

# Grafcet++

**AUTOMGEN<sup>8.011</sup>**

*Grafcet++ multi instance macro-steps and encapsulating steps with parameters*

These functionalities are available from AUTOMGEN 8.011.

## ***Main concept***

Automation applications sometimes need to drive system with identical or quasi identical sub-modules. Function blocks programming allows to build a modular description in this case. Macro-steps and encapsulating steps concepts as defined in the norm allow a limited used in this case. The purpose of Grafset++ extension proposed in AUTOMGEN is to provide a macro-step expansion or an encapsulate callable several times and runnable at the same time with their own parameters.

## ***How to use?***

Macro-steps or encapsulating steps defined in folder properties may now contain a number of usable instances.

This number is calculated as follow:

Number of the first macro-step or encapsulating step + (10000 x number of usable instances)

**Folder properties**

Name  
my macro step

Size (the dimensions of the folder surface)  
XXL (very large folders)

Literal language  
 IEC1131-3  
 AUTOMGEN

Folder type  
 Normal  Ask  
 Macro-step expansion 20001  
 Function block  
 Task  
 Encapsulation

Variables names  
 IEC1131-3  
 AUTOMGEN  
 AUTOMGEN and IEC1131-:  
 Block the use of inputs/outputs except set symbols

Do not compile this folder  
 Protected by password

Comments (for example the last modifications, the author etc ...).  
Created 9/9/2008.  
Modified 9/9/2008.

This dialogue box displays the folder properties.

OK  
Cancel

In this sample, 20001 means that 2 instances will be usable with number 1 as first number. Macro-steps with number 1 and 2 will use 2 different instances of the same expansion.

**Folder properties**

Name  
my encapsulating

Size (the dimensions of the folder surface)  
XXL (very large folders)

Literal language  
 IEC1131-3  
 AUTOMGEN

Variables names  
 IEC1131-3  
 AUTOMGEN  
 AUTOMGEN and IEC1131-:  
 Block the use of inputs/outputs except set symbols

Folder type  
 Normal  Ask  
 Macro-step expansion  
 Function block  
 Task  
 Encapsulation 50100

Do not compile this folder  
 Protected by password

Comments (for example the last modifications, the author etc ...).

This dialogue box displays the folder properties.

