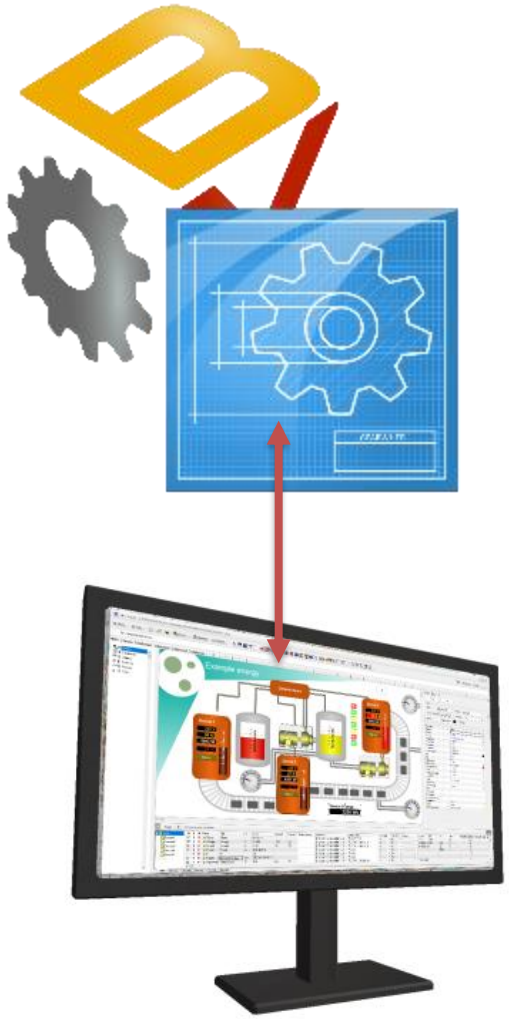
Engineering
PLC to HMI interface



English Version 1.1

Content

1. Overview

The BatchXpert system is a system for controlling, managing, and visualizing batch processes, incorporating batch reporting, protocols and recipes, batch tracking with materials, trends, alarms, BatchXpert station and/or HMI, etc. BatchXpert is a modular system that can be adapted to a wide variety of use cases, and can manage whole production plants, such as breweries, but also be reduced for controlling single CIP stations, or Pasteurization units. The system is fundamentally divided into three categories, which work together in an automation project.

Target Audience of this Manual

This manual is directed towards SCADA system engineers that have a basic understanding of the fundamentals of the BatchXpert system, and process engineering in general. A fundamental understanding of the functionality and usage of the BatchXpert system and advanced knowledge of the target SCADA system is assumed for the purpose of this manual. Furthermore, basic knowledge of Automation technology and Programming with Simatic S7 style controllers is also assumed.
This manual tries to teach the basics of how the PLC to HMI interface works, and how to implement it in other HMI systems.

Communication

The BatchXpert system plc program communicates via signal exchange data blocks with the HMI systems and the different SCADA stations. The system groups all the control modules of a type in the same Data Block. That is, as all modules of the same type, such as actuators or analog inputs, are within the same data block.

To optimize data exchange with the SCADA systems, the Visualization data blocks only contain data relevant to the SCADA systems and do not contain all the data from the control modules. These data blocks are the only blocks that communicate with HMI systems and contain all control module statuses relevant to process graphics. Apart from having all the statuses of the control modules, they also incorporate a command interface with which actions and commands can be sent from the SCADA systems to the control modules to be executed in the PLC. An example of this command would be manual activation or activation of simulation mode.

You can review more information in the dedicated sections of this manual.

Data block numbers relevant to the HMI

Name of DB	DB Number	Description
Bx GeneralAlarm	DB 2	Alarms for all modules
Bx Act Visu	DB 11	actuators - interface to visu
Bx ActPC D	DB 12	actuator - parameter channel
Bx Act D	DB 13	
Bx DIn Visu	DB 16	digital input - interface to visu
Bx DInPC D	DB 17	digital input - parameter channel
Bx DIn D	DB 18	digital input - data
Bx AIn Visu	DB 21	analog input - interface to visu
Bx AInPC D	DB 22	analog input - parameter channel
Bx AIn D	DB 23	analog input - data
Bx PoligonPC D	DB 24	parameter chanel for poligon table
Bx Poligon D	DB 25	data for poligon table
Bx Cnt Visu	DB 26	counter - interface to visu
Bx CntPC D	DB 27	counter - parameter channel
Bx Cnt D	DB 28	counter data
Bx PID Visu	DB 31	PID controller - interface to visu
Bx PIDPC D	DB 32	PID controller - parameter channel
Bx PID D	DB 33	datas PID controller
Bx Msg Visu	DB 36	data for message system
Bx MsgPC D	DB 37	parameter channel for message
Bx Msg D	DB 38	data for message modul
Bx Switch Visu	DB 39	data software switch to visu
Bx Switch D	DB 40	data softare switch
Bx DiagDP D	DB 45	Profibus Diagnostics
Bx Diag PN D	DB 46	Profinet Diagnostics

The Visualization Data Blocks

These are data blocks for communication with SCADA systems called Visualization blocks. These data blocks are optimized to allow an efficient reading of the most relevant data from the control modules for SCADA systems.

The system includes the following control modules with the following data block numbers. The HMI data is marked green:

Name of DB	DB Number	Description
Bx GeneralAlarm	DB 2	Alarms for all modules
Bx Act Visu	DB 11	actuators - interface to visu
Bx ActPC D	DB 12	actuator - parameter channel
Bx Act D	DB 13	
Bx DIn Visu	DB 16	digital input - interface to visu
Bx DInPC D	DB 17	digital input - parameter channel
Bx DIn D	DB 18	digital input - data
Bx AIn Visu	DB 21	analog input - interface to visu
Bx AInPC D	DB 22	analog input - parameter channel
Bx AIn D	DB 23	analog input - data
Bx PoligonPC D	DB 24	parameter chanel for poligon table
Bx Poligon D	DB 25	data for poligon table
Bx Cnt Visu	DB 26	counter - interface to visu
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Bx Cnt D	DB 28	counter data
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Bx PID D	DB 33	datas PID controller
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Bx MsgPC D	DB 37	parameter channel for message
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Bx DiagDP D	DB 45	Profibus Diagnostics
Bx Diag PN D	DB 46	Profinet Diagnostics

Faceplates

To further reduce the amount of data that must be exchanged with scatter stations from the PLC, PLC implements communication channels that allow you to read detailed parameters of each control module. These communication channels are referred to as “parameter channels”.

Each control module type has one dedicated data block that handles these parameter channels. From discarded system basically you request which control module number of this specific type you want to see the parameters from, and the PLC loads the current parameters and statuses from the request the control module to the parameter channel. Here all parameters can be changed and are automatically transferred back to the originally requested control module.

This basically implements and multiplexing mechanism whereby you only must design one single faceplate which links to one single data area in the PLC and then tell the PLC which control module you want to show. This way you only must upload the parameters of only the parameter channel and not create all data takes for all control modules to be able to show them in the face plates. This drastically reduces the amount of data that needs to be exchanged, while maintaining the ability to adjust all parameters and statuses of all control modules.

The system includes the following control modules with the following data block numbers. The Parameter Channel data is marked green:

Name of DB	DB Number	Description
Bx GeneralAlarm	DB 2	Alarms for all modules
Bx Act Visu	DB 11	actuators - interface to visu
Bx ActPC D	DB 12	actuator - parameter channel
Bx Act D	DB 13	
Bx DIn Visu	DB 16	digital input - interface to visu
Bx DInPC D	DB 17	digital input - parameter channel
Bx DIn D	DB 18	digital input - data
Bx AIn Visu	DB 21	analog input - interface to visu
Bx AInPC D	DB 22	analog input - parameter channel
Bx AIn D	DB 23	analog input - data
Bx PoligonPC D	DB 24	parameter chanel for poligon table
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Bx CntPC D	DB 27	counter - parameter channel
Bx Cnt D	DB 28	counter data
Bx PID Visu	DB 31	PID controller - interface to visu
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Bx Diag PN D	DB 46	Profinet Diagnostics

Command

To send comments or actions from the SCADA system to the individual control modules, you can send special values that represent certain actions for each control module. These commands can be sent by writing these special comment values directly onto the visualization status values that are uploaded from the PLC. If one of these commands is recognized by the PLC it will be executed on the corresponding control module and then it status is reset to the corresponding unit status.

These actions architecturally things like manual activations confirming an alarm or setting control modules from automatic to manual and back. The SCADA system sense commands for example for left click or right Click to PLC, and the PLC decides what actions should be executed on the corresponding control modules.

So instead of sending a command to put actuators into manual automatic mode you send and comment for left click to the PLC which then in turn executes the configured commands which may include manual automatic switch over.

The left click is referred to as the immediate action and the right click will always open the parameter channel anti corresponding faceplate of Control module.

2. Endianness

One important characteristics of Simatic 7 controllers is that these type of controllers use as CPU with Big endian architecture. This contrasts with most computer systems which are based on the X86 CPU architecture and which uses little endian.

The Endianness of CPU architecture defines how integers are stored in memory and thus also defines how the memory of these integers is laid out. This becomes important when you are transferring data between two different CPU architectures with different endianness, such as when you are reading data from an Simatic 7 CPU on a SCADA operating station. You must keep the endianness in mind since the data layout of status words from control models individualization data blocks has to be adapted accordingly on the SCADA systems.

In addition to this you must keep in mind that schematic PLCS implement and byte-oriented memory model whereas modern SCADA systems implement and word or double word-oriented memory model. For example, what would be Byte 1.2 would become bit 18 on the SCADA system, since the endianness is going to be corrected by the corresponding IO communication driver.

