Syscience
System Engineering Science

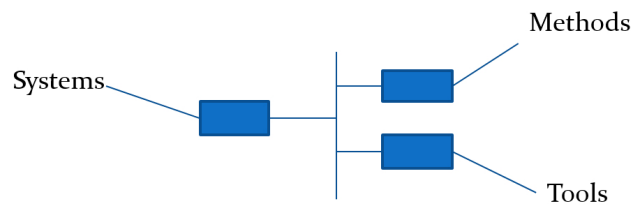# Architecture and design document
System of interest

System: G01

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Syscience

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Systems — Methods

Tools

Reference: Syscience DD02

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Table of contents

1 Introduction

1.1 Object of the document

The purpose of this document is to establish a system architecture. It covers both new designs, reuse of components out of the shelf (COTS) or out of the box (OOTB) and the definition of such components. The different processes can be repeated cyclically. Several methods to establish or adapt the architecture are proposed.

Syscience has developped the Syscience Workshop software. It is a system engineering workshop consisting in a SaaS software associated to a database. It enables the description of the detailed architecture of the system of interest, using graphical model views. It has been specially designed to support engineers for the deployment of systems engineering.

Examples illustrating the architecture building methods and the corresponding outcomes of the syscience workshop are are presented in the following paragraphs.

1.2 System mission

The mission of the system of interest consists in providing (service description, or deliverable description) to (main user description). The mission is characterized in detail by models and requirements which are identified in the following paragraphs.

Key measures of effectiveness (KMEs) reflect overall satisfaction level of stakeholder expectations [IEEE1220] Â§6.1.5.

- Performance

- Safety

- Operability

- usability

- reliability

- maintainability

- time and cost to train

- workload

- human performance requirements

1.3   References

- IEEE Standard for Application and Management of the Systems Engineering Process

- Systems Engineering - System Life Cycle Processes

- IEEE Recommended Practice for Architectural Description of Software-Intensive Systems

1.4   Glossary

1.4.1   Terms definitions

- A component is a part designed in order to contribute to system mission

- A collaborating system is a system which has interfaces with the system of interest, designed for its own sake, but which has a contribution to the mission of the SOI.

- Human Machine Interface: A user interface, allowing a human user to interact with a device, a machine, a system, or an apparatus.

- Diagram: Graphical representation of a view of a system.

- Requirement: Formalized description of the characteristics of a system that are measurable, useful, simple and traceable.

1.4.2   Acronyms definitions

- Signification

- MBSE: Model Based System Engineering

- RBSE: Requirement Based System Engineering

- COTS: Commercial off the shelf

- OOTB: Out Of The Box

- SOI: System of interest

- MOP: Measure of performance

- KME: Key measures of effectiveness

- TPM: Technical performance measure

The functional point of view of a system corresponds to a theoretical description of how it works. This description establishes a shared vision of the system functioning.

2 Functionning modes

2.1 State diagram

The system has several functionning modes, each of them enabling a set of functions. The system changes its functioning mode according to transition conditions that can be triggered either internally or externally. Functionning modes and transitions between them are represented on the following state chart.
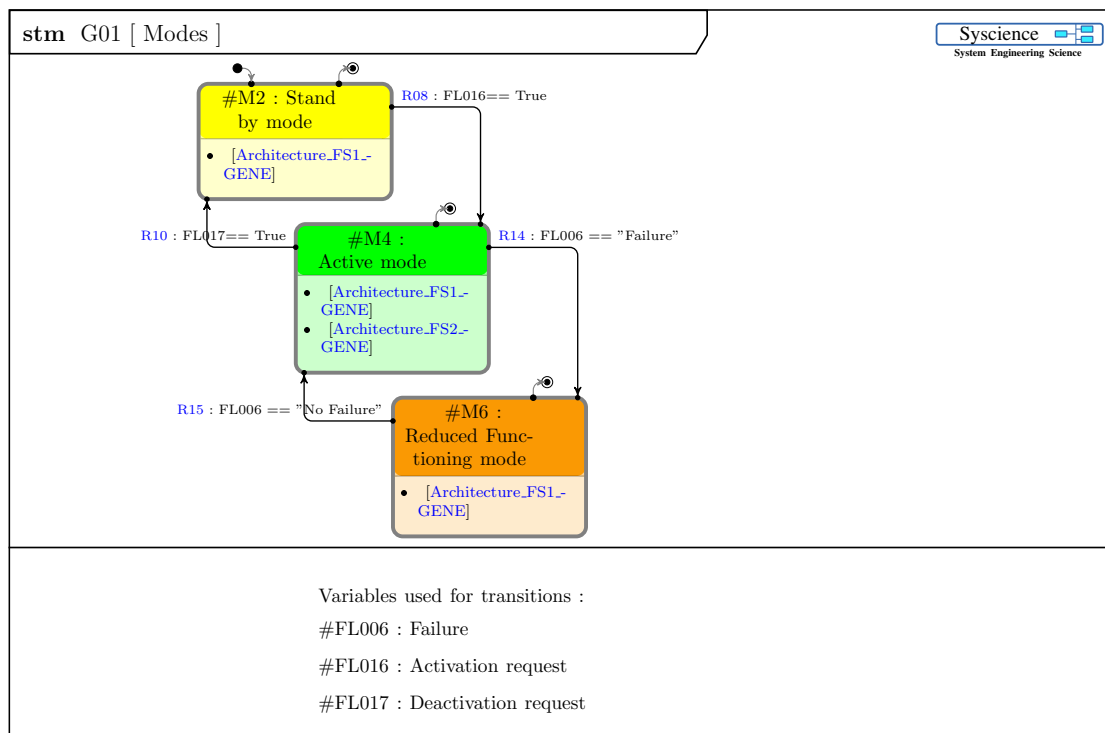

