buttons On, Off, Stop.

Message acknowledgement.
Dosing Circuits, DOS, DOS_A and DOS_E

Faceplates for DOS_A and DOS_E are similar

**Display**

Name, short text, scale range and physical unit.

Current counter reading CA and switch-off value S as numeric values and as a bar chart. As further numeric values the current counter reading of the last period CP, the pre-threshold value PS and the basic value BV. The basic value also as a mark immediately to the left of the bar graph.

The dosing mode coarse/fine dosing or valve CLOSED, symbols displayed beside the columns.

*Figure 34. Dosing Circuits*
Operator interventions

Input of basic value BV, pre-threshold value PS and switch-off value S.
Changing the operating modes manual and automatic, buttons Man and Aut.
In automatic mode the dosing circuit can be stopped using the Stop button and can be reactivated using the Enable button. The current counter reading is set to basic value with the Reset key.
In manual, dosing can take place with the Coarse (coarse dosing), Fine (fine dosing), ValveClose (dosing off) button.
Section 7  Constant Function Blocks

Constant Inputs, CSTBO, ...... , CSTWO

The following constant function blocks are available:

- CSTBO    Input of False or True
- CSTBY    Input of bytes
- CSTD1    Input of double integer value with sign
- CSTD1T   Input of date and time
- CSTDW    Input of double word value
- CSTIN    Input of integer value
- CSTRE    Input of floating point value
- CSTTI    Input of time value
- CSTUD    Input of double integer word value without sign
- CSTUI    Input of integer word value without sign
- CSTWO    Input of word value

Display

Name, short text and numeric value of the constant CV. With the function blocks CSTD1, CSTIN, CSTRE, CSTTI, CSTUD and CSTUI an additional scaling (L and H) is displayed.
Operator Interventions
Changing of the operating numeric value of the constant.

Input Boolean, CSTBO / Input Byte, CSTBY

Figure 35. Input Boolean, CSTBO / Input Byte, CSTBY
Input Double Integer, CSTDI / Input Date and Time CSTDT

Figure 36. Input double integer, CSTDI / Input date and time CSTDT
Input Double Word, CSTDW / Input Integer, CSTIN

![Input Double Word, CSTDW / Input Integer, CSTIN](image)

*Figure 37. Input Double Word, CSTDW / Input Integer, CSTIN*
Input floating point, CSTRE / Input time, CSTTI

Figure 38. Input floating point, CSTRE / Input time, CSTTI
Input double integer word, CSTUD / Input integer word, CSTUI

Figure 39. Input double integer word, CSTUD / Input integer word, CSTUI
Input Word, CSTWO

Figure 40. Input Word, CSTWO
Constant Inputs, CSTSTR8, ...... , CSTSTR256

The following function block string constants are available:

<table>
<thead>
<tr>
<th>Block</th>
<th>Data type</th>
<th>Max. number of characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSTSTR8</td>
<td>STRING8</td>
<td>8</td>
</tr>
<tr>
<td>CSTSTR16</td>
<td>STRING16</td>
<td>16</td>
</tr>
<tr>
<td>CSTSTR32</td>
<td>STRING32</td>
<td>32</td>
</tr>
<tr>
<td>CSTSTR64</td>
<td>STRING64</td>
<td>64</td>
</tr>
<tr>
<td>CSTSTR128</td>
<td>STRING128</td>
<td>128</td>
</tr>
<tr>
<td>CSTSTR256</td>
<td>STRING256</td>
<td>256</td>
</tr>
</tbody>
</table>

The IEC character set is supported. This includes all characters from the ISO646 Table 1 “Basic Code Table”, columns 3 to 7, also lower-case letters. Non-printing characters such as e.g. line feed are denoted by the dollar sign $ and are entered as hexadecimal characters.

Example $0D$0A corresponds to 2 characters,

$0D = carriage return and
$0A = line feed.$

Other examples of the non-printing characters according to IEC are:

| $|$ | Dollar sign, |
| $'$ | Apostrophe, |
| $P$ oder $p$ | Form feed, |
| $L$ oder $l$ | Line feed or $0A$ |
Characters denoted by $ are not interpreted in the faceplates, but are displayed in the form entered,

\[
e.g. \text{ $AB$ for «.}
\]

The characters known from IEC are abbreviated accordingly, e.g. $0A$ is displayed as $0L$. 

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R$ or $r$</td>
<td>Carriage return or $0D,</td>
</tr>
<tr>
<td>$N$ or $n$</td>
<td>New line, end current line and begin at start of next line,</td>
</tr>
<tr>
<td>$T$ or $t$</td>
<td>Tab, with non-proportional script, forwarding is effected to the column that can be divided by 8, and the next 2 cm limit with proportional script.</td>
</tr>
</tbody>
</table>
Example of a faceplate (string constant):

![Example of a faceplate](image)

_Figure 41. Example of a faceplate_

**Display**
Name, short text and the constant value (text).

**Operator interventions**
Text can be entered and changed in the text area after pressing the Edit button.
Section 8  Batch Function Blocks

Phase X Control, FPX

This chapter covers the function and operation of the FPX (Freelance PhaseX) function block.

