

Doc no.:	Functional Design Specification	Date: 05/11/2015
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Spike

Bio101

Functional Design Specification for Manufacturing Control
System

Doc no.:	Functional Design Specification	Date: 05/11/2015
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Table of Contents

Table of Contents.....	2
1. Unit.....	3
1.1. Properties.....	3
1.2. Parameters.....	3
2. Equipment Modules and Control Modules.....	3
3. Continuous Function Block Code	5

Doc no.:	Functional Design Specification	Date: 05/11/2015
----------	--	------------------

1. Unit

Unit Name	Diagram	Process Cell
Bio101	SmallFermenter	fermentation

1.1. Properties

Description	Version	Security Area	Security Level
		Null	Null

1.2. Parameters

2. Equipment Modules and Control Modules

Equipment Module	Control Modules
EM-Scenarios	Ag-Bio101-1
	FV-Bio101-052
	FV-Bio101-054
	FV-Bio101-049
	FV-Bio101-144
	FV-Bio101-142

Doc no.:	Functional Design Specification	Date: 05/11/2015
Equipment Module		Control Modules
		FV-Bio101-042
		FV-Bio101-045
		FV-Bio101-030
		FV-Bio101-034
		PT-Bio101-1
		LT-Bio101-1

Doc no.:	Functional Design Specification	Date: 05/11/2015
----------	--	------------------

3. Continuous Function Block Code

```
#####
# CFB: Bio101/CFB
#####

def main():
    """Main Function"""

    # enable interlocks

    opc('FV-Bio101-049').InterlocksEnabled = True;
    opc('FV-Bio101-142').InterlocksEnabled = True;
    opc('FV-Bio101-144').InterlocksEnabled = True;
    opc('FV-Bio101-042').InterlocksEnabled = True;
    opc('FV-Bio101-045').InterlocksEnabled = True;
    opc('FV-Bio101-030').InterlocksEnabled = True;
    opc('FV-Bio101-034').InterlocksEnabled = True;

    # enable em CFB

    opc('EM-Scenarios').CFB.IsEnabled = True

    #if over fill then interlock the inlet valve

    if opc('LT-Bio101-1').IsInAlarm == True:
        overfill = opc('FV-Bio101-045').GetInterlock('overfill')
        overfill.Fire()
        overfill = opc('FV-Bio101-042').GetInterlock('overfill')
        overfill.Fire()
        overfill = opc('FV-Bio101-034').GetInterlock('overfill')
        overfill.Fire()
        overfill = opc('FV-Bio101-030').GetInterlock('overfill')
        overfill.Fire()

    #if over pressure then interlock inlet valves, sparge gas valves and open back pressure
control

    if opc('PT-Bio101-1').IsInAlarm == True:
        opc('FV-Bio101-054').CmdOpen();
        opc('FV-Bio101-052').CmdOpen();
        overpressure = opc('FV-Bio101-049').GetInterlock('overpressure');
        overpressure.Fire();
        overpressure = opc('FV-Bio101-144').GetInterlock('overpressure');
        overpressure.Fire();
        overpressure = opc('FV-Bio101-142').GetInterlock('overpressure');
        overpressure.Fire()

    #actions upon equipment interlocks
```

```
if opc('FV-Bio101-042').IsInterlocked == True:
    opc('FV-Bio101-042').CmdClose()

if opc('FV-Bio101-045').IsInterlocked == True:
    opc('FV-Bio101-045').CmdClose()

if opc('FV-Bio101-034').IsInterlocked == True:
    opc('FV-Bio101-034').CmdClose()

if opc('FV-Bio101-142').IsInterlocked == True:
    opc('FV-Bio101-142').CmdClose()

if opc('FV-Bio101-144').IsInterlocked == True:
    opc('FV-Bio101-144').CmdClose()

if opc('FV-Bio101-049').IsInterlocked == True:
    opc('FV-Bio101-049').CmdClose()

if opc('FV-Bio101-030').IsInterlocked == True:
    opc('FV-Bio101-030').CmdClose()

#actions upon valve position switch failures - just a message in this case

if (opc('FV-Bio101-054').Alarms.FailToOpen == True):
    info('FV 054 failure')
if (opc('FV-Bio101-052').Alarms.FailToOpen == True):
    info('FV-Bio101-052 failure')
if (opc('FV-Bio101-049').Alarms.FailToClose == True):
    info('FV-Bio101-049 failure')
if (opc('FV-Bio101-144').Alarms.FailToClose == True):
    info('FV-Bio101-144 failure')
if (opc('FV-Bio101-142').Alarms.FailToClose == True):
    info('FV-Bio101-142 failure')
if (opc('FV-Bio101-042').Alarms.FailToClose == True):
    info('FV-Bio101-042 failure')
if (opc('FV-Bio101-045').Alarms.FailToClose == True):
    info('FV-Bio101-045 failure')
if (opc('FV-Bio101-030').Alarms.FailToClose == True):
    info('FV-Bio101-030 failure')
if (opc('FV-Bio101-034').Alarms.FailToClose == True):
    info('FV-Bio101-034 failure')
```

Doc no.:	Functional Design Specification	Date: 05/11/2015