OK  
Cancel

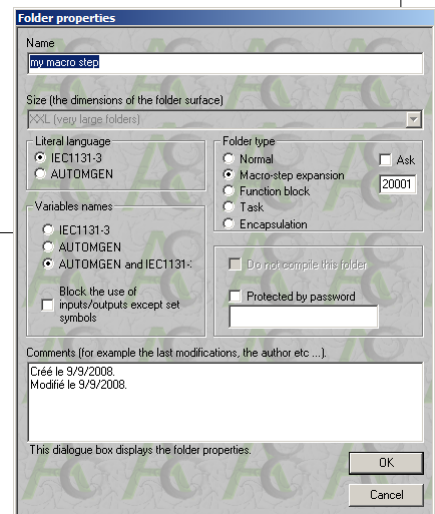
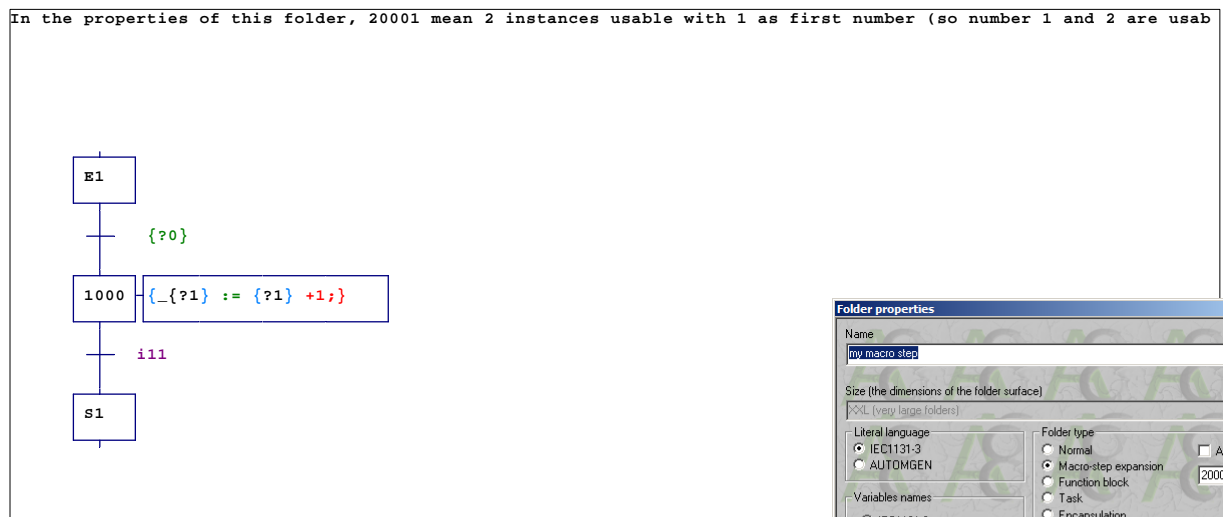
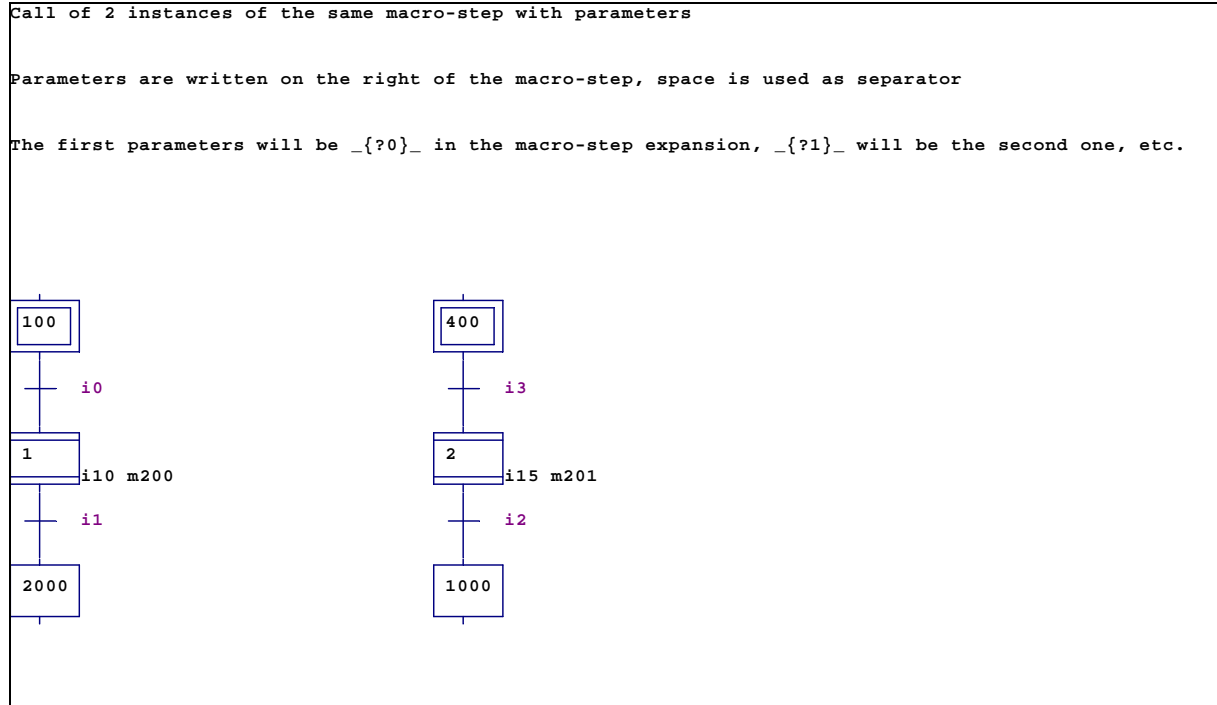
In this sample, 50100 means that 5 instances are usable with 100 as first number. Encapsulating steps with number 100 to 104 will use 5 different instances of the same encapsulate.

