

Vention Python API V1.12.1

Contents

[Compatibility](#)

[Python limitations in](#)

[MachineLogic](#)

[Motion Features](#)

[MachineLogic Python](#)

[Programming v1.0 Interface](#)

[Machine](#)

[MachineMotion](#)

[Actuator](#)

[ActuatorState](#)

[ActuatorConfiguration](#)

[ActuatorGroup](#)

[Robot](#)

[RobotState](#)

[RobotConfiguration](#)

[RobotOperationalState](#)

[RobotSafetyState](#)

[SequenceBuilder](#)

[DigitalInput](#)

[DigitalInputState](#)

[DigitalInputConfiguration](#)

[DigitalOutput](#)

[DigitalOutputConfiguration](#)

[Pneumatic](#)

[PneumaticConfiguration](#)

[ACMotor](#)

[ACMotorConfiguration](#)

[BagGripper](#)

[BagGripperConfiguration](#)

Compatibility

This table specifies the compatibility of the Python package versions with the Vention's MachineMotion and Pendant versions.

Package	MachineMotion	Pendant
v1.12.x*	v2.13.x	v3.2 and v3.3
v1.13.x	v2.14.x	v3.4

*Package versions <1.13.0 were published to PyPi under the package name machine-code-python-sdk

Python limitations in MachineLogic

When executing your Python code in simulation, the script will run in a restricted environment to avoid abuses. Only a few Modules are allowed and some

Built-in Functions are not available.

Available Python Built-in Functions

The following Built-in Functions are currently restricted in simulation.

- compile
- dir
- eval
- exec
- globals
- input
- locals
- memoryview
- object
- open
- vars

Available Python Modules

The following Modules are allowed in simulation.

- machinelogic
- time
- math
- copy
- json
- abc
- random
- numpy

Motion Features

When the Python program ends, any motion that is still executing will continue their execution. If you want to wait for a motion to complete, you should call:

```
actuator.wait_for_move_completion()
```

Asynchronous moves will not wait for the motion to complete before terminating the program.

The 'continuous_move' function will run forever if not stopped by the program.

MachineLogic Python Programming v1.0 Interface

Machine

A software representation of the entire Machine. A Machine is defined as any number of MachineMotions, each containing their own set of axes, outputs, inputs, pneumatics, bag grippers, and AC Motors. The Machine class offers a global way to retrieve these various components using the friendly names that you've defined in your MachineLogic configuration.

To create a new Machine, you can simply write:

```
machine = Machine()
```

You should only ever have a single instance of this object in your program.

get_ac_motor

- **Description** Retrieves an AC Motor by name.
 - **Parameters**
 - **name**
 - **Description** The name of the AC Motor.
 - **Type** str
 - **Returns**
 - **Description** The AC Motor that was found.
 - **Type** IACMotor
 - **Raises**
 - **Type** MachineMotionException
 - **Description** If it is not found.

get_actuator

- **Description** Retrieves an Actuator by name.
 - **Parameters**
 - **name**
 - **Description** The name of the Actuator.
 - **Type** str
 - **Returns**
 - **Description** The Actuator that was found.
 - **Type** IActuator
 - **Raises**
 - **Type** MachineException
 - **Description** If we cannot find the Actuator.

```

from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

start_position = my_actuator.state.position

print("starting at position: ", start_position)

target_distance = 150.0 # mm

my_actuator.move_relative(

    distance=target_distance,

    timeout=10, # seconds

)

# first_move_end_position is approx. equal to start_position + target_distance.

first_move_end_position = my_actuator.state.position

print("first move finished at position: ", first_move_end_position)

# move back to starting position

target_distance = -1 * target_distance

my_actuator.move_relative(

    distance=target_distance,

    timeout=10, # seconds

)

# approx. equal to start_position,

end_position = my_actuator.state.position

print("finished back at position: ", end_position)

```

get_bag_gripper

- **Description** Retrieves a Bag Gripper by name.
- **Parameters**
 - **name**
 - **Description** The name of the Bag Gripper
 - **Type** str