Figure 1: **State_Modes**

This figure was cited in SingleBlock_F04, State_Configurations.

The state machine describes the behavior of the state transitions of the system. Requirements for each transition are created automatically to enable verification traceability.

2.2   Requirements

Requirement identifier	State_Modes R08
Requirement Text	FL016== True shall trigger the transition from #M2 : Stand by mode to #M4 : Active mode.
Diagram	State_Modes
Id	R08
Link	[MultiBlock_O80 R003] [G01:State_Modes R08]
Type	LLR

Table 1: **State_Modes R08**, cited in the figure State_Modes

Requirement identifier	State_Modes R14
Requirement Text	FL006 == Failure shall trigger the transition from #M4 : Active mode to #M6 : Reduced Functioning mode.
Diagram	State_Modes
Id	R14
Link	[MultiBlock_O80 R003] [G01:State_Modes R14]
Type	LLR

Table 2: **State_Modes R14**, cited in the figure State_Modes

Requirement identifier	State_Modes R10
Requirement Text	FL017== True shall trigger the transition from #M4 : Active mode to #M2 : Stand by mode.
Diagram	State_Modes
Id	R10
Link	[MultiBlock_O80 R003] [G01:State_Modes R10]
Type	LLR

Table 3: **State_Modes R10**, cited in the figure State_Modes

Requirement identifier	State_Modes R15
Requirement Text	FL006 == No Failure shall trigger the transition from #M6 : Reduced Functioning mode to #M4 : Active mode.
Diagram	State_Modes
Id	R15
Link	[MultiBlock_O80 R003] [G01:State_Modes R15]
Type	LLR

Table 4: **State_Modes R15**, cited in the figure State_Modes

3   Functional Breakdown
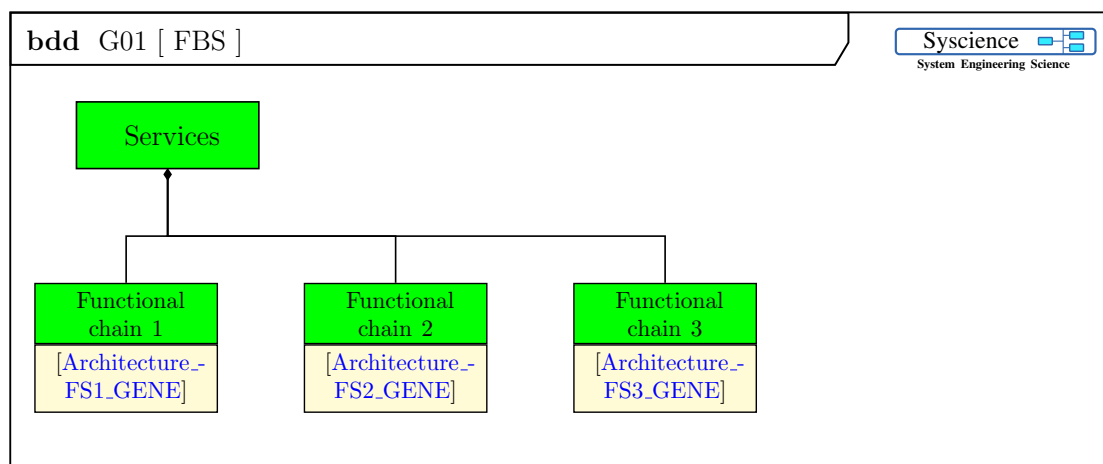
Functions are represented in the following tree diagram.