## Parameters

The use of parameters is closed to the existing items usable with function block in AUTOMGEN. In an encapsulate or a macro-step expansion, symbols including the string  $\{?n\}$  (where  $n$  is the number of the parameter from 0 to 63) will be replace with the parameter written near the macro-step or encapsulating step. Parameters must be written at the right of the macro-step or encapsulating step, starting in the closest block. Space is used as separator between parameters. The first parameters has the number 0, the second 1, etc.

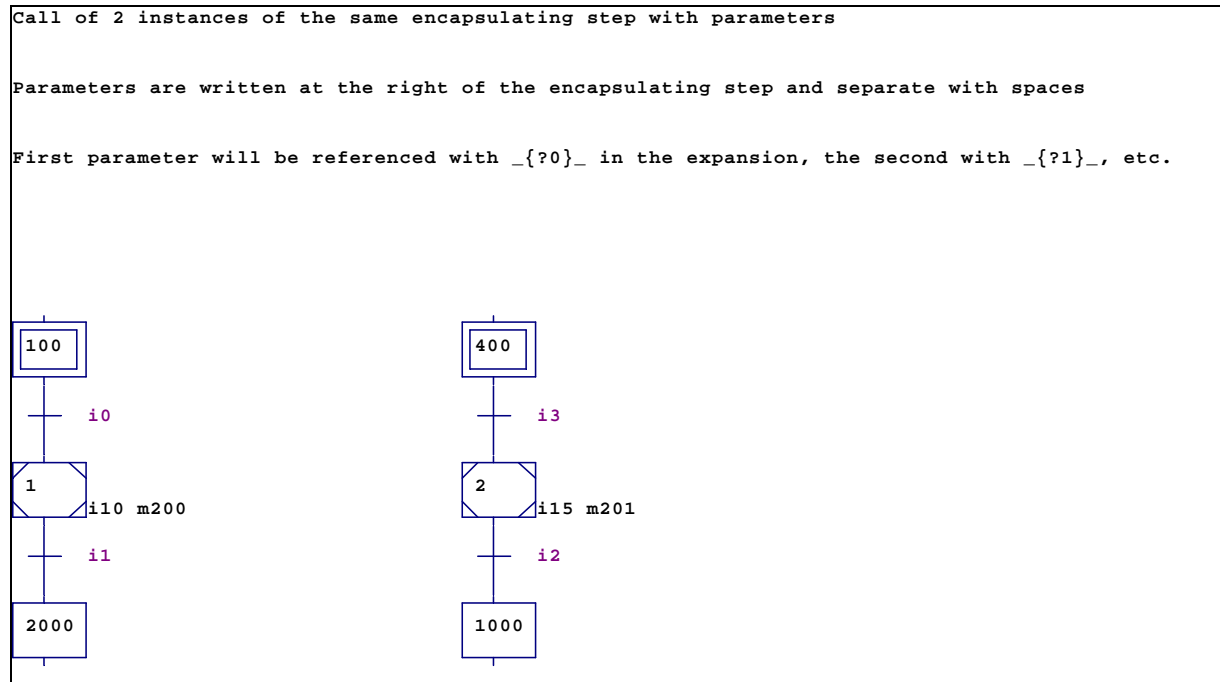
# Macro-step sample

## Main folder

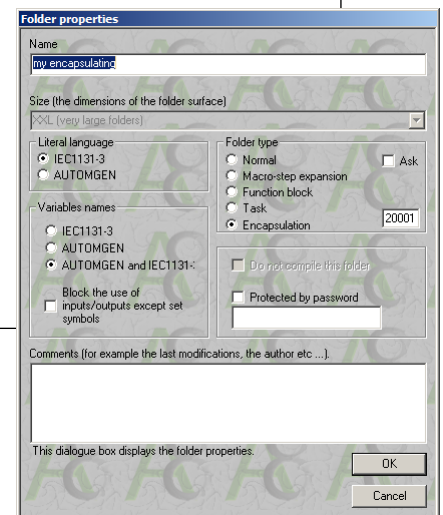
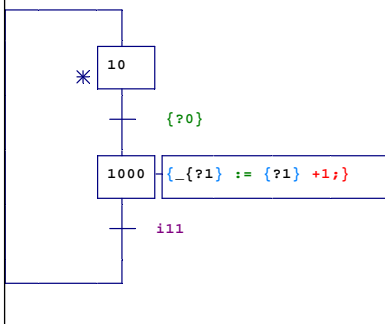


## Encapsulating step sample

### Main folder



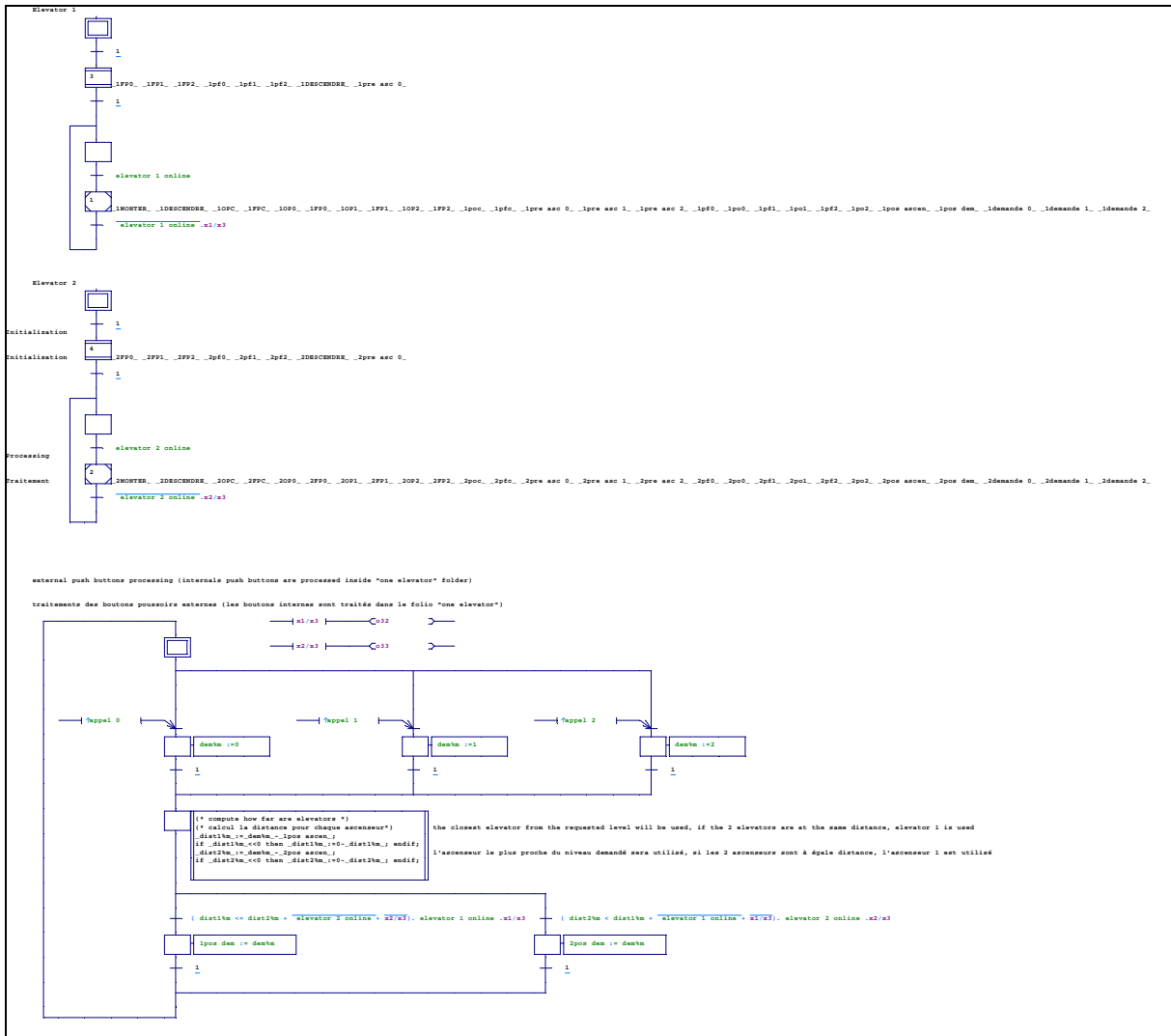
In the properties of this folder, 20001 means 2 possible instances with 1 as first number (so number 1 and 2 are usable)