Batch expert uses double integers (int32) as their status words for all control modules, which means that all statuses from the PLC must be converted by the following table on and Scada station:

SCADA bit number	Address in PLC
24	0.0
25	0.1
26	0.2
27	0.3
28	0.4
29	0.5
30	0.6
31	0.7
16	1.0
17	1.1
18	1.2
19	1.3
20	1.4
21	1.5
22	1.6
23	1.7
8	2.0
9	2.1
10	2.2
11	2.3
12	2.4
13	2.5
14	2.6
15	2.7
0	3.0
1	3.1
2	3.2
3	3.3
4	3.4
5	3.5
6	3.6
7	3.7

3. Alarms

To enable efficient reading of alarm data, all alarms of all control modules are collected in one single data block that can be read as one single array containing all the current alarms active on all controls modules on PLC. The alarm data block contains one array for each control module type where every element corresponds to one alarm that is active on this control module a of this control module type.

Structure of DB2 "Bx GeneralAlarm"

Adress	Tag	Type	Description
28.0	General.AnyAlarmPresent	BOOL	Any alarm of any module is active
28.1	General.Horn	BOOL	The Acoustic alarm should be turned on now
34.0	Act	ARRAY[1..1600] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
234.0	DIn	ARRAY[1..1600] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
434.0	AInAlarm	ARRAY[1..480] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
494.0	AInWarning	ARRAY[1..480] of Bool	Like the Alarm but for a Warning
554.0	CntAlarm	ARRAY[1..320] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
594.0	CntWarning	ARRAY[1..320] of Bool	Like the Alarm but for a Warning
634.0	PIDAlarm	ARRAY[1..320] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
674.0	PIDWarning	ARRAY[1..320] of Bool	Like the Alarm but for a Warning
714.0	MsgAlarm	ARRAY[1..256] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
746.0	MsgOpReq	ARRAY[1..256] of Bool	Like the Alarm, but for an Operational Message to indicate that the Operator should do some manual operation
778.0	UnitAlarm	ARRAY[1..160] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
798.0	UnitOpReq	ARRAY[1..160] of Bool	Like the Alarm, but for an Operational Message to indicate that the Operator should do some manual operation
818.0	FConvAlarm	ARRAY[1..256] of Bool	The Alarm bit of the corresponding Control module. Note that the first bit is for the first module number of this module type
882.0	FConvWarning	ARRAY[1..256] of Bool	Like the Alarm but for a Warning

Example

For example, if bit 35.1 is set, it means that array element Act[10] is set, which means that Actuator 10 has an alarm.

Or if Bit 780.5 is set, it means that Unit[22] is TRUE and that Unit 22 has an alarm

Her is an Example of the array layout:

34.0	Act[1]
34.1	Act[2]
34.2	Act[3]
34.3	Act[4]
34.4	Act[5]
34.5	Act[6]
34.6	Act[7]
34.7	Act[8]
35.0	Act[9]
35.1	Act[10]
35.2	Act[11]
35.3	Act[12]
35.4	Act[13]
35.5	Act[14]
35.6	Act[15]
35.7	Act[16]
36.0	Act[17]
36.1	Act[18]
36.2	Act[19]
36.3	Act[20]
36.4	Act[21]
36.5	Act[22]
36.6	Act[23]
36.7	Act[24]
37.0	Act[25]
37.1	Act[26]
37.2	Act[27]
37.3	Act[28]
37.4	Act[29]

4. HMI Tag names

In the following description we will refer to the default batch expert take naming scheme as implemented in the VisXpert SCADA system. These tag names define symbolic names for all data that must be communicated between the PLC and the HMI system. You can find a detailed list attached to this manual.
The provided variable list defines the following naming schemes:

Control Module Tags

All variables related to control models are generally composed off and three letter control module short name and four-digit control module number, and dot-separated a post fix denominating its data. For Example:

AIn0001.Sp
AIn0001.St
AIn0001.Val

The Ain denominates an Analog Input, the 0001 denominates Analog Input 1, and the ".Sp", ".St" and ".Val" the actual datapoint of the module. Other Examples are:

Act1273.St Status of Actuador 1273
Cnt0188.Val Current Value of Counter 188
DIn0327.St Status of Digital Input 327
...

Control Module Post fixes

Post fix	Data Type	Description
.St	Dint (Int32)	Current Status of the Module. This is an "BitField" where each bit represents an individual Status of a Control Module. Please check the appropriate section for information about the individual bits of this status.
.Sp	Real	SetPoint. The current Nominal Value for the Control Module. Only applies to Regulators (PID) and Frequency Converters (FConv)
.Val	Real	Current Value. The current value of an analog Measurement, counter or frequency drive
.Out	Real	Output. The current Analog Output between 0 a 100% of the module. Only applies to Regulators (PID) and FConv

Parameter Channel variables

For easier identification of variables related to parameter channels, all parameter channel variables start with an lowercase "z", followed by the control modules short name and the parameter channel number which generally is PC01.

- zActPC01. Data of Parameter channel 1 for Actuators
- zDInPC01. Data of Parameter channel 1 for Digital Inputs
- zAinPC01. Data of Parameter channel 1 for Analog Inputs

5. Parameter Channels

Each control module type has a parameter channel which is implemented in its own dedicated data block. All parameter channels follow the same basic principles. The SCADA system will send the number of the control module that it wants to view in the parameter channel to the parameter channel, and the PLC will load the data of the requested control module onto the parameter channel, where parameters can be manipulated from the SCADA system.
In in short it acts as a multiplexer for oil control modules of unspecific type, meaning you tell the PLC which control module you want to activate and it will show you the parameters of the requested module. However, only one control module of the requested control module type can be viewed and edited at the same time since the parameter channel can only handle data for one single control module.
Also, all parameter channels have the same structure and operating mechanism, which is described in this section.

Selecting a Control module into the Parameter channel

A SCADA system can request a module to be open in the parameter channel by sending the right click command to its visualization status. PLC in turn will enter the requested control module into the parameter channel of the requested control module type where it can be viewed and its parameter edited.

This means that on SCADA system typically must send the right click command to the requested control modules visualization status, requesting the PLC to open the control module in the parameter channel, and then opening the window of the parameter channel itself which then will be populated with the data of the requested control module.

Apart from the control modules status, the parameter channel also holds some metadata about which control module number is currently being viewed in its parameter section. This number identifies the control module currently being active in the parameter channel. This value can be used by the SCADA system to determine which control module is currently being viewed and which control module texts it needs to show on the faceplate screen.

Actions via “VisuOrder”

In the concept of parameter channels implemented in this PLC framework the exists the following problem:
If a user opens a control module faceplate, the parameter channel will activate the requested control module and SCADA system will open the appropriate faceplate of this control module type. If then and user on a different operating station also opens and faceplate of the same control module type, a new control model will be activated in the parameter channel. However, since the first user may not be aware that a second control module of the same type was opened in a face plate, he would suddenly see the data of the control module selected by the second user instead of the one selected by himself.

To avoid this problem the parameter channels, implement so-called “visu orders”. These are comments given from the parameter channel, meaning from the PLC, to discard a system to act upon. For example, one of these visu orders is the “close command”, which will be sent each time a new control module is selected in the parameter channel.

This avoids these kind of problems, because if the first user views data from and control module and a second one selects and different control module, the parameter channel will send the close command to all face plates, and

the currently opened faceplate from the user will simply be closed instead of showing data from a different control module.

All face plates must monitor the Visu-order variable corresponding to their control module type and execute the appropriate action if the value of this variable changes. All visu-orders are represented by integer numbers. All face plates must implement this functionality and execute the appropriate order if the Faceplate window is visible. If the faceplate window is not visible, the visu-order commands can be ignored. All parameter channels implement a visu order variable available to be monitored by these faceplates.

Currently the parameter channels implement the following visu-orders.

Order ID	Action to be taken
0	No action to be taken
4711	Close current Faceplate

Variable of a Parameter channel

In the following section we will go over the variables and their meaning and functioning. The following section we'll talk about the actuator parameter channel, but all parameter channels of all control module types generally follow the same principle and have the same variables available. Of course, the parameters and status of the control modules that are active in the parameter channel are different for each control module type.

Tag Name	PLC Address	Type	Comment
zActPC01.ObjNo	DB 12.DBD 160	DINT	The currently active Actuator Number that is in the Parameter channel
zActPC01.ObjNoOld	DB 12.DBD 164	DINT	Not relevant to the SCADA system
zActPC01.VisuOrder	DB 12.DBD 168	DINT	A command on which the "faceplate window" should act. If the value is 4711, the Faceplate should close
zActPC01.TimeOpen	DB 12.DBD 172	REAL	How long is the Faceplate already visible in seconds
zActPC01.CopyOrder	DB 12.DBD 180	DINT	Not relevant to the SCADA system
zActPC01.AlarmReason	DB 12.DBD 196	DINT	Not relevant to the SCADA system
Starting from DBX200.0 you can view the current data, status and parameters of the requested control modules, in this case an Actuator. You can set and write any writeable variable or parameter here, and it Will automatically propagate to the selected control module type. You can view this section as an "Alias" to the selected module.			
zActPC01.ACo	DB 12.DBX 200.0	BOOL	These statuses correspond to the Visu Status field of the control module type.
zActPC01.ExCo	DB 12.DBX 200.1	BOOL	
zActPC01.SCS	DB 12.DBX 200.2	BOOL	
zActPC01.xFBa1	DB 12.DBX 200.3	BOOL	
zActPC01.xFBa2	DB 12.DBX 200.4	BOOL	
zActPC01.Rel	DB 12.DBX 200.5	BOOL	
zActPC01.Rel2	DB 12.DBX 200.6	BOOL	
zActPC01.xAuto	DB 12.DBX 200.7	BOOL	
zActPC01.ACoHM	DB 12.DBX 201.0	BOOL	