Figure 2: **Tree_FBS**

4   Functional blocks

Following block diagrams display functions represented as blocks. Arrows represent input and output flows.
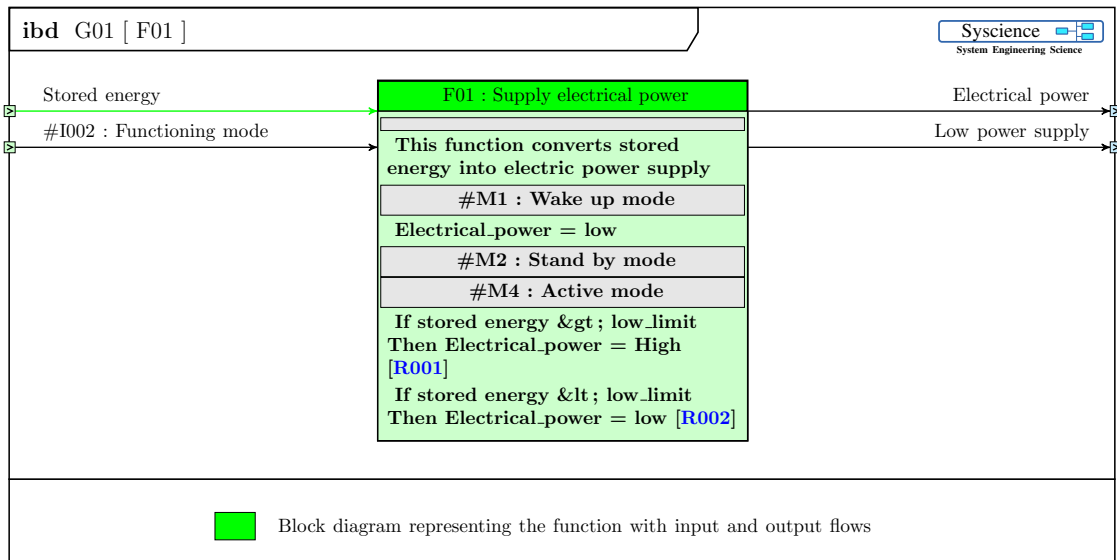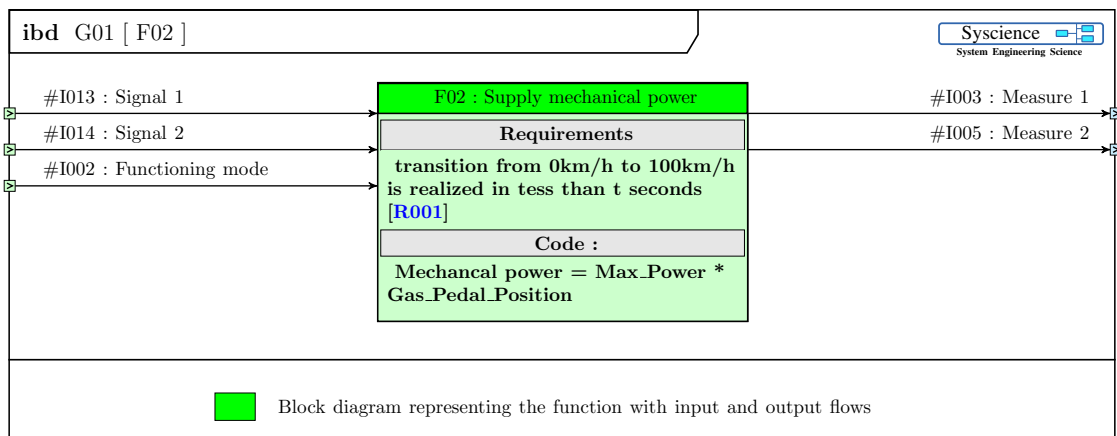
Figure 3: **SingleBlock_F01**
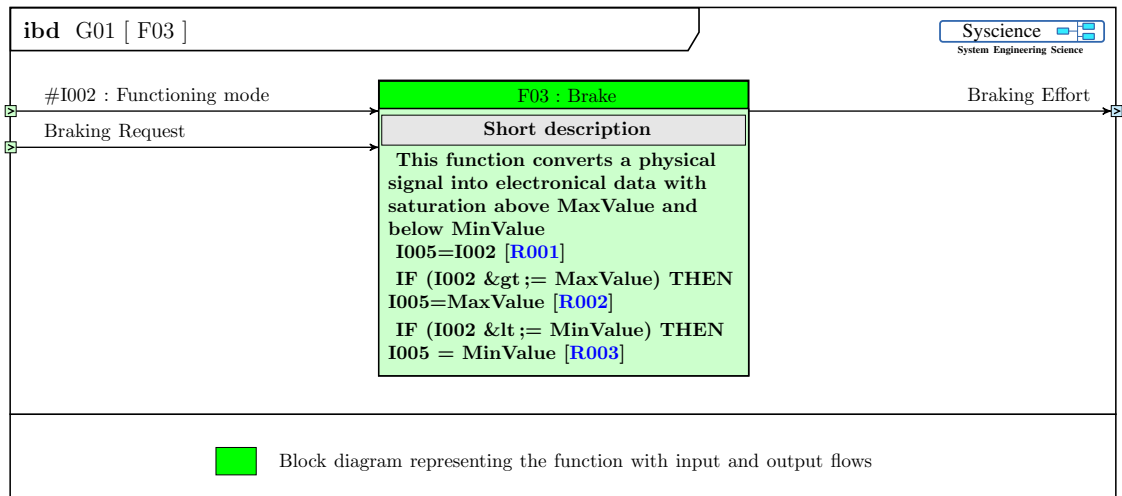