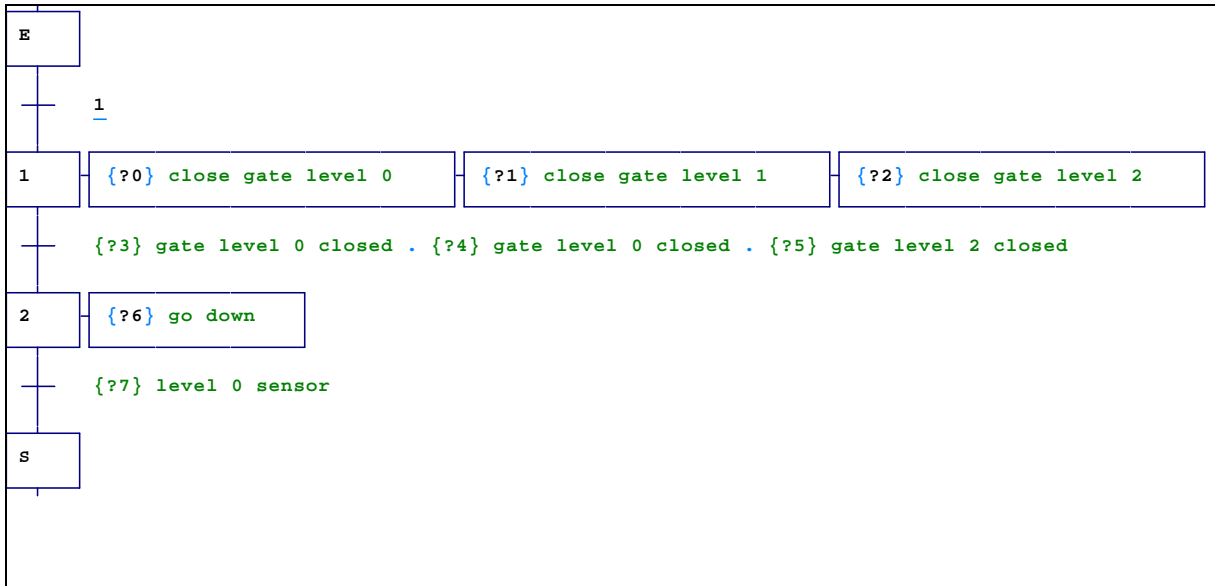
The project files for these samples can be found in the Examples \ Grafcet \ Grafcet++ sub directory of the AUTOMGEN installation directory.