- **Returns**
 - **Description** The Bag Gripper that was found.
 - **Type** IBagGripper
- **Raises**
 - **Type** MachineMotionException
 - **Description** If it is not found.

```
from machinelogic import Machine

machine = Machine()

my_bag_gripper = machine.get_bag_gripper("Bag Gripper")
```

get_input

- **Description** Retrieves an DigitalInput by name.
- **Parameters**
 - **name**
 - **Description** The name of the DigitalInput.
 - **Type** str
- **Returns**
 - **Description** The DigitalInput that was found.
 - **Type** IDigitalInput
- **Raises**
 - **Type** MachineException
 - **Description** If we cannot find the DigitalInput.

```
from machinelogic import Machine

machine = Machine()

my_input = machine.get_input("Input")

if my_input.state.value:

    print(f"{my_input.configuration.name} is HIGH")

else:

    print(f"{my_input.configuration.name} is LOW")
```

get_machine_motion

- **Description** Retrieves an IMachineMotion instance by name.

- **Parameters**

- **name**
 - **Description** The name of the MachineMotion.
 - **Type** str

- **Returns**

- **Description** The MachineMotion that was found.
- **Type** IMachineMotion

- **Raises**

- **Type** MachineException
 - **Description** If we cannot find the MachineMotion.

```
from machinelogic import Machine, MachineException

machine = Machine()

my_controller_1 = machine.get_machine_motion("Controller 1")

configuration = my_controller_1.configuration

print("Name:", configuration.name)

print("IP Address:", configuration.ip_address)
```

get_output

- **Description** Retrieves an Output by name.

- **Parameters**

- **name**
 - **Description** The name of the Output
 - **Type** str

- **Returns**

- **Description** The Output that was found.
- **Type** IOutput

- **Raises**

- **Type** MachineException
 - **Description** If we cannot find the Output.

```
from machinelogic import Machine, MachineException, DigitalOutputException

machine = Machine()

my_output = machine.get_output("Output")

my_output.write(True) # Write "true" to the Output

my_output.write(False) # Write "false" to the Output
```

get_pneumatic

- **Description** Retrieves a Pneumatic by name.
- **Parameters**
 - **name**
 - **Description** The name of the Pneumatic.
 - **Type** str
- **Returns**
 - **Description** The Pneumatic that was found.
 - **Type** IPneumatic
- **Raises**
 - **Type** MachineException
 - **Description** If we cannot find the Pneumatic.

```
import time

from machinelogic import Machine

machine = Machine()

my_pneumatic = machine.get_pneumatic("Pneumatic")

# Idle

my_pneumatic.idle_async()

time.sleep(1)

# Push

my_pneumatic.push_async()

time.sleep(1)

# Pull

my_pneumatic.pull_async()

time.sleep(1)
```

get_robot

- **Description** Retrieves a Robot by name. If no name is specified, then returns the first Robot.
- **Parameters**
 - **name**
 - **Description** The Robot name. If it's None, then the first Robot in the Robot list is returned.
 - **Type** str
- **Returns**
 - **Description** The Robot that was found.
 - **Type** IRobot
- **Raises**
 - **Type** MachineException
 - **Description** If the Robot is not found.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

#Set TCP offset explicitly when importing a robot.

#In this example, the TCP offset is of 110mm in Z

my_robot.set_tcp_offset([0, 0, 110, 0, 0, 0])

# Example of use: moving robot to specified joint angles in deg

my_robot.movej([0, -90, 120, -90, -90, 0])
```

on_mqtt_event

- **Description** Attach a callback function to an MQTT topic.
- **Parameters**
 - **topic**
 - **Description** The topic to listen on.
 - **Type** str
 - **callback**
 - **Description** A callback where the first argument is the topic and the second is the message.
 - **Type** Union[Callable[[str, str], None], None]


```
import time

from machinelogic import Machine

machine = Machine()

my_event_topic = "my_custom/event/topic"

# A "callback" function called everytime a new mqtt event on my_event_topic is received.

def event_callback(topic: str, message: str):

    print("new mqtt event:", topic, message)

machine.on_mqtt_event(my_event_topic, event_callback)

machine.publish_mqtt_event(my_event_topic, "my message")

time.sleep(2)

machine.on_mqtt_event(my_event_topic, None) # remove the callback.
```

publish_mqtt_event

- **Description** Publish an MQTT event.
 - **Parameters**
 - **topic**
 - **Description** Topic to publish.
 - **Type** str
 - **message**
 - **Description** Optional message.
 - **Type** Optional[str]
 - **Default** None