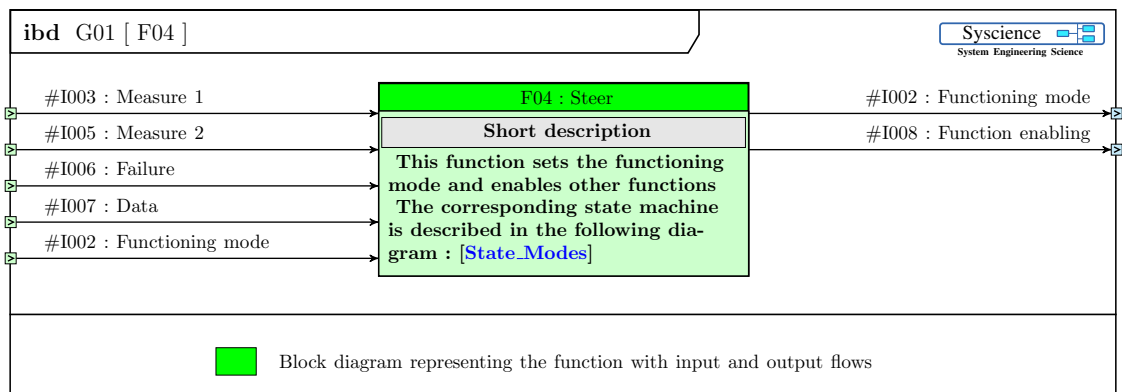Figure 4: **SingleBlock_F02**

Figure 5: **SingleBlock_F03**

Figure 6: **SingleBlock_F04**

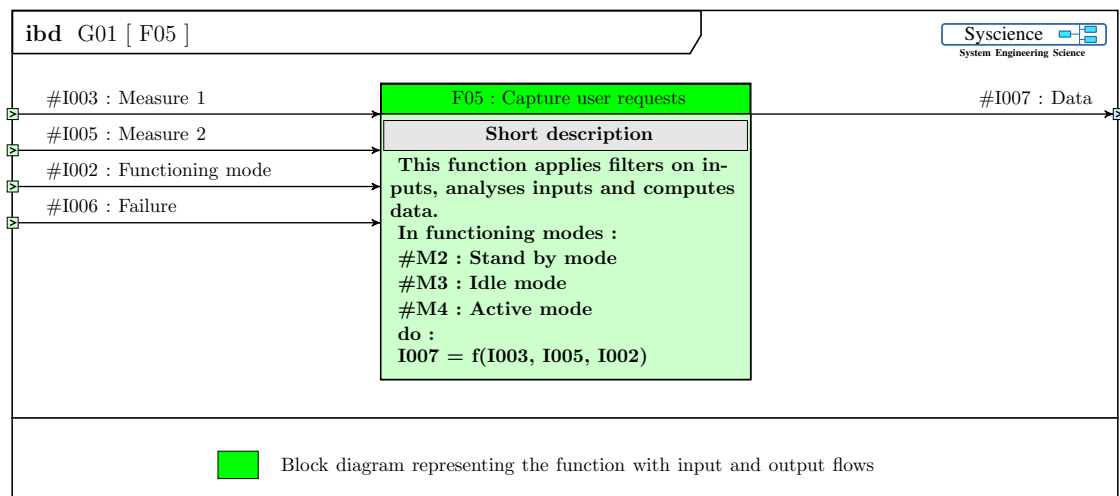This figure was cited in **SingleBlock_C002**, **Architecture_FS1_GENE**, **Architecture_FS2_GENE**, **Architecture_FS3_GENE**.