# Complete sample

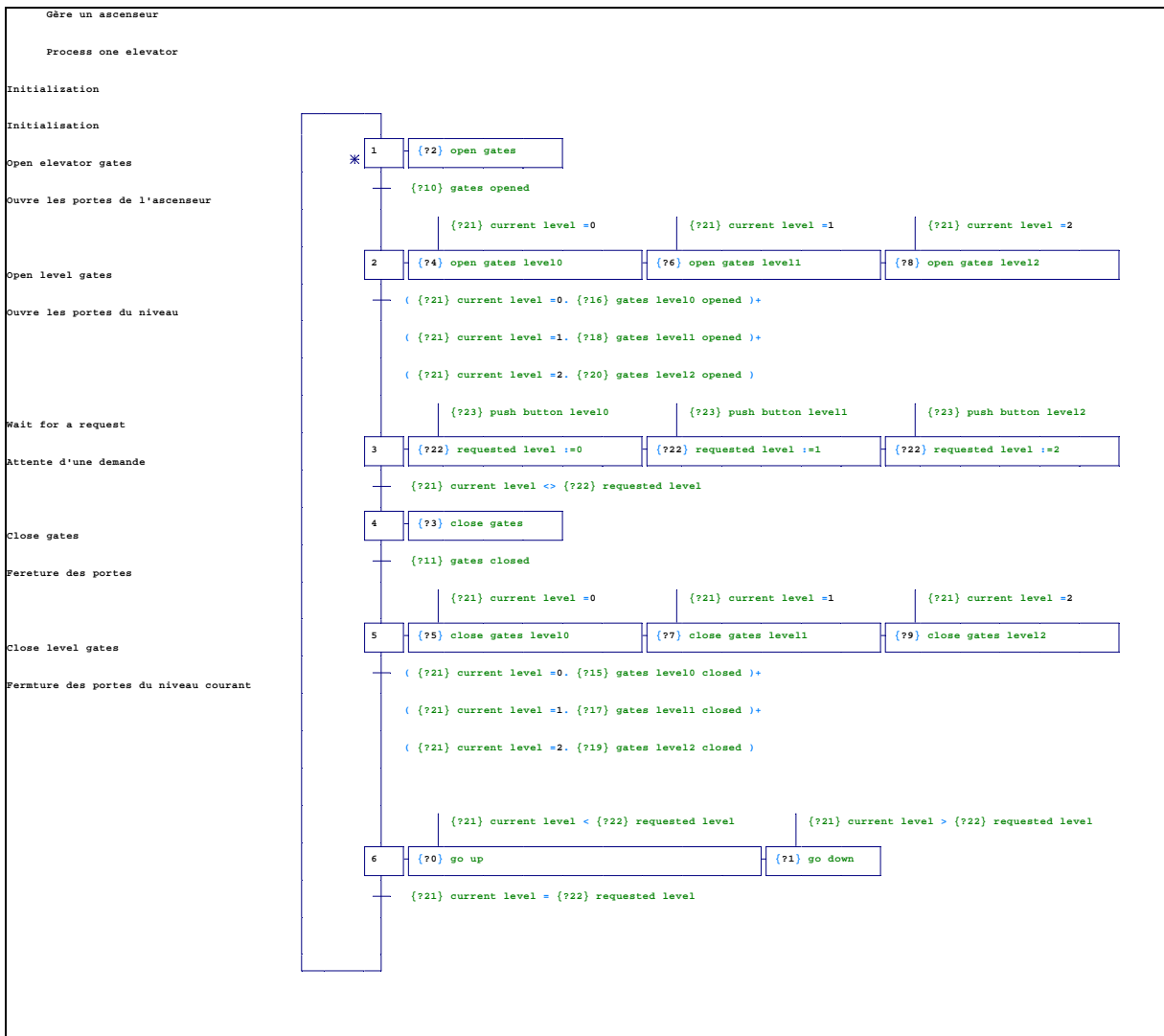
This sample shows how to create reusable piece of programs for similar sub modules (here 2 elevators).



Main folder



Macro-steps expansion folder



Encapsulates folder