```
import time

from machinelogic import Machine

machine = Machine()

# Example for publishing a cycle-start and cycle-end topic and message

# to track application cycles in MachineAnalytics

cycle_start_topic = "application/cycle-start"

cycle_start_message = '{"applicationId':'My Python Application', 'cycleId':'default'}"

cycle_end_topic = "application/cycle-end"

cycle_end_message = '{"applicationId':'My Python Application', 'cycleId':'default'}"

while True:

    machine.publish_mqtt_event(cycle_start_topic, cycle_start_message)

    print("Cycle Start")

    time.sleep(5)

    machine.publish_mqtt_event(cycle_end_topic, cycle_end_message)

    time.sleep(1)

    print("Cycle end")
```

MachineMotion

A software representation of a MachineMotion controller. The MachineMotion is comprised of many actuators, inputs, outputs, pneumatics, ac motors, and bag grippers. It keeps a persistent connection to MQTT as well.

You should NEVER construct this object yourself. Instead, it is best to rely on the Machine instance to provide you with a list of the available MachineMotions.

configuration

- **Description** MachineMotionConfiguration: The representation of the configuration associated with this MachineMotion.

Actuator

A software representation of an Actuator. An Actuator is defined as a motorized axis that can move by discrete distances. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance:

E.g.:

```
machine = Machine()

my_actuator = machine.get_actuator("Actuator")
```

In this example, "New actuator" is the friendly name assigned to the Actuator in the MachineLogic configuration page.

configuration

- **Description** ActuatorConfiguration: The representation of the configuration associated with this MachineMotion.

home

- **Description** Home the Actuator synchronously.
 - **Parameters**
 - **timeout**
 - **Description** The timeout in seconds.
 - **Type** float
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the home was unsuccessful or request timed out.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

my_actuator.home(timeout=10)
```

lock_brakes

- **Description** Locks the brakes on this Actuator.
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the brakes failed to lock.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

my_actuator.unlock_brakes()

# Home the actuator before starting to ensure position is properly calibrated

my_actuator.home(timeout=10)

my_actuator.move_relative(distance=100.0)

my_actuator.lock_brakes()

# This move will fail because the brakes are now locked.

my_actuator.move_relative(distance=-100.0)
```

move_absolute

- **Description** Moves absolute synchronously to the specified position.
 - **Parameters**
 - **position**
 - **Description** The position to move to.
 - **Type** float
 - **timeout**
 - **Description** The timeout in seconds.
 - **Type** float
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the move was unsuccessful.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

my_actuator.move_absolute(

    position=150.0, # millimeters

    timeout=10, # seconds

)
```

move_absolute_async

- **Description** Moves absolute asynchronously.
- **Parameters**
 - **position**
 - **Description** The position to move to.
 - **Type** float
- **Raises**
 - **Type** ActuatorException
 - **Description** If the move was unsuccessful.

```

import time

from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

target_position = 150.0 # millimeters

# move_*_async will start the move and return without waiting for the move to complete.

my_actuator.move_absolute_async(target_position)

while my_actuator.state.move_in_progress:

    print("move is in progress...")

    time.sleep(1)

# end_position will be approx. equal to target_position.

end_position = my_actuator.state.position

print("finished at position: ", end_position)

```

move_continuous_async

- **Description** Starts a continuous move. The Actuator will keep moving until it is stopped.
- **Parameters**
 - **speed**
 - **Description** The speed to move with.
 - **Type** float
 - **Default** 100.0
 - **acceleration**
 - **Description** The acceleration to move with.
 - **Type** float
 - **Default** 100.0
- **Raises**
 - **Type** ActuatorException
 - **Description** If the move was unsuccessful.

```
import time

from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

target_speed = 100.0 # mm/s

target_acceleration = 500.0 # mm/s^2

target_deceleration = 600.0 # mm/s^2

# move_*_async will start the move and return without waiting for the move to complete.

my_actuator.move_continuous_async(target_speed, target_acceleration)

time.sleep(10) # move continuously for ~10 seconds.

my_actuator.stop(target_deceleration) # decelerate to stopped.
```