Figure 7: **SingleBlock_F05**

This figure was cited in **SingleBlock_C002**, **Architecture_FS1_GENE**, **Architecture_FS2_GENE**, **Architecture_FS3_GENE**.
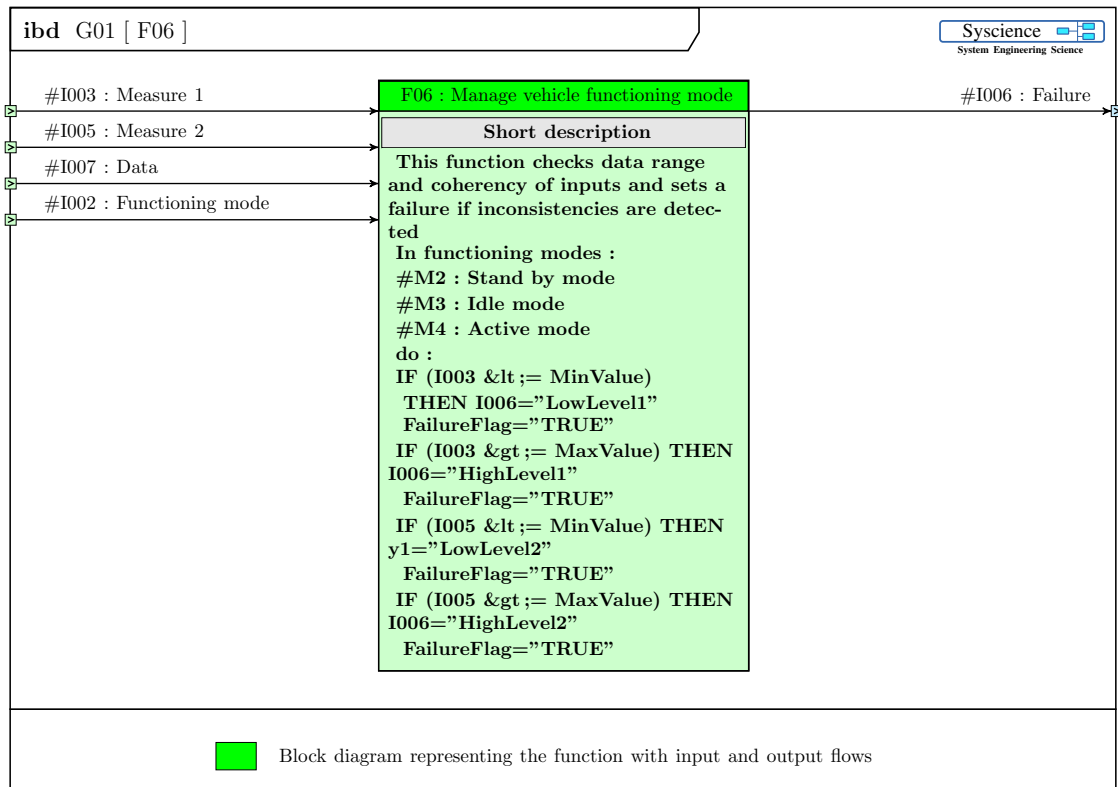
Figure 8: **SingleBlock_F06**

This figure was cited in Architecture_FS1_GENE, Architecture_FS2_GENE, Architecture_FS3_GENE.
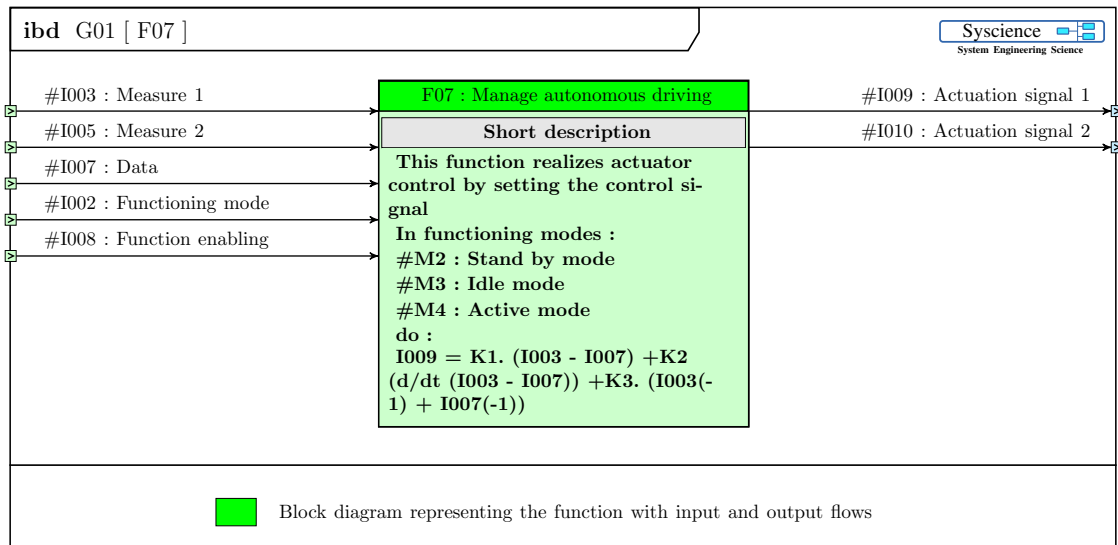
Figure 9: **SingleBlock_F07**