zActPC01.ExCoHM	DB 12.DBX 201.1	BOOL	
zActPC01.FBaOn	DB 12.DBX 201.2	BOOL	
zActPC01.FBaOff	DB 12.DBX 201.3	BOOL	
zActPC01.xAl	DB 12.DBX 201.4	BOOL	
zActPC01.FBa1Active	DB 12.DBX 201.5	BOOL	
zActPC01.FBa2Active	DB 12.DBX 201.6	BOOL	
zActPC01.xAutoHM	DB 12.DBX 201.7	BOOL	
zActPC01.GAlQuitt	DB 12.DBX 202.0	BOOL	
zActPC01.Ign	DB 12.DBX 202.1	BOOL	
zActPC01.Sim	DB 12.DBX 202.2	BOOL	
zActPC01.Auto	DB 12.DBX 202.3	BOOL	
zActPC01.MCo	DB 12.DBX 202.4	BOOL	
zActPC01.EmRel	DB 12.DBX 202.5	BOOL	
zActPC01.InterlockGAl	DB 12.DBX 202.6	BOOL	
zActPC01.Maint	DB 12.DBX 202.7	BOOL	
zActPC01.GAl	DB 12.DBX 203.0	BOOL	
zActPC01.GAlS	DB 12.DBX 203.1	BOOL	
zActPC01.SCE	DB 12.DBX 203.2	BOOL	
zActPC01.Mov	DB 12.DBX 203.3	BOOL	
zActPC01.On	DB 12.DBX 203.4	BOOL	
zActPC01.Off	DB 12.DBX 203.5	BOOL	
zActPC01.Out	DB 12.DBX 203.6	BOOL	
zActPC01.User	DB 12.DBX 203.7	BOOL	
zActPC01.TOnVal	DB 12.DBD 204	REAL	
zActPC01.TOnSp	DB 12.DBD 208	REAL	
zActPC01.TOfVal	DB 12.DBD 212	REAL	
zActPC01.TOfSp	DB 12.DBD 216	REAL	
zActPC01.ADVal	DB 12.DBD 220	REAL	
zActPC01.ADSp	DB 12.DBD 224	REAL	
zActPC01.TInterlock	DB 12.DBD 228	REAL	
zActPC01.SwCntVal	DB 12.DBD 232	DINT	
zActPC01.RunTimeVal	DB 12.DBD 236	DINT	

The Process of opening and closing of a Faceplate window

The process of opening a faceplate window from control module type generally follows the following steps:

- Send the right click command to the requested control module or from control module type
- Open the appropriate faceplate window
- Monitor the visu order variable

and then when the user closes the first plate window again:

- close the faceplate window
- Write The variable “0” to the “zActPC01.ObjNo” variable

6. Commands

Commands are an easy way for a SCADA system to send orders or commands to individual control modules in the PLC. The SCADA system does this by writing and special command value onto the status off the requested control module. Depending on the value written, the PLC will execute the requested command on the requested control module.

It is important to note text this also means that visualization statuses from control modules are not read only but can also be written with commands from the SCADA system. After the command has been executed by the PLC D control modules status will be overwritten by the current control module status from the PLC again.

All current statuses of all control modules are they nominated by the ".St" postfix in their variable names. Discard a system writes and specific command value onto these values. All commands sent to the PLC are negative integer numbers. This means that this current system can determine if on command or the status is visible on a Status Tag (".St") from control module, by checking if the observed integer number is negative or positive.

"Left click" or Immediate Action

and left click denominates an immediate action that should be executed by the PLC. Which action should be executed is defined in a configuration section in the PLC. The actions include setting actuators to manual, manual activation of actuators, or acknowledging of current alarms. The immediate action is going to be used by the operators to execute manual operations on the plants equipment such as manually opening valves and turning on pumps in specific cases.

The Code for this action that should be written to the PLC is: L#-1000000

For example:

```
Scada system Pseudo Script Code:

//this will execute the Immediate action on Analog Input 97
Sub OnClick()
	Runtime.WriteVariable("AIn0097.St", -1000000)
End Sub
```

"Right click" or show Faceplate

The right click comment on and control module always opens the faceplate and requests the corresponding parameter channel for the requested control module.

The Code for this action that should be written to the PLC is: L#-2000000

```
Scada system Pseudo Script Code:

//this will Request the Parameter Channel for Actuator 432
Sub OnRightClick()
	Runtime.WriteVariable("Act0432.St", -2000000)
	Runtime.ShowWindow("ActuatorFacePlate")
End Sub

//When the faceplate is closed again, release the parameter channel
Sub OnFaceplateClose
	Runtime.WriteVariable("zActPC01.ObjNo", 0)
End Sub
```

7. Actuator

Visualization Status Data block

The visualization data block for actuator control modules can be viewed as an array of actuator control module statuses where each status is represented as a double integer (int32)

“Bx Act Visu” DB 11

Adress	Tag	Type	Description
0.0	Act	ARRAY[0..1600] of DINT	The status Double integer for each of the 1600 Actuators

Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	ACo	BOOL	automatic control
25	0.1	ExCo	BOOL	extern control
26	0.2	SCS	BOOL	status check start
27	0.3	xFBa1	BOOL	feedback 1
28	0.4	xFBa2	BOOL	feedback 2
29	0.5	Rel	BOOL	release
30	0.6	Rel2	BOOL	release 2
31	0.7	xAuto	BOOL	extern automatic
16	1.0	ACoHM	BOOL	automatic control help memory
17	1.1	ExCoHM	BOOL	extern control help memory
18	1.2	FBaOn	BOOL	feedback ON intern
19	1.3	FBaOff	BOOL	feedback OFF intern
20	1.4	FBaChange	BOOL	change extern feedback (0 FBa1=OFF FBa2=ON / 1 FBa1=ON FBa2=OFF)
21	1.5	FBa1Active	BOOL	feedback 1 active
22	1.6	FBa2Active	BOOL	feedback 2 active
23	1.7	xAutoHM	BOOL	extern automatik old
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	Auto	BOOL	automatic mode
12	2.4	MCo	BOOL	manual control
13	2.5	EmRel	BOOL	emergency release
14	2.6	InterlockGAl	BOOL	interlock by alarm
15	2.7	Maint	BOOL	maintenence
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	SCE	BOOL	status check error
3	3.3	Mov	BOOL	actuator is moving for visu
4	3.4	On	BOOL	actuator is ON
5	3.5	Off	BOOL	actuator is OFF
6	3.6	Out	BOOL	output
7	3.7	User	BOOL	free for user programm

Symbol

The Actuator control module represents valves motors and other elements that can be activated. Depending on the type of element that you want to represent the symbol may have a different appearance. However, all symbolic representations of Actuators follow the same concept.

All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- background color
- symbol border color
- symbol background color

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Act0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	Act0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	Act0001.St.SCE	2	3.2	Bit = TRUE	The module presents an Start condition Check error.
	Act0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	Act0001.St	0,1,2,9	3.0, 3.1, 3.2, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

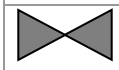
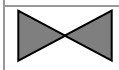
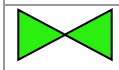
background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Act0001.St.Maint	15	2.7	Bit = TRUE	Maintenance: The module has been locked by maintenance personnel and cannot be activated in either automatic or manual mode.
	Act0001.St.EmRel	13	2.5	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	Act0001.St.Auto	11	2.3	Bit = FALSE	Manual: The module is in manual mode and can be operated only by the operator.
	Act0001.St.Auto	11	2.3	Bit = TRUE	Automatic: The module is in automatic mode and is being controlled by the system

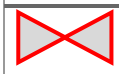
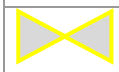
Symbol Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Act0001.St.Maint	15	2.7	Bit = TRUE	Maintenance: The module has been locked by maintenance personnel and cannot be activated in either automatic or manual mode.
	Act0001.St.Rel	29	0.5	Bit = TRUE	Locked: The module is locked by a process lock or a security lock. The module cannot be activated in either manual or automatic mode
	Act0001.St.Rel2	30	0.6	Bit = TRUE	Locked: The module is locked by a process lock or a security lock. The module cannot be activated in either manual or automatic mode
	Act0001.St.Off	5	3.5	Bit = TRUE	Off: The module is not stopped/closed.
	Act0001.St.On	4	3.4	Bit = TRUE	On: The module is not Running/Open

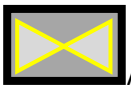
Symbol Border color

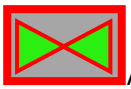
This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Act001.St.GAl	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	Act001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. Internally, it always assumes that the final position and/or feedback of the module are correct, regardless of ground signals
	Act001.St	0, 10	3.0, 2.2	All Bits = FALSE	Status OK: The module does not have any alarms, warnings or similar. It is in its normal status

Examples


Actuator in Automatic, unlocked, Closed, without alarm or simulation. Normal Status