move_relative

- **Description** Moves relative synchronously by the specified distance.
 - **Parameters**
 - **distance**
 - **Description** The distance to move.
 - **Type** float
 - **timeout**
 - **Description** The timeout in seconds.
 - **Type** float
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the move was unsuccessful.

```

from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

start_position = my_actuator.state.position

print("starting at position: ", start_position)

target_distance = 150.0 # mm

my_actuator.move_relative(

    distance=target_distance,

    timeout=10, # seconds

)

# first_move_end_position is approx. equal to start_position + target_distance.

first_move_end_position = my_actuator.state.position

print("first move finished at position: ", first_move_end_position)

# move back to starting position

target_distance = -1 * target_distance

my_actuator.move_relative(

    distance=target_distance,

    timeout=10, # seconds

)

# approx. equal to start_position,

end_position = my_actuator.state.position

print("finished back at position: ", end_position)

```

move_relative_async

- **Description** Moves relative asynchronously by the specified distance.
- **Parameters**
 - **distance**
 - **Description** The distance to move.
 - **Type** float

- **Raises**
 - **Type** ActuatorException
 - **Description** If the move was unsuccessful.

```
import time

from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

start_position = my_actuator.state.position

print("starting at position: ", start_position)

target_distance = 150.0 # mm

# move*_async will start the move and return without waiting for the move to complete.

my_actuator.move_relative_async(distance=150.0)

while my_actuator.state.move_in_progress:

    print("move is in progress...")

    time.sleep(1)

# end_position will be approx. equal to start_position + target_distance.

end_position = my_actuator.state.position

print("finished at position", end_position)
```

set_acceleration

- **Description** Sets the max acceleration for the Actuator.
- **Parameters**
 - **acceleration**
 - **Description** The new acceleration.
 - **Type** float
- **Raises**
 - **Type** ActuatorException
 - **Description** If the request was unsuccessful.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

target_speed = 100.0 # mm/s

target_acceleration = 500.0 # mm/s^2

my_actuator.set_speed(target_speed)

my_actuator.set_acceleration(target_acceleration)
```

set_speed

- **Description** Sets the max speed for the Actuator.
 - **Parameters**
 - **speed**
 - **Description** The new speed.
 - **Type** float
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the request was unsuccessful.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

target_speed = 100.0 # mm/s

target_acceleration = 500.0 # mm/s^2

my_actuator.set_speed(target_speed)

my_actuator.set_acceleration(target_acceleration)
```

state

- **Description** ActuatorState: The representation of the current state of this MachineMotion.

stop

- **Description** Stops movement on this Actuator. If no argument is provided, then a quickstop is emitted which will abruptly stop the motion. Otherwise, the actuator will decelerate following the provided acceleration.

- **Parameters**

- **acceleration**

- **Description** Deceleration speed.
 - **Type** float

- **Raises**

- **Type** ActuatorException

- **Description** If the Actuator failed to stop.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

deceleration = 500 # mm/s^2

my_actuator.stop(deceleration) # Deceleration is an optional parameter

# The actuator will stop as quickly as possible if no deceleration is specified.
```

unlock_brakes

- **Description** Unlocks the brakes on this Actuator.

- **Raises**

- **Type** ActuatorException

- **Description** If the brakes failed to unlock.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

my_actuator.unlock_brakes()

# Home the actuator before starting to ensure position is properly calibrated

my_actuator.home(timeout=10)

my_actuator.move_relative(distance=100.0)

my_actuator.lock_brakes()

# This move will fail because the brakes are now locked.

my_actuator.move_relative(distance=-100.0)
```

wait_for_move_completion

- **Description** Waits for motion to complete before commencing the next action.
 - **Parameters**
 - **timeout**
 - **Description** The timeout in seconds, after which an exception will be thrown.
 - **Type** float
 - **Raises**
 - **Type** ActuatorException
 - **Description** If the request fails or the move did not complete in the allocated amount of time.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

# Always home the actuator before starting to ensure position is properly calibrated.

my_actuator.home(timeout=10)

target_position = 150.0 # millimeters

# move*_async will start the move and return without waiting for the move to complete.

my_actuator.move_absolute_async(target_position)

print("move started...")

my_actuator.wait_for_move_completion(timeout=10)

print("motion complete.")