This figure was cited in Architecture_FS2_GENE.
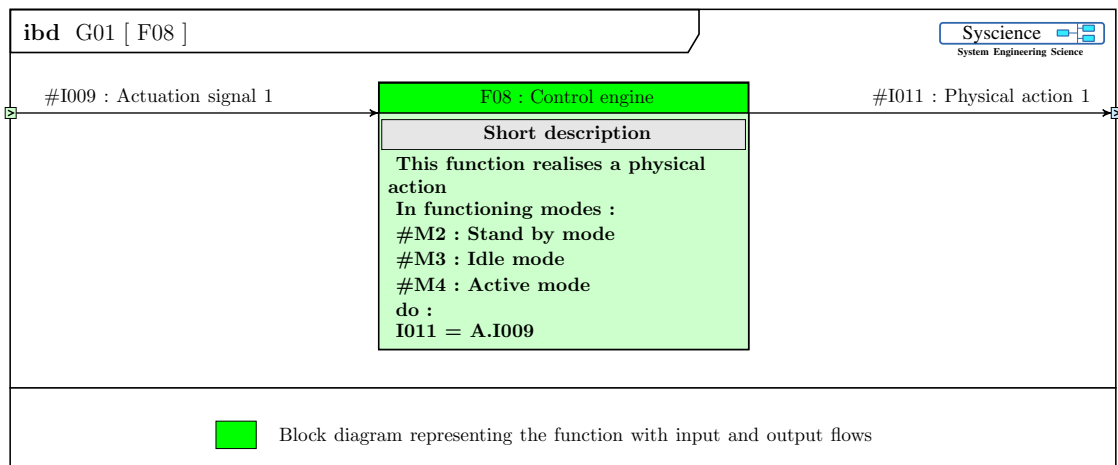
Figure 10: **SingleBlock_F08**

ibd G01 [F09]

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#I010 : Actuation signal 2

F09 : Brake

| Short description |
| This function realises a physical action |
| In functioning modes : |
| #M2 : Stand by mode |
| #M3 : Idle mode |
| #M4 : Active mode |
| do : |
| I012 = B.I010 |

#I012 : Physical action 2

Block diagram representing the function with input and output flows
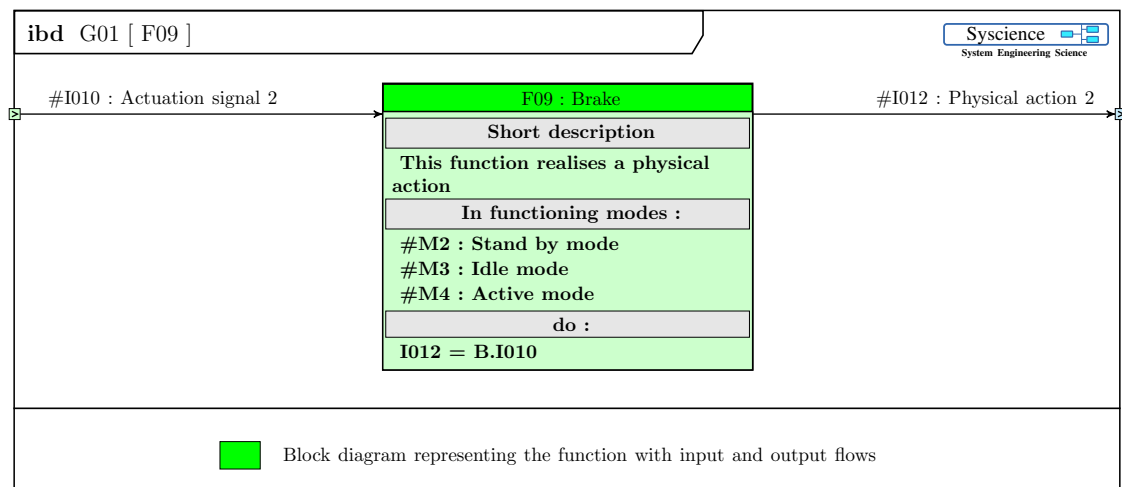
Figure 11: **SingleBlock_F09**

This figure was cited in Architecture_FS2_GENE.