Actuator Simulated, in automatic and normal status

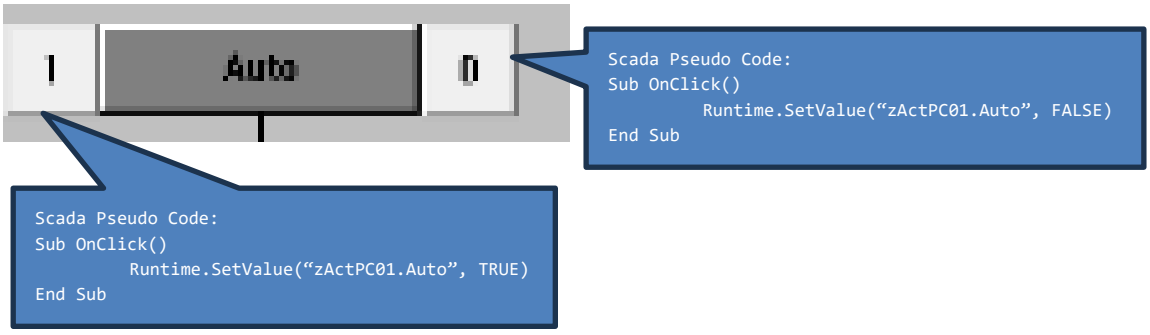

Actuator failing, trying to open, but not getting to its position Open

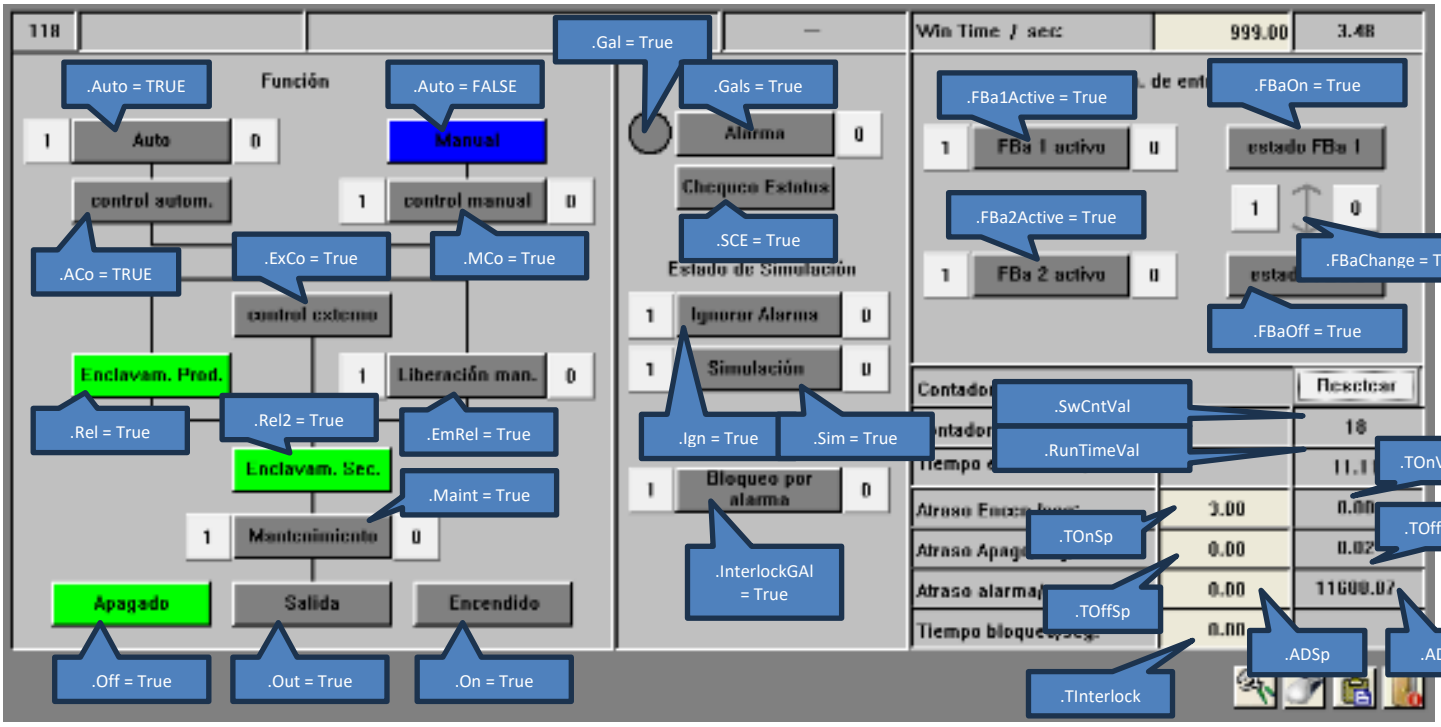

Actuator in Maintenance

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zActPC01”. The Tag “.Auto” becomes “zActPC01.Auto” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:





8. Digital Input

Visualization Status Data block

The visualization data block for Digital Input control modules can be viewed as an array of control module statuses where each status is represented as a double integer (int32)

“Bx DIn Visu” DB 16

Adress	Tag	Type	Description
0.0	DIn	ARRAY[0..1600] of DINT	The status Double integer for each of the 1600 Digital Inputs

Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	EA0	BOOL	enable alarm by 0-signal
25	0.1	EA1	BOOL	enable alarm by 1-signal
26	0.2	SCS0	BOOL	status check alarm by 0-signal
27	0.3	SCS1	BOOL	status check alarm by 1-signal
28	0.4	xSig	BOOL	signal extern
29	0.5	B29	BOOL	spare
30	0.6	B30	BOOL	spare
31	0.7	B31	BOOL	spare
16	1.0	AlHM	BOOL	help memory for alarm
17	1.1	ImpHM	BOOL	help memory for impulse
18	1.2	xSigHM	BOOL	signal extern help memory
19	1.3	B19	BOOL	spare
20	1.4	B20	BOOL	spare
21	1.5	B21	BOOL	spare
22	1.6	B22	BOOL	spare
23	1.7	B23	BOOL	spare
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	iEA0	BOOL	intern alarm by 0
12	2.4	iEA1	BOOL	intern alarm by 1
13	2.5	ImpProt	BOOL	write impule flank to protocol
14	2.6	ImpNegProt	BOOL	write negative impule flank to protocol
15	2.7	Switch	BOOL	convert as switch output
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	SCE	BOOL	status check error
3	3.3	Sig	BOOL	signal state
4	3.4	Imp	BOOL	impulse flank
5	3.5	ImpNeg	BOOL	negative impulse flank
6	3.6	B06	BOOL	spare
7	3.7	User	BOOL	free for user

Symbol

All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- symbol border color
- symbol background color

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	DIn0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	DIn0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	DIn0001.St.SCE	2	3.2	Bit = TRUE	The module presents a Start condition Check error.
	DIn0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	DIn0001.St	0,1,2,9	3.0, 3.1, 3.2, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

Symbol Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	DIn0001.St.Sig	3	3.3	Bit = FALSE	Off: the input is low
	DIn0001.St.Sig	3	3.3	Bit = TRUE	On: the input is high

Symbol Border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Din0001.St.GAl	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	DIn0001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. Internally, it always assumes that the final position and/or feedback of the module are correct, regardless of ground signals
	DIn0001.St	0, 10	3.0, 2.2	All Bits = FALSE	Status OK: The module does not have any alarms, warnings or similar. It is in its normal status

Examples


Digital Input is High

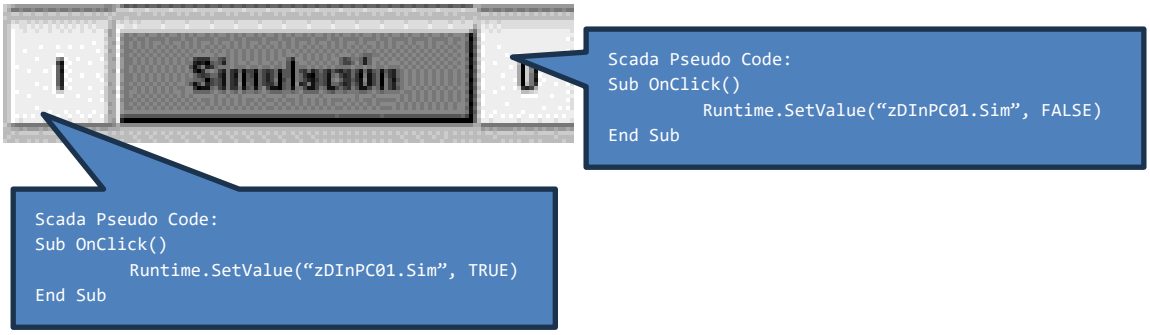

Digital Input Simulated

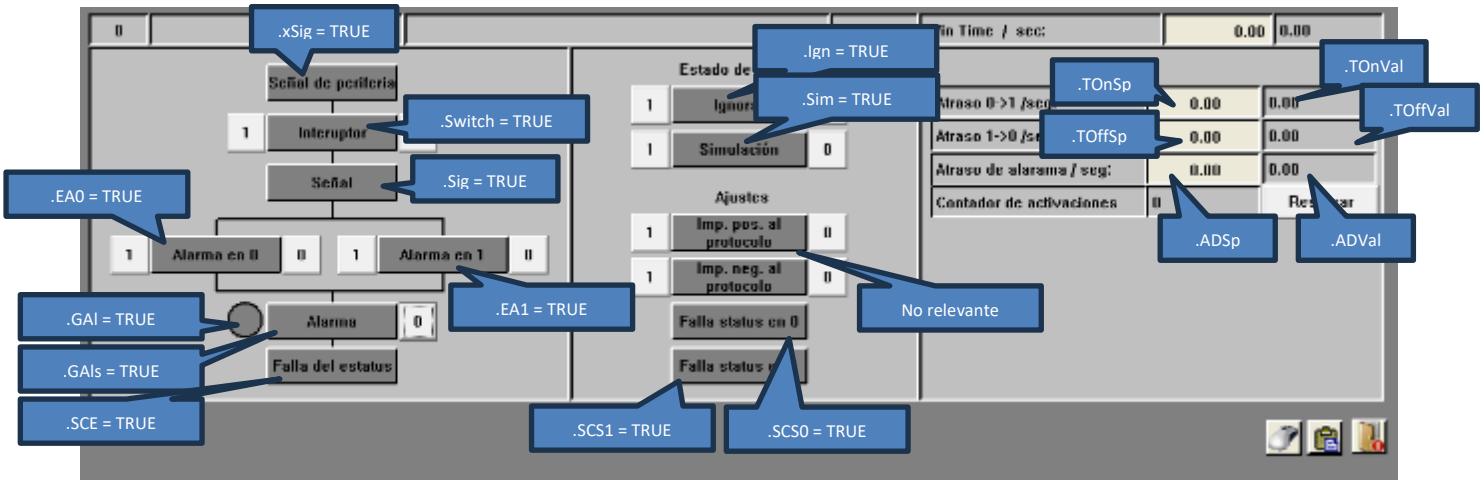

Digital Input has an Alarm

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zDInPC01”. The Tag “.Sig” becomes “zDInPC01.Sig” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:





9. Analog Input

Analog inputs represent analog measurements in the field, which deliver instantaneous measurement values. Each module may have set Alarm or Warning levels, which trigger the module's alarm/warning when these limits are exceeded.