# end_position will be approx. equal to target_position.

end_position = my_actuator.state.position

print("finished at position: ", end_position)
```

ActuatorState

Representation of the current state of an Actuator instance. The values in this class are updated in real time to match the physical reality of the Actuator.

brakes

- **Description** float: The current state of the brakes of the Actuator. Set to 1 if locked, otherwise 0.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.brakes)
```

end_sensors

- **Description** Tuple[bool, bool]: A tuple representing the state of the [home, end] sensors.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.end_sensors)
```

move_in_progress

- **Description** bool: The boolean is True if a move is in progress, otherwise False.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.move_in_progress)
```

output_torque

- **Description** dict[str, float]: The current torque output of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.output_torque)
```

position

- **Description** float: The current position of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.position)
```

speed

- **Description** float: The current speed of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.state.speed)
```

ActuatorConfiguration

Representation of the configuration of an Actuator instance. This configuration defines what your Actuator is and how it should behave when work is requested from it.

actuator_type

- **Description** ActuatorType: The type of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.actuator_type)
```

home_sensor

- **Description** Literal["A", "B"]: The home sensor port, either A or B.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.home_sensor)
```

ip_address

- **Description** str: The IP address of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.ip_address)
```

name

- **Description** str: The name of the Actuator.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.name)
```

units

- **Description** Literal["deg", "mm"]: The units that the Actuator functions in.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.units)
```

uuid

- **Description** str: The Actuator's ID.

```
from machinelogic import Machine

machine = Machine()

my_actuator = machine.get_actuator("Actuator")

print(my_actuator.configuration.uuid)
```

ActuatorGroup

A helper class used to group N-many Actuator instances together so that they can be acted upon as a group. An ActuatorGroup may only contain Actuators that are on the same MachineMotion controller.

E.g.:

```
machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)
```

lock_brakes

- **Description** Locks the brakes for all Actuators in the group.
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the brakes failed to lock on a single Actuator in the group.


```
from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

actuator_group.lock_brakes()

# This move will fail because the brakes are locked.

actuator_group.move_absolute((50.0, 120.0), timeout=10)
```

move_absolute

- **Description** Moves absolute synchronously to the tuple of positions.
 - **Parameters**
 - **position**
 - **Description** The positions to move to. Each value corresponds 1-to-1 with the actuators tuple provided to the constructor.
 - **Type** Tuple[float, ...]
 - **timeout**
 - **Description** The timeout in seconds after which an exception is thrown.
 - **Type** float
 - **Default** DEFAULT_MOVEMENT_TIMEOUT_SECONDS
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the request fails or the timeout occurs.

```
from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

target_positions = (100.0, 200.0) # (mm - actuator1, mm - actuator2)

actuator_group.move_absolute(target_positions, timeout=10)
```

move_absolute_async

- **Description** Moves absolute asynchronously to the tuple of positions.
 - **Parameters**
 - **distance**
 - **Description** The positions to move to. Each value corresponds 1-to-1 with the actuators tuple provided to the constructor.
 - **Type** Tuple[float, ...]
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the request fails.

```

from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

target_positions = (75.0, 158.0) # (mm - actuator1, mm - actuator2)

# move_*_async will start the move and return without waiting for the move to complete.

actuator_group.move_absolute_async(target_positions)

print("move started..")

actuator_group.wait_for_move_completion()

print("motion completed.")