The FPX function block FPX is the interface between the batch package and the Freelance controller AC, DCP 10 etc.

The FPX block relays the commands and parameter entries of the recipe package for just one control function to a Freelance controller.

The FPX block controls the implementation of the commands and process data (parameters) from the recipe package and provides feedback on status and error status.
The commands for a control function of the batch program are implemented by activation by permanently allocated sequential control programs (sequences) in the Freelance user program. These sequential control programs are triggered by the FPX block, in which the names of the already configured sequential control programs are entered.

The following sequences are possible:

- Running sequence
- Hold sequence
- Stop sequence
- Abort sequence
- Restart sequence

The running sequence must be configured as a minimum and be made known to the FPX block. All other sequences are optional. For example, if there is a change in
command from Running to Holding, the running sequence is held at the next transition and the hold sequence is started in which the process-related controls for this case are configured.

**Operator, Program, Manual** and **Automatic** are available for selection as operating modes.

For recipe operation, **Program** and **Operator** are available.

With **Program** all commands automatically come from the recipe program. The FPX block can only be operated in **Operator**.

In **Automatic** mode, the control function, i.e. the FPX block and the subordinate sequences (sequential control programs), is processed automatically, i.e. without further operator intervention. If the operating mode is changed to **Manual**, the running running sequence (sequential control program) is switched to Manual mode and its active step action outputs are reset. It is not possible to start the running sequence in this state.

If, for example, the operator changes the value of a recipe parameter, the value is checked for overranging. If the upper or lower limit value is exceeded, a message is sent to the operator.

After the control function has been processed, the FPX block resets the Mode Attribute to Program and the operating mode to Automatic.
Phase X Faceplate

Display

The phase name NA is the name of the control function allocated within an operation. The phase status ST such as Running or Stopped corresponds to the current status of the phase in the recipe program. The phase number NU indicates the current position within the recipe program.

The name of the sequence currently being executed (sequential control program) on the Freelance controller is displayed under PR. If there is an error, the error code is displayed under FA.

Figure 43. Phase X Faceplate
The Batch Manager is responsible for the display of the Batch ID BA, the Recipe ID RE, the Lot ID LO and the Campaign ID CA. This information comes from the Scheduler and is logged accordingly.

Recipe and Param are used to switch between the display of status and recipe information and the display of the 20 recipe parameters. In the parameter display, the value of the parameter can be changed by selection of the appropriate button.

Tool tips are provided to display the full parameter text.

**Status Display**

The status transition diagram forms the basis for the status display and operation. Depending on the status, certain commands are possible. During the status transition, the corresponding sequence is processed on the controller. If only the running sequence is configured or only here a sequential control program is configured and allocated to the FPX block, the statuses such as stopped or held are controlled directly.

![Status Display Diagram](image)

*Figure 44. Status Display*

**Operator intervention**

With the batch package, certain commands can be executed on the recipe levels and on the individual control functions.
The FPX block receives the commands and the recipe parameters from the batch package and returns the state information to the batch package.

The commands are implemented depending on the **Operator/Program** operating authorization.

In the **Operator OP** mode, commands can be given not only by the operator but also at appropriate input pins of the FPX block.

In **Program PR** operating authorisation, these commands come automatically from the batch package and are relayed via the FPX block to the control function implemented in the Freelance user program.

If the operating authorisation changes to **OP**, the higher-level recipe level switches from the batch package to the Freelance operator and it is possible to change the operating mode of the FPX block from **Automatik** to **Manual**.

The possible commands in connection with the current state of the control function and the resulting state/status changes are defined in the status transition diagram.

If the FPX block receives an unknown command or a command which does not correspond to the status transition diagram, i.e. it is not permissible with the current state of the control function/FPX, an error code is generated.
### Table 2. Commands and Descriptions

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abort</td>
<td>Instructs the FPX block to put the control function in the state Aborting. Execution is possible from any state apart from Idle, Complete and Stopped. If the running sequence is in the state Held (forced by a previous state change), it is reset before the start of the Abort sequence.</td>
<td>10</td>
</tr>
<tr>
<td>Hold</td>
<td>Stops the processing of the running or restart sequence; the operating mode of the sequence control? program is set to Manual and the step action outputs currently activated are reset. Executed from the state Running or Restarting.</td>
<td>20</td>
</tr>
<tr>
<td>Stop</td>
<td>Instructs the FPX block to put the control function in the state Stopping. Execution is possible from the states Running, Holding, Hold and Restarting. If the running sequence is in the state Held (forced by a previous state change), it is reset before the start of the Stop sequence.</td>
<td>30</td>
</tr>
<tr>
<td>Reset</td>
<td>Resets the control function from the state Stopped, Aborted or Complete to Idle. In Operator mode, the Reset command is issued by the FPX block internally.</td>
<td>40</td>
</tr>
</tbody>
</table>
The operator can cause the processing of the sequence control? program to be interrupted by transmitting the command PAUSE. If the FPX block receives the command PAUSE, it writes a logic 1 signal to the output P (Pause). The batch program then goes to the next programmed pause transition which must set the input PD (Pause mode) to logic 1 signal and waits until the output P of the FPX block is reset by the command Resume before continuing with the processing.