5   Functional architecture

In each state a set of functions are executed. Functional chains constituted by activated functions is displayed in one of the following block diagrams.
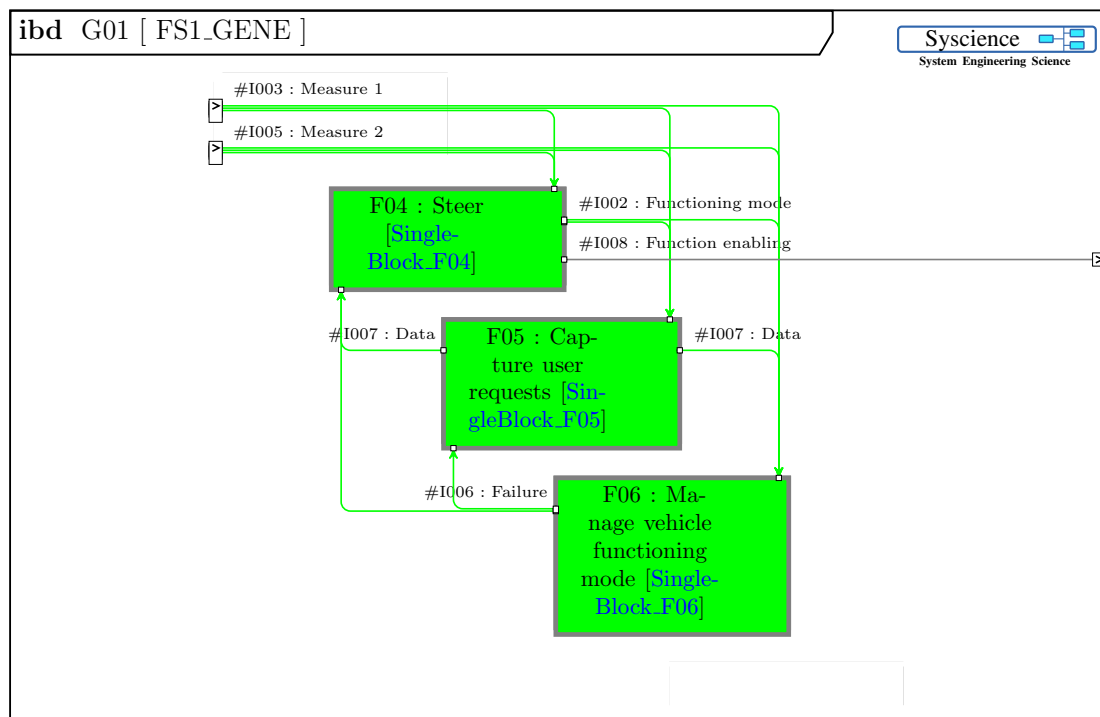
Figure 12: **Architecture_FS1_GENE**
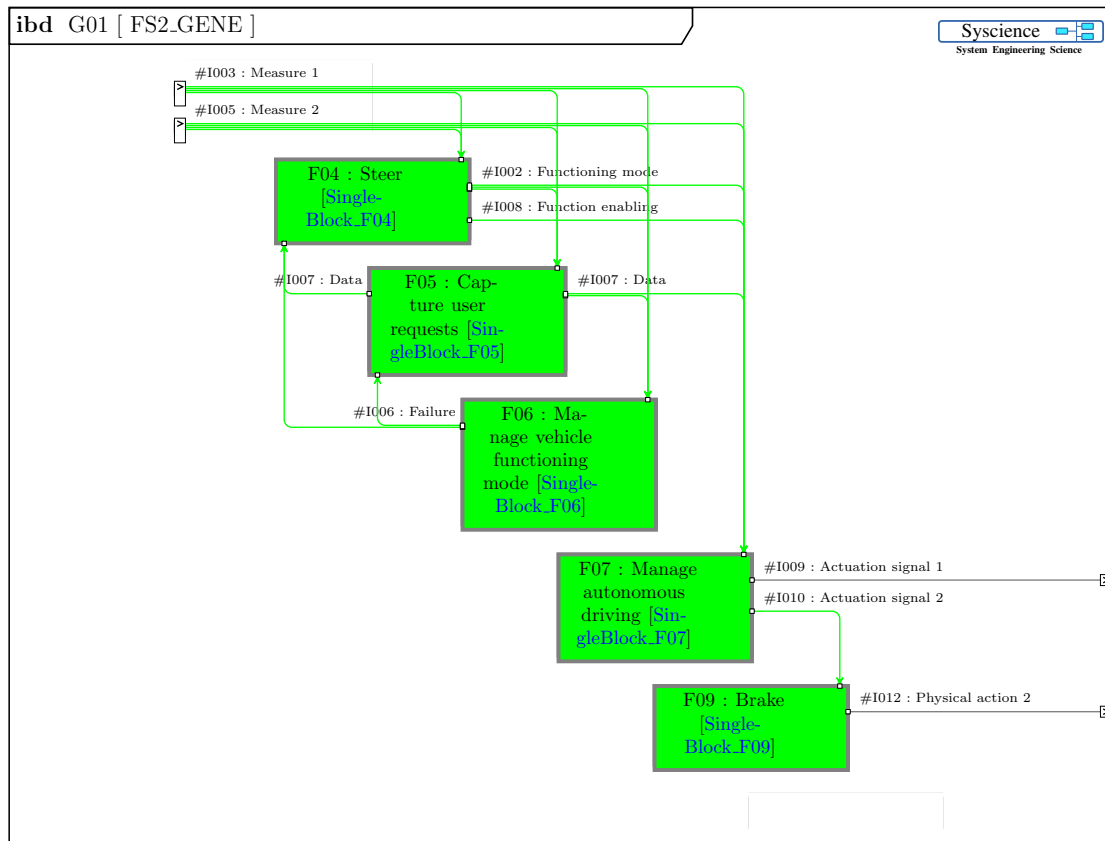
This figure was cited in State_Modes, Tree_FBS.