Visualization Status Data block

The visualization data block for Analog Input control modules can be viewed as an array of control module statuses where each status is represented as a double integer (int32)

"Bx AIn Visu" DB 21

Adress	Tag	Type
0.0	AIn	ARRAY[0..480] of Struct

Adress	Tag	Type	Description
0.0	St	DInt	The status Double integer for each of the Analog Inputs
4.0	Val	Real	The Current Value of the Analog Input
8.0	Sp	Real	The current Nominal Value of the Analog Input

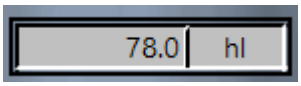
Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	ELLA	BOOL	enable low low alarm
25	0.1	EHHA	BOOL	enable high high alarm
26	0.2	xAI	BOOL	alarm from extern
27	0.3	NPA	BOOL	no peripherie adaption
28	0.4	B28	BOOL	spare
29	0.5	B29	BOOL	spare
30	0.6	B30	BOOL	spare
31	0.7	B31	BOOL	spare
16	1.0	LLA	BOOL	low low alarm - alarm if enabled
17	1.1	LL	BOOL	low low limite - warning if enabled
18	1.2	L	BOOL	low limit
19	1.3	Sp	BOOL	setpoint
20	1.4	H	BOOL	high limite
21	1.5	HH	BOOL	high high limite - warning if enabled
22	1.6	HHA	BOOL	high high alarm - alarm if enabled
23	1.7	HWA	BOOL	alarm from hardware
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	iEHWA	BOOL	enable hardeware alarm

12	2.4	iELLA	BOOL	enable LL alarm
13	2.5	iEHHA	BOOL	enable HH alarm
14	2.6	iELLW	BOOL	enable LL warning
15	2.7	iEHHW	BOOL	enable HH warning
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	Warn	BOOL	general warning
3	3.3	Filter1	BOOL	filter 1 on (75%)
4	3.4	Filter2	BOOL	filter 2 on (88%)
5	3.5	Filter3	BOOL	filter 3 on (94%)
6	3.6	ManuInp	BOOL	manual input (no peripherie)
7	3.7	User	BOOL	memory free for user

Symbol



All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- background color
- Text

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Ain0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	Ain0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	AIn0001.St.Wrn	2	3.2	Bit = TRUE	The module has a Warning
	Ain0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	AIn0001.St	0,1,2,9	3.0, 3.1, 3.2, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

Background color

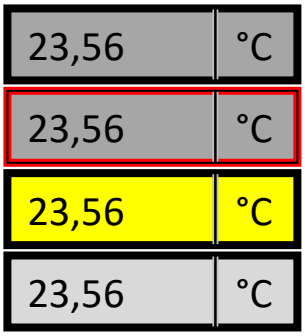
This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	AIn0001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. The current signal of the module can be changed by the operator
	AIn0001.St.ManuInp	6	3.6	Bit = TRUE	Manual Entry: The module functions as input of operator values. That is, the operator can enter a process value measured with laboratory equipment
	Ain0001.St	10,6	2.2, 3.6	All bits = FALSE	Normal condition for an Analog input

Text

The text shows the current value of the Analog Input by referencing the “AIn0001.Val” variable

Examples



Normal input, no Alarm

Input failed, high or low limit has been exceeded

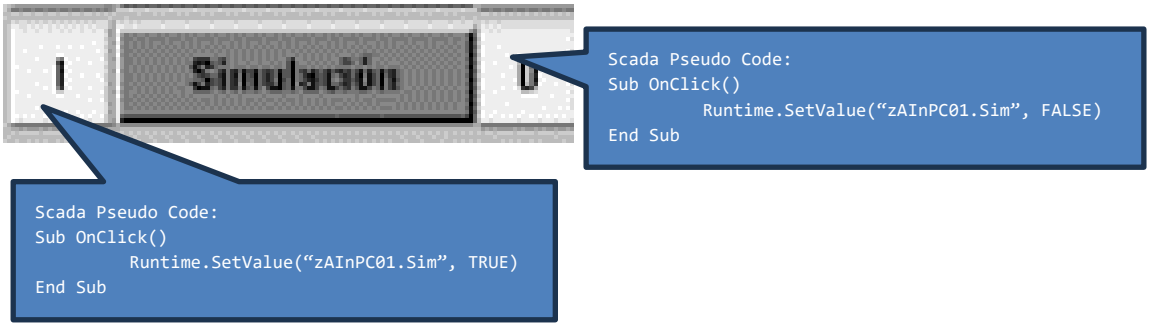
Module in simulation

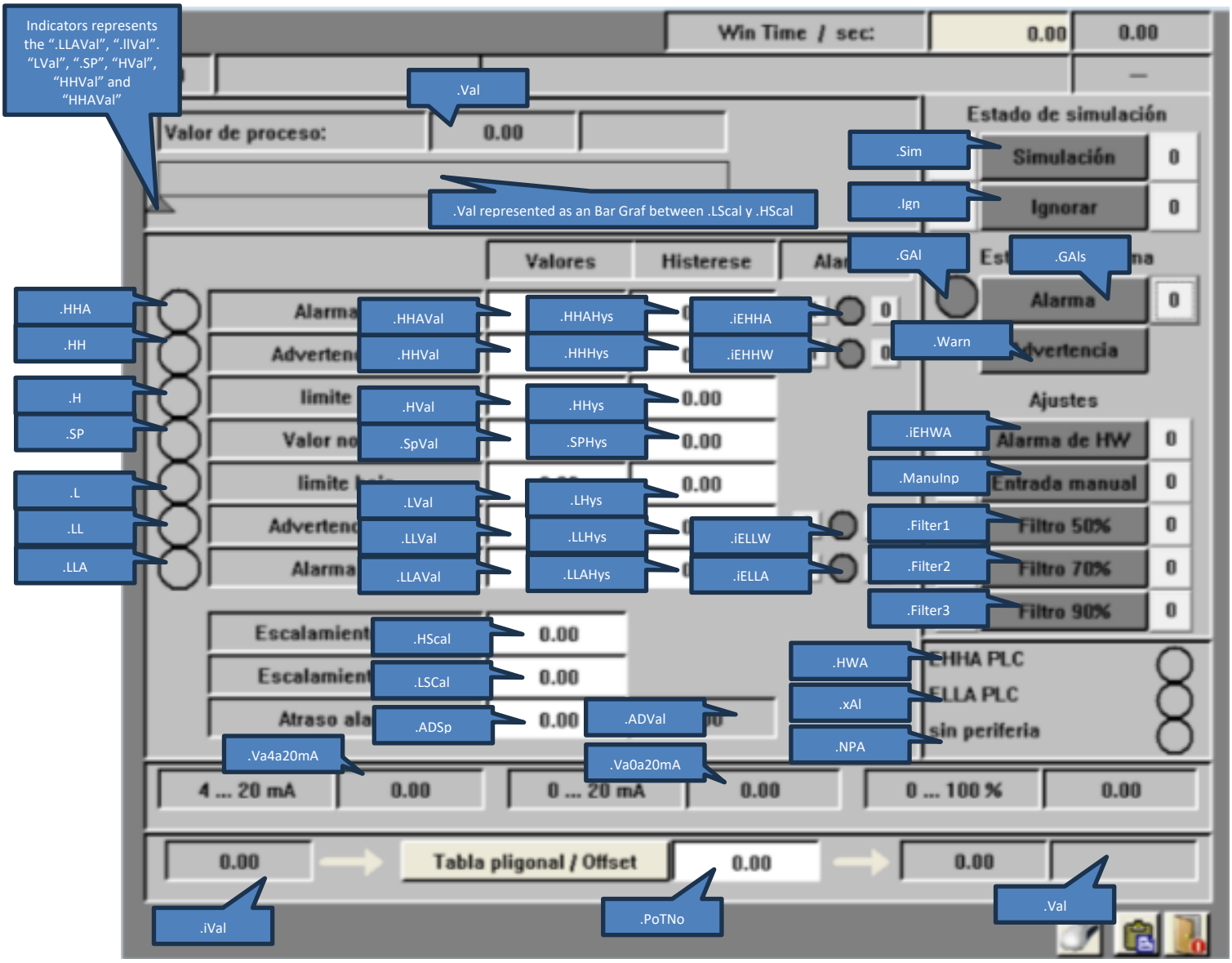
Modulo works as manual entry, where the operator must enter a value manually

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zAInPC01”. The Tag “.Sig” becomes “zAInPC01.Sig” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:





10. Regulator

Regulators represent equipment that controls Manipulator Valves or Pumps with Frequency Harvester, to adjust a parameter such as Flow or Temperature in the process. Alarms are triggered when the controller is unable to adjust the process value within the normal control time.

Visualization Status Data block

The visualization data block for Analog Input control modules can be viewed as an array of control module statuses where each status is represented as a double integer (int32)

"Bx PID Visu" DB 31

Adress	Tag	Type
0.0	AIn	ARRAY[0..360] of Struct

Adress	Tag	Type	Description
0.0	St	DInt	The status Double integer for each of the Regulators
4.0	Out	Real	The Current Output Value of the Regulator
8.0	Sp	Real	The current Nominal Value of the Regulator

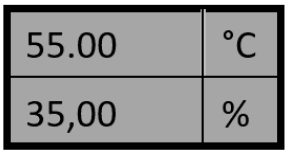
Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	EAl	BOOL	enable alarm
25	0.1	SCS	BOOL	status check start
26	0.2	MStC	BOOL	static output value
27	0.3	MStrt	BOOL	starting value
28	0.4	MOVMin	BOOL	output value min.
29	0.5	MOVMax	BOOL	output value max.
30	0.6	OVOn	BOOL	output value on
31	0.7	B31	BOOL	spare
16	1.0	B16	BOOL	spare
17	1.1	B17	BOOL	spare
18	1.2	B18	BOOL	spare
19	1.3	B19	BOOL	spare
20	1.4	AlHM	BOOL	help memory for alarm
21	1.5	AHystHM	BOOL	help memory outside hysterese
22	1.6	StrtHM	BOOL	help memory starting value active
23	1.7	Warn	BOOL	warning
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	MCOn	BOOL	mode controller on (0=off)