Resume is the opposite of the command PAUSE. A batch program in the state PAUSE is to continue being processed. The FPX block resets the output P, after which the batch program resets the input PD and continues with the processing. The command is executed when the output P has been set.

Restart instructs the FPX block to switch the control function from Held to Running via Restarting. The command is executed when the control function is in the state Held and there is no error.

Start starts the running sequence. The state switches from Idle to Running. In Program mode, the recipe parameters of the phase are automatically loaded in the FPX block. The command is executed when the FPX block is in the state Idle and there is no error.

-/- Displays list with all allocated sequences. From this list one may get directly to the SFC structure display.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pause</td>
<td>The operator can cause the processing of the sequence control program to be interrupted by transmitting the command PAUSE. If the FPX block receives the command PAUSE, it writes a logic 1 signal to the output P (Pause). The batch program then goes to the next programmed pause transition which must set the input PD (Pause mode) to logic 1 signal and waits until the output P of the FPX block is reset by the command Resume before continuing with the processing.</td>
<td>50</td>
</tr>
<tr>
<td>Resume</td>
<td>Is the opposite of the command PAUSE. A batch program in the state PAUSE is to continue being processed. The FPX block resets the output P, after which the batch program resets the input PD and continues with the processing. The command is executed when the output P has been set.</td>
<td>80</td>
</tr>
<tr>
<td>Restart</td>
<td>Instructs the FPX block to switch the control function from Held to Running via Restarting. The command is executed when the control function is in the state Held and there is no error.</td>
<td>90</td>
</tr>
<tr>
<td>Start</td>
<td>Starts the running sequence. The state switches from Idle to Running. In Program mode, the recipe parameters of the phase are automatically loaded in the FPX block. The command is executed when the FPX block is in the state Idle and there is no error.</td>
<td>100</td>
</tr>
<tr>
<td>-/-</td>
<td>Displays list with all allocated sequences. From this list one may get directly to the SFC structure display</td>
<td></td>
</tr>
</tbody>
</table>
Error Codes

The FPX block has 3 alarm/message inputs, \( LO \), \( HI \) and \( EM \). These alarms can be generated by the user program when errors have occurred in the sequential control program processing on the individual control level.

If there is an alarm, the recipe goes to failure.

If a value other than zero (0) is read at the error output, the error is displayed in the faceplate with its error code \( FA \).

If an error occurs and if the running or restart sequence is being executed at the same time, the FPX block holds this sequence (the sequence is switched to Manual mode) and starts the Hold sequence if it has been configured.

The processing of the held sequence is only continued when the failure has been remedied (there is a zero (0) at the error output) and the PLI block has received the command RESTART.

The following table shows the possible error codes and their causes:

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>No error</td>
<td>0</td>
</tr>
<tr>
<td>Low alarm</td>
<td>1</td>
</tr>
<tr>
<td>High alarm</td>
<td>2</td>
</tr>
<tr>
<td>Emergency alarm</td>
<td>3</td>
</tr>
<tr>
<td>Sequential control program cannot be operated</td>
<td>100</td>
</tr>
<tr>
<td>Sequential control program is not installed</td>
<td>101</td>
</tr>
<tr>
<td>Error in read access to sequential control program</td>
<td>102</td>
</tr>
<tr>
<td>Error in write access to sequential control program</td>
<td>103</td>
</tr>
<tr>
<td>Invalid command</td>
<td>104</td>
</tr>
</tbody>
</table>

Table 3. Error codes and causes
Section 9  Sequence Control Function Blocks

Sequential Flow Chart, SFC

Figure 45. Sequential Flow Chart, SFC
Display

Name, short text, number of the active step, current run time of the sequence flow $tg$. Depending on the selection $ts$ or $t$, step-related or sequence flow-related times are also displayed.

$t$ selected: restart time $tnst$, last start time $tlst$ and repeat time $trep$.

$ts$ selected: Run time of the active step $ts1, ..., ts8$, residual waiting time of the active step $tw1, ..., tw8$ and residual monitoring time of the active step $tu1, ..., tu8$.

Eight selection spots 1,..., 8 are arranged above the display of the step number. If more than one step is active (simultaneous flows), the corresponding number of the spots has a yellow background. By selecting the spots with a yellow background, it is possible to switch the display of the step number and the step times between the active steps. The spot selected has a blue background.

The current operating mode, Manual/Automatic, enable and the preselected inching mode are displayed by the buttons in the operator area having a yellow background.

Operator intervention

Switching the operating mode between Manual and Automatic with the buttons Man/Aut.

Preselection of inching mode:

- **Button Km1**: Waiting time, monitoring time, actions and transitions are not activated.
- **Button Km2**: Actions are activated.
- **Button Km3**: Actions and transitions are activated.
- **Button Km4**: Transitions are activated.

The sequence flow is enabled with the button Enable. In Manual mode, the sequence flow can be stepped (CarryOut button) or reset (Reset button).

Changing the restart time $tnst$ and the repeat time $trep$. 