```

move_relative

- **Description** Moves relative synchronously by the tuple of distances.
- **Parameters**
 - **distance**
 - **Description** The distances to move each Actuator. Each value corresponds 1-to-1 with the actuators tuple provided to the constructor.
 - **Type** Tuple[float, ...]
 - **timeout**
 - **Description** The timeout in seconds after which an exception is thrown.
 - **Type** float
 - **Default** DEFAULT_MOVEMENT_TIMEOUT_SECONDS
- **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the request fails or the timeout occurs

```
from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

target_distances = (-120.0, 240.0) # (mm - actuator1, mm - actuator2)

actuator_group.move_relative(target_distances, timeout=10)
```

move_relative_async

- **Description** Moves relative asynchronously by the tuple of distances.
 - **Parameters**
 - **distance**
 - **Description** The distances to move each Actuator. Each value corresponds 1-to-1 with the actuators tuple provided to the constructor.
 - **Type** Tuple[float, ...]
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the request fails.

```
import time

from machinelogic import Machine, ActuatorGroup

machine = Machine()

actuator1 = machine.get_actuator("My Actuator #1")

actuator2 = machine.get_actuator("My Actuator #2")

# Always home the actuators before starting to ensure position is properly calibrated.

actuator1.home(timeout=10)

actuator2.home(timeout=10)

actuator_group = ActuatorGroup(actuator1, actuator2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

target_distances = (-120.0, 240.0) # (mm - actuator1, mm - actuator2)

# move_*_async will start the move and return without waiting for the move to complete.

actuator_group.move_relative_async(target_distances)

while actuator_group.state.move_in_progress:

    print("motion is in progress..")

    time.sleep(1)

print("motion complete")
```

set_acceleration

- **Description** Sets the acceleration on all Actuators in the group.
 - **Parameters**
 - **acceleration**
 - **Description** The acceleration to set on all Actuators in the group.
 - **Type** float
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the acceleration failed to set on any Actuator in the group.

set_speed

- **Description** Sets the speed on all Actuators in the group.

- **Parameters**

- **speed**

- **Description** The speed to set on all Actuators in the group.

- **Type** float

- **Raises**

- **Type** ActuatorGroupException

- **Description** If the speed failed to set on any Actuator in the group.

state

- **Description** ActuatorGroupState: The state of the ActuatorGroup.

stop

- **Description** Stops movement on all Actuators in the group.

- **Raises**

- **Type** ActuatorGroupException

- **Description** If any of the Actuators in the group failed to stop.

unlock_brakes

- **Description** Unlocks the brakes on all Actuators in the group.

- **Raises**

- **Type** ActuatorGroupException

- **Description** If the brakes failed to unlock on a single Actuator in the group.

```
from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

actuator_group.lock_brakes()

# This move will fail because the brakes are locked.

actuator_group.move_absolute((50.0, 120.0), timeout=10)
```

wait_for_move_completion

- **Description** Waits for motion to complete on all Actuators in the group.
 - **Parameters**
 - **timeout**
 - **Description** The timeout in seconds, after which an exception will be thrown.
 - **Type** float
 - **Raises**
 - **Type** ActuatorGroupException
 - **Description** If the request fails or the move did not complete in the allocated amount of time.

```

from machinelogic import Machine, ActuatorGroup

machine = Machine()

my_actuator_1 = machine.get_actuator("Actuator 1")

my_actuator_2 = machine.get_actuator("Actuator 2")

# Always home the actuators before starting to ensure position is properly calibrated.

my_actuator_1.home(timeout=10)

my_actuator_2.home(timeout=10)

actuator_group = ActuatorGroup(my_actuator_1, my_actuator_2)

actuator_group.set_speed(100.0) # mm/s

actuator_group.set_acceleration(500.0) # mm/s^2

target_positions = (75.0, 158.0) # (mm - actuator1, mm - actuator2)

# move_*_async will start the move and return without waiting for the move to complete.

actuator_group.move_absolute_async(target_positions)

print("move started..")

actuator_group.wait_for_move_completion()

print("motion completed.")

```

Robot

A software representation of a Robot. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance:

E.g.:

```

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0,0,110,0,0,0])

```

In this example, "Robot" is the friendly name assigned to the actuator in the MachineLogic configuration page. The TCP (Tool Center Point) offset should be explicitly set after querying for a robot if using an end of arm tool. In this example, the TCP offset is of 110 mm in Z

compute_forward_kinematics

- **Description** Computes the forward kinematics from joint angles.
- **Parameters**
 - **joint_angles**
 - **Description** The 6 joint angles, in degrees.