12	2.4	MSpExt	BOOL	mode setpoint extern (0=intern)
13	2.5	DisOut	BOOL	disable output peripherie (0=enable)
14	2.6	EW	BOOL	enable warning
15	2.7	B15	BOOL	spare
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	SCE	BOOL	status check error
3	3.3	Filter1	BOOL	filter 1 on (75%)
4	3.4	Filter2	BOOL	filter 2 on (88%)
5	3.5	Filter3	BOOL	filter 3 on (94%)
6	3.6	CA	BOOL	control acting (1 = inverse)
7	3.7	User	BOOL	memory free for user

Symbol



All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- background color
- Upper line Text
- Lower line Text

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	PID0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	PID0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	PID0001.St.Wrn	2	3.2	Bit = TRUE	The module has a Warning
	PID0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	PID0001.St	0,1,2,9	3.0, 3.1, 3.2, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	PID0001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. The current signal of the module can be changed by the operator
	PID0001.St. MSpExt	12	2.4	Bit = FALSE	Internal Setpoint: The module uses the Nominal Value adjusted in the same module by the operator, instead of the nominal value of the recipe.
	PID0001.St. MCOn	11	2.3	Bit = FALSE	Manual: The slider does not manipulate the output value, but the output of the slider is fixed to a value set by the operator
	PID0001.St	10,6	2.2, 3.6	All bits = FALSE	Normal condition for an Analog input

Upper line Text

The text shows the current nominal value of the regulator by referencing the “PID0001.Sp” variable

Lower line Text

The text shows the current Output value of the regulator by referencing the “PID0001.Out” variable

Examples

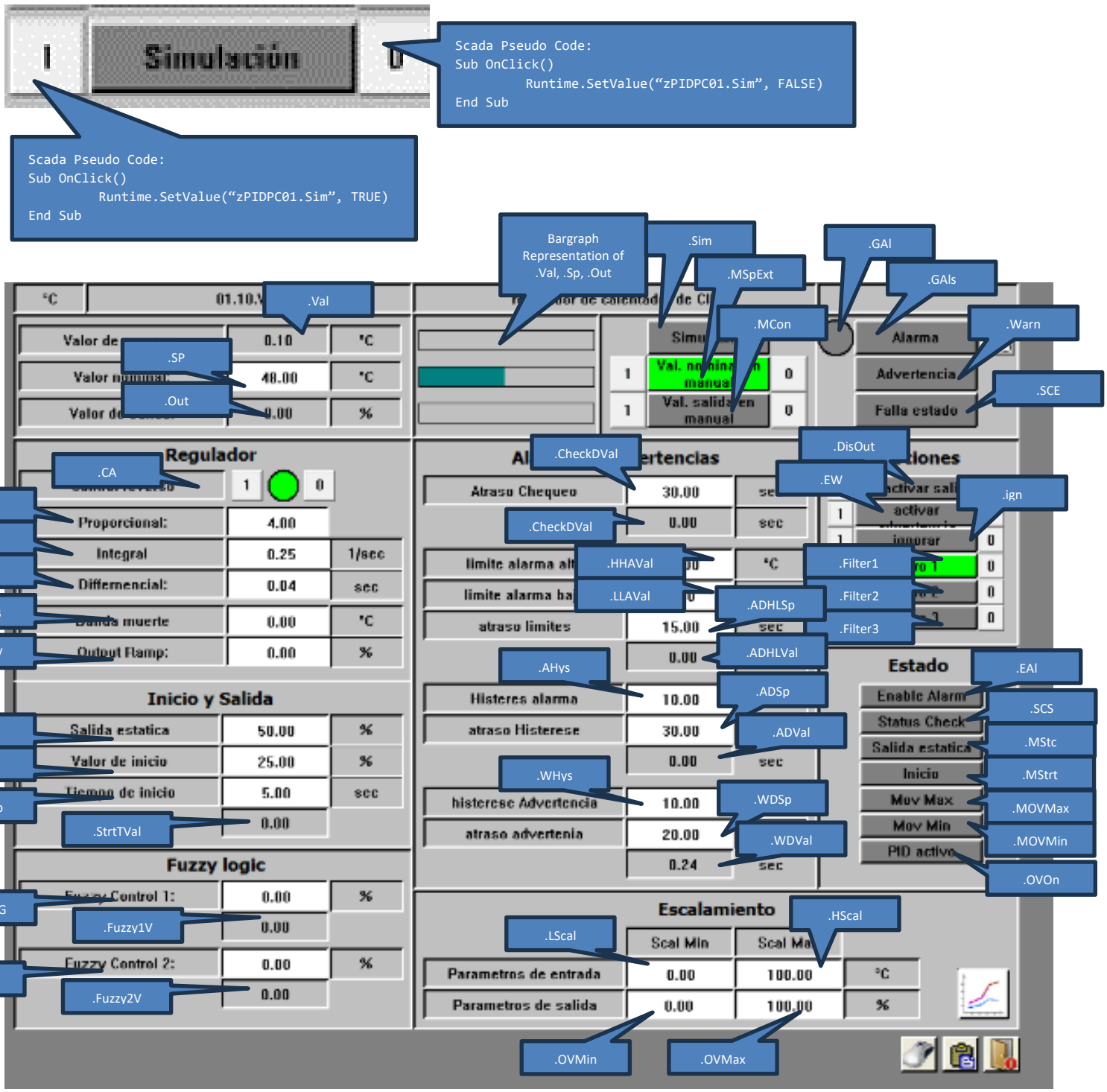
55.00	°C
35,00	%

Normal regulator, activated with a nominal value of 55°C and a valve opening of 35%

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zPIDPC01”. The Tag “.Sig” becomes “zPIDPC01.Sig” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:



11. Counter

Counters represent totalizers that account for the number of pulses delivered by a flowmeter in the field. These modules deliver in aggregated volume of flow meters

Visualization Status Data block

The visualization data block for Counter control modules can be viewed as an array of control module statuses where each status is represented as a double integer (int32)

"Bx Cnt Visu" DB 26

Adress	Tag	Type
0.0	Cnt	ARRAY[0..360] of Struct

Adress	Tag	Type	Description
0.0	St	DInt	The status Double integer for each of the Counters
4.0	Val	Real	The Current Value of the Analog Input
8.0	Sp	Real	The current Nominal Value of the Analog Input

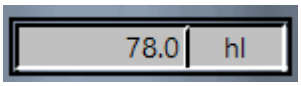
Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	EAImp	BOOL	enable impulse alarm
25	0.1	ELLA	BOOL	enable low low alarm
26	0.2	EHHA	BOOL	enable high high alarm
27	0.3	xAI	BOOL	alarm from extern
28	0.4	ResetBlock	BOOL	interlock counter reset
29	0.5	xSig	BOOL	impulse input
30	0.6	B30	BOOL	spare
31	0.7	B31	BOOL	spare
16	1.0	MLLA	BOOL	low low alarm - alarm if enabled
17	1.1	MLL	BOOL	low low limite - warning if enabled
18	1.2	ML	BOOL	low limit
19	1.3	MSp	BOOL	setpoint
20	1.4	MH	BOOL	high limite
21	1.5	MHH	BOOL	high high limite - warning if enabled
22	1.6	MHHA	BOOL	high high alarm - alarm if enabled
23	1.7	ImpHM	BOOL	impulse help memory
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	Reset	BOOL	reset counter
12	2.4	iELLA	BOOL	counting reserve

13	2.5	iEHHA	BOOL	enable HH alarm
14	2.6	iELLW	BOOL	enable LL warning
15	2.7	iEHHW	BOOL	enable HH warning
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	Warn	BOOL	general warning
3	3.3	Imp	BOOL	impulse flank
4	3.4	B04	BOOL	spare
5	3.5	B05	BOOL	spare
6	3.6	B06	BOOL	spare
7	3.7	User	BOOL	memory free for user

Symbol



All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- background color
- Text

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Cnt0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	Cnt0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	Cnt0001.St.Wrn	2	3.2	Bit = TRUE	The module has a Warning
	Cnt0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	Cnt0001.St	0,1,2,9	3.0, 3.1, 3.2, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

Background color

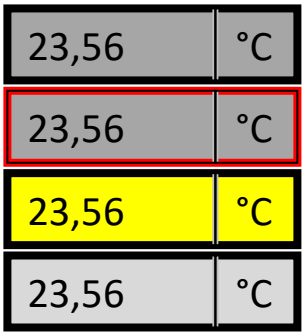
This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Cnt0001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. The current signal of the module can be changed by the operator
	Cnt0001.St.ManuInp	6	3.6	Bit = TRUE	Manual Entry: The module functions as input of operator values. That is, the operator can enter a process value measured with laboratory equipment
	Cnt0001.St	10,6	2.2, 3.6	All bits = FALSE	Normal condition for an Analog input

Text

The text shows the current value of the Analog Input by referencing the “AIn0001.Val” variable