Figure 13: **Architecture_FS2_GENE**
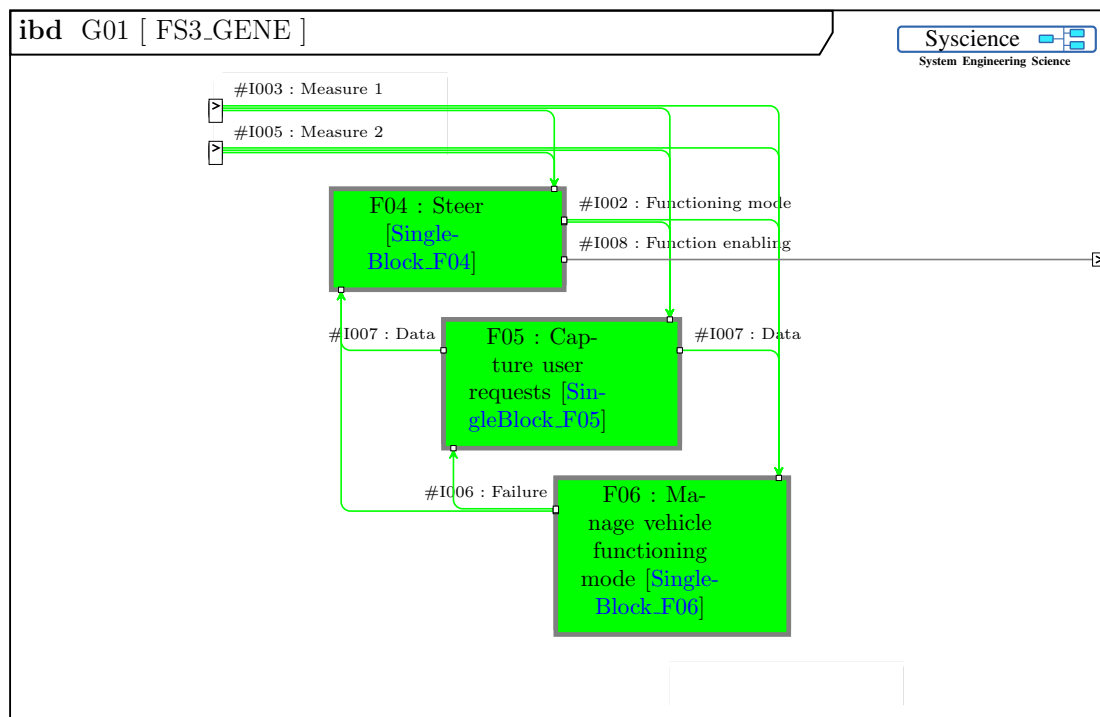
This figure was cited in State_Modes, Tree_FBS.

Figure 14: **Architecture_FS3_GENE**

This figure was cited in Tree_FBS.