Examples



Normal input, no Alarm

Input failed, high or low limit has been exceeded

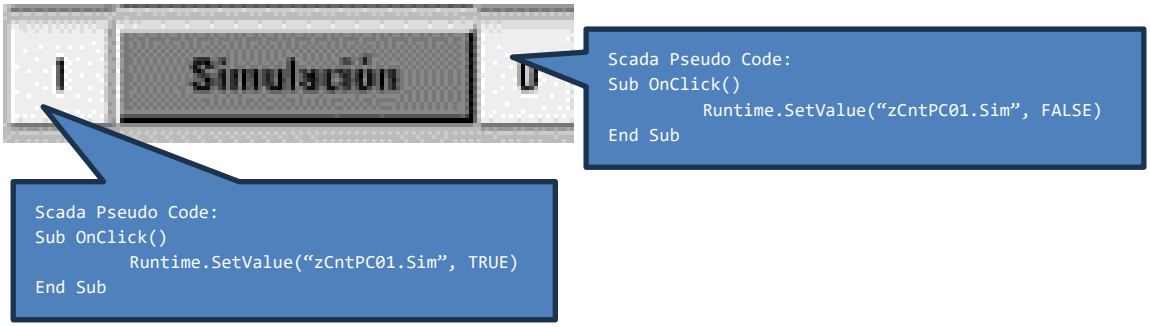
Module in simulation

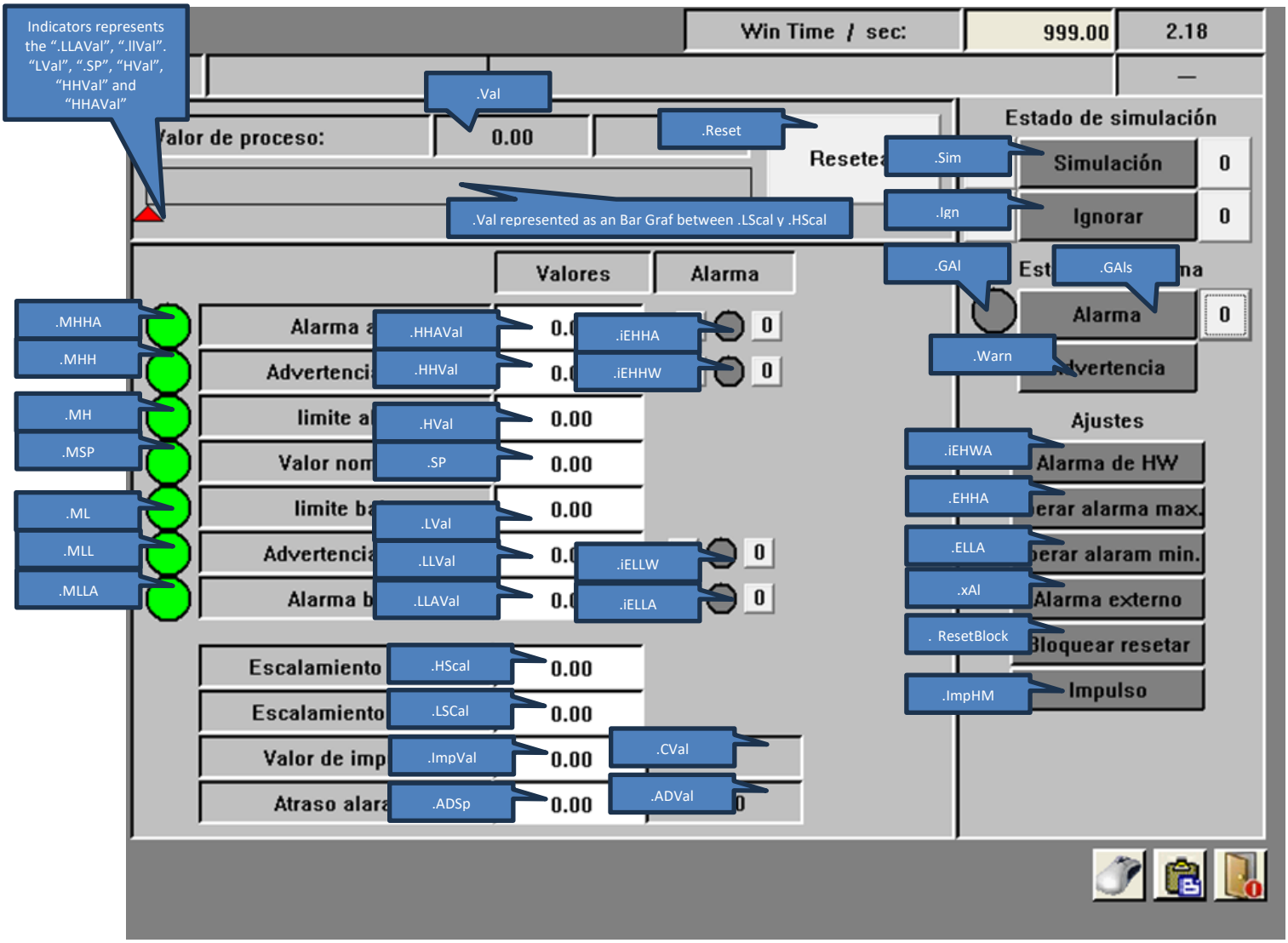
Modulo works as manual entry, where the operator must enter a value manually

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zCntPC01”. The Tag “.Sig” becomes “zCntPC01.Sig” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:





12. Messages

Messages represent situations in the process that require the attention of operators. There are Operational Messages, which indicate some manual operation to be performed, and Failure Messages, which indicate some non-normal condition of the process.

Visualization Status Data block

The visualization data block for Message control modules can be viewed as an array of control module statuses where each status is represented as a double integer (int32)

"Bx DIn Visu" DB 16

Adress	Tag	Type	Description
0.0	Msg	ARRAY[0..360] of DINT	The status Double integer for each of the Messages

Status definition

As mentioned in the Endianness section of this manual the addresses from the PLC must be converted to appropriate addresses for the HMI system. For example, the very first address pit 0.0 in the PLC, becomes bit 24 on the SCADA system after the driver uploaded the data and converted it by its endianness. Each individual bit of the control module status has the following meaning:

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	B24	BOOL	spare
25	0.1	B25	BOOL	spare
26	0.2	B26	BOOL	spare
27	0.3	B27	BOOL	spare
28	0.4	xAlarm	BOOL	signal extern for alarm condition
29	0.5	B29	BOOL	spare
30	0.6	B30	BOOL	spare
31	0.7	B31	BOOL	spare
16	1.0	B16	BOOL	spare
17	1.1	B17	BOOL	spare
18	1.2	B18	BOOL	spare
19	1.3	B19	BOOL	spare
20	1.4	B20	BOOL	spare
21	1.5	B21	BOOL	spare
22	1.6	B22	BOOL	spare
23	1.7	B23	BOOL	spare
8	2.0	GAlQuitt	BOOL	general alarm quitt
9	2.1	Ign	BOOL	ignore alarm
10	2.2	Sim	BOOL	simulation
11	2.3	OPMsg	BOOL	operator message
12	2.4	B12	BOOL	spare
13	2.5	B13	BOOL	spare
14	2.6	B14	BOOL	spare
15	2.7	B15	BOOL	spare
0	3.0	GAl	BOOL	general alarm
1	3.1	GAlS	BOOL	general alarm save
2	3.2	OPMsgActive	BOOL	operator message active
3	3.3	AlarmMsgActive	BOOL	alarm message active

4	3.4	iAlarm	BOOL	alarm active intern
5	3.5	B05	BOOL	spare
6	3.6	B06	BOOL	spare
7	3.7	User	BOOL	free for user

Symbol

All of the symbols have the following animation elements that can change color depending on the control module status.

- exterior border color
- background color
- Text

Exterior border color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Msg0001.St.Gal	0	3.0	Bit = TRUE	Module is currently on Alarm. The alarm is still present
	Msg0001.St.Gals	1	3.1	Bit = TRUE	The module was on alarm, the alarm is not present anymore, but the module alarm has not yet been acknowledged
	Msg0001.St.Wrn	11	2.3	Bit = TRUE	Operational Message: That the process requires some manual operation on the part of the operators
	Msg0001.St.Ign	9	2.1	Bit = TRUE	Modules Alarm is currently being ignored
	Msg0001.St	0,1,11,9	3.0, 3.1, 2.3, 2.1	All Bits = FALSE	None of the above status bits is active. The module is “normal”

Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Msg0001.St.Sim	10	2.2	Bit = TRUE	Simulation: The mode is simulated. The current signal of the module can be changed by the operator
	Msg0001.St	10	2.2	All bits = FALSE	Normal condition for an Analog input

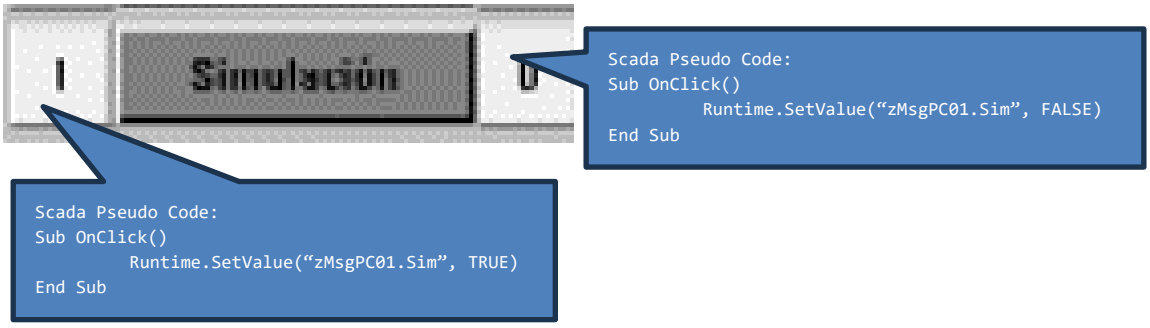
Text

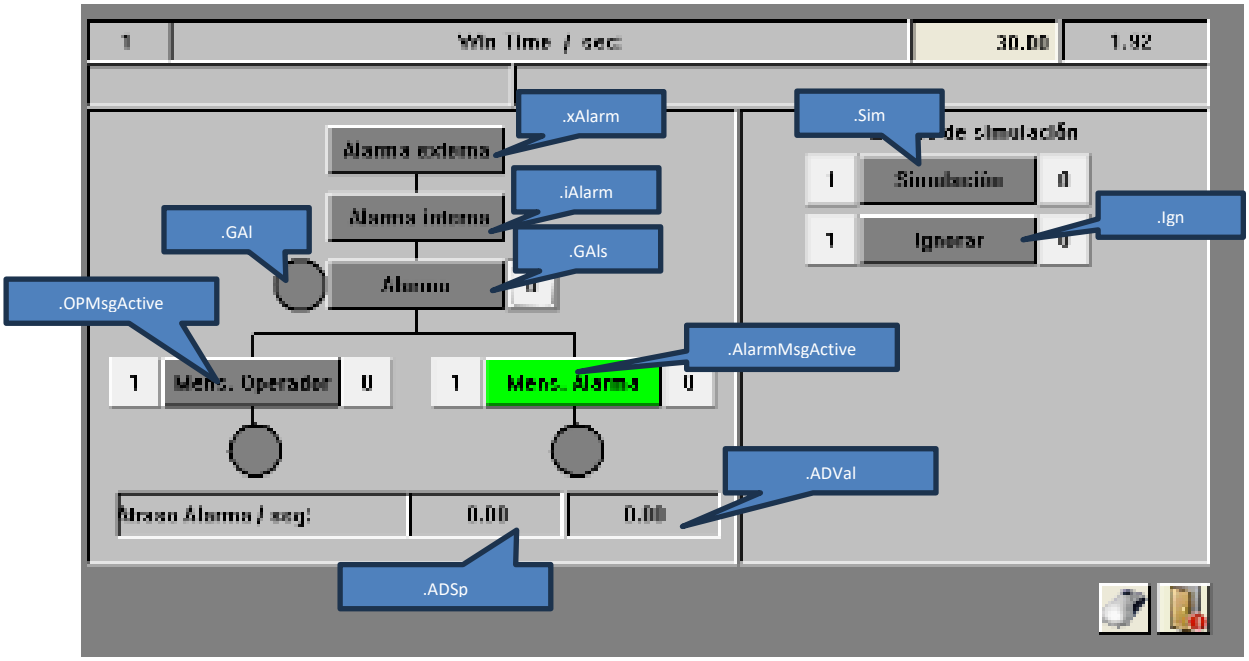
The text shows the Messages associated Message text

Faceplate

In the following diagram we will only indicate the status Bit Symbolic Postfixes of the actual Tags. All the Tags start with: “zMsgPC01”. The Tag “.Sig” becomes “zMsgPC01.Sig” and can be referenced in the Variable List.

For all status that can be manipulated by the user you will see a set and reset button left and right next to the status indication. The one button sets the corresponding “bit = TRUE” and the zero button sets the corresponding “bit = FALSE”. For example:





13. Switch

Switches are modules that allow the user to activate conditional functionality or confirm actions during the process execution. They are used, when an action should be active or executed, independently of a process being executed.

Switch Off, Off

Switch on, the function is active

Switch Locked. Activation is not possible

Visualization Status Data block

"Bx Switch Visu" DB 39

Adress	Tag	Type	Description
0.0	Switch	ARRAY[0..360] of DINT	The status Double integer for each of the Switches

Status Definition

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	Set	BOOL	set software switch
25	0.1	Reset	BOOL	reset software switch
26	0.2	B26	BOOL	spare
27	0.3	B27	BOOL	spare
28	0.4	B28	BOOL	spare
29	0.5	B29	BOOL	spare
30	0.6	B30	BOOL	spare
31	0.7	B31	BOOL	spare
16	1.0	B16	BOOL	spare
17	1.1	B17	BOOL	spare
18	1.2	B18	BOOL	spare
19	1.3	B19	BOOL	spare
20	1.4	B20	BOOL	spare
21	1.5	B21	BOOL	spare
22	1.6	B22	BOOL	spare
23	1.7	B23	BOOL	spare
8	2.0	B08	BOOL	spare
9	2.1	B09	BOOL	spare
10	2.2	B10	BOOL	spare
11	2.3	B11	BOOL	spare
12	2.4	B12	BOOL	spare
13	2.5	B13	BOOL	spare
14	2.6	B14	BOOL	spare
15	2.7	B15	BOOL	spare
0	3.0	B00	BOOL	spare
1	3.1	B01	BOOL	spare
2	3.2	B02	BOOL	spare
3	3.3	Sig	BOOL	spare
4	3.4	B04	BOOL	spare
5	3.5	B05	BOOL	spare
6	3.6	B06	BOOL	spare
7	3.7	User	BOOL	free for user

Symbol

All of the symbols have the following animation elements that can change color depending on the control module status.

- background color
- Text color

Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
	Switch0001.St.Sig	3	3.3	Bit = TRUE	Switch is active
	Switch0001.St.Sig	3	3.3	Bit = FALSE	Switch is not active

Background color

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

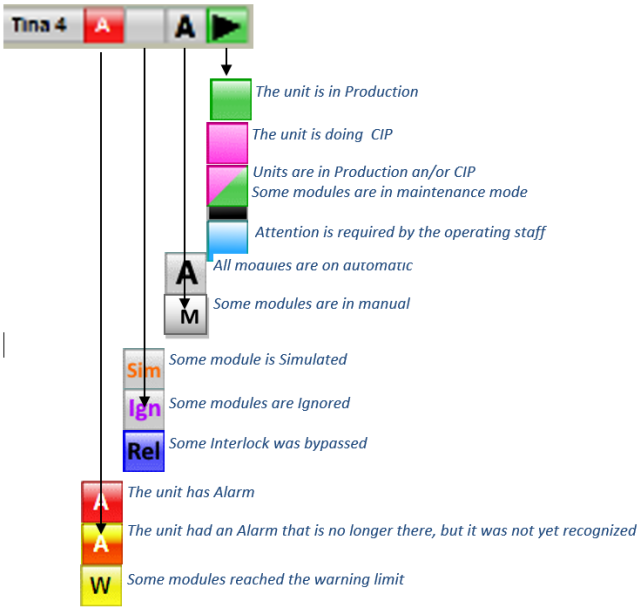
Color	Tag	HMI Bit	PLC bit	Condition	Description
Text	Msg0001.St.Set	24	0.0	Bit = TRUE	Switch is forced to On
Text	Msg0001.St.Reset	25	0.1	Bit = TRUE	Switch is forced to off
Text	Msg0001.St.Sig	24, 25	0.0, 0.1	All bits =False	Switch is normal

Faceplate

Switches do not have a Faceplate, since they do not have any settings nor parameters

14. Alarm Group

Alarm groups allow You to group certain alarms together into logical groups and then show and collective status for all control modules belonging to this group. This is usually done to group all control modules of a specific production area or a production unit together to show an overall unit or production area status.



Visualization Status Data block

"Bx Switch Visu" DB 39

Adress	Tag	Type	Description
0.0	Switch	ARRAY[0..360] of DINT	The status Double integer for each of the Switches

Status Definition

HMI Address	PLC Address	Symbol	Type	Remark
24	0.0	B24	BOOL	set software switch
25	0.1	Ign	BOOL	reset software switch
26	0.2	Sim	BOOL	spare
27	0.3	Auto	BOOL	spare
28	0.4	B28	BOOL	spare
29	0.5	EmRel	BOOL	spare
30	0.6	B30	BOOL	spare
31	0.7	Maint	BOOL	spare
16	1.0	Gal	BOOL	spare
17	1.1	Gals	BOOL	spare
18	1.2	SCE	BOOL	spare
19	1.3	Warn	BOOL	spare
20	1.4	Msg	BOOL	spare
21	1.5	ProcRun	BOOL	spare
22	1.6	ProcProd	BOOL	spare
23	1.7	ProcCIP	BOOL	spare
8	2.0	B08	BOOL	spare
9	2.1	B09	BOOL	spare
10	2.2	B10	BOOL	spare
11	2.3	B11	BOOL	spare
12	2.4	B12	BOOL	spare
13	2.5	B13	BOOL	spare
14	2.6	B14	BOOL	spare
15	2.7	B15	BOOL	spare
0	3.0	B00	BOOL	spare
1	3.1	B01	BOOL	spare
2	3.2	B02	BOOL	spare
3	3.3	Sig	BOOL	spare
4	3.4	B04	BOOL	spare
5	3.5	B05	BOOL	spare
6	3.6	B06	BOOL	spare
7	3.7	User	BOOL	free for user

Symbol

All of the symbols have the following animation elements that can change their symbol depending on the Alarm groups status.

- Section 1 (left most)
- Section 2
- Section 3
- Section 4

Section 1

This coloring table is ordered by priority which means if more than one single bit is active at the same time, the color that is closer to the top of this table should be shown on the SCADA Symbol.

Color	Tag	HMI Bit	PLC bit	Condition	Description
A	AlGroup_U1.St.GAl	16	1.0	Bit = TRUE	Group has an Alarm
A	AlGroup_U1.St.GAls	17	1.1	Bit = TRUE	Group had an Alarm, but is not yet acknowledged
W	AlGroup_U1.St.Warn	19	1.3	Bit = TRUE	Group has a Warning

Section 2

Color	Tag	HMI Bit	PLC bit	Condition	Description
Sim	AlGroup_U1.St.Sim	26	0.2	Bit = TRUE	At least one module is simulated
Ign	AlGroup_U1.St.Ign	25	0.1	Bit = TRUE	At least one module is ignored
Rel	AlGroup_U1.St.EmRel	29	0.5	Bit = TRUE	At least one modules release is manually overridden

Section 3

Color	Tag	HMI Bit	PLC bit	Condition	Description
A	AlGroup_U1.St.Auto	3	3.3	Bit = TRUE	All modules are in automatic
M	AlGroup_U1.St.Auto	3	3.3	Bit = FALSE	At least one module is on manual

Section 4

Color	Tag	HMI Bit	PLC bit	Condition	Description
	AlGroup_U1.St.Msg	20	1.4	Bit = TRUE	At least one unit requested a user interaction
	AlGroup_U1.St.ProcProd	22	1.6	Bit = TRUE	At least one unit is in Production
	AlGroup_U1.St.ProcCIP	23	1.7	Bit = TRUE	At least one unit is in CIP
	AlGroup_U1.St.ProcProd AlGroup_U1.St.ProcCIP	22, 23	1.6, 1.7	All bits = TRUE	At least one unit is in Production and one is in CIP
	AlGroup_U1.St.Maint	31	0.7	Bit = TRUE	At least one unit is in Maintenance

Section 4 Overlay

Color	Tag	HMI Bit	PLC bit	Condition	Description
▶	AlGroup_U1.St.ProcRun	21	1.5	Bit = TRUE	At least one unit requested a user interaction