- **Type** JointAnglesDegrees

- **Returns**

- **Description** Cartesian pose, in mm and degrees
- **Type** CartesianPose

- **Raises**

- **Type** ValueError
- **Description** Throws an error if the joint angles are invalid.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

# Joint angles, in degrees

joint_angles = [

    176.68, # j1

    -35.95, # j2

    86.37, # j3

    -150.02, # j4

    -90.95, # j5

    -18.58, # j6

]

computed_robot_pose = my_robot.compute_forward_kinematics(joint_angles)

print(computed_robot_pose)
```

compute_inverse_kinematics

- **Description** Computes the inverse kinematics from a Cartesian pose.

- **Parameters**

- **cartesian_position**
 - **Description** The end effector's pose, in mm and degrees,

where the angles are extrinsic Euler angles in XYZ order.

****Type**** CartesianPose

****Returns****

****Description**** Joint angles, in degrees.

****Type**** JointAnglesDegrees

Raises

Type ValueError

Description Throws an error if the inverse kinematic solver fails.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

cartesian_position = [

    648.71, # x in millimeters

    -313.30, # y in millimeters

    159.28, # z in millimeters

    107.14, # rx in degrees

    -145.87, # ry in degrees

    15.13, # rz in degrees

]

computed_joint_angles = my_robot.compute_inverse_kinematics(cartesian_position)

print(computed_joint_angles)
```

configuration

- **Description** The Robot configuration.

create_sequence

- **Description** Creates a sequence-builder object for building a sequence of robot movements. This method is expected to be used with the `append_*`

methods.

Returns

Description A sequence builder object.

Type SequenceBuilder

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

# Create an arbitrary Cartesian waypoint, that is 10mm or 10 degrees away from the current position
cartesian_waypoint = [i + 10 for i in my_robot.state.cartesian_position]

# Create an arbitrary joint waypoint, that is 10 degrees away from the current joint angles
joint_waypoint = [i + 10 for i in my_robot.state.joint_angles]

cartesian_velocity = 100.0 # millimeters per second

cartesian_acceleration = 100.0 # millimeters per second squared

blend_factor_1 = 0.5

joint_velocity = 10.0 # degrees per second

joint_acceleration = 10.0 # degrees per second squared

blend_factor_2 = 0.5

with my_robot.create_sequence() as seq:

    seq.append_move_l(cartesian_waypoint, cartesian_velocity, cartesian_acceleration, blend_factor_1)

    seq.append_move_j(joint_waypoint, joint_velocity, joint_acceleration, blend_factor_2)

# Alternate Form:

seq = my_robot.create_sequence()

seq.append_move_l(cartesian_waypoint)

seq.append_move_j(joint_waypoint)

my_robot.execute_sequence(seq)

```

execute_sequence

- **Description** Moves the robot through a specific sequence of joint and linear motions.
- **Parameters**
 - **sequence**
 - **Description** The sequence of target points.
 - **Type** SequenceBuilder
- **Returns**
 - **Description** True if successful.
 - **Type** bool

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

# Create an arbitrary Cartesian waypoint, that is 10mm or 10 degrees away from the current position

cartesian_waypoint = [i + 10 for i in my_robot.state.cartesian_position]

# Create an arbitrary joint waypoint, that is 10 degrees away from the current joint angles

joint_waypoint = [i + 10 for i in my_robot.state.joint_angles]

cartesian_velocity = 100.0 # millimeters per second

cartesian_acceleration = 100.0 # millimeters per second squared

blend_factor_1 = 0.5

joint_velocity = 10.0 # degrees per second

joint_acceleration = 10.0 # degrees per second squared

blend_factor_2 = 0.5

seq = my_robot.create_sequence()

seq.append_movei(cartesian_waypoint, cartesian_velocity, cartesian_acceleration, blend_factor_1)

seq.append_movej(joint_waypoint, joint_velocity, joint_acceleration, blend_factor_2)

my_robot.execute_sequence(seq)

```

move_stop

- **Description** Stops the robot current movement.
- **Returns**
 - **Description** True if the robot was successfully stopped, False otherwise.
 - **Type** bool

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

my_robot.move_stop()

```

movej

- **Description** Moves the robot to a specified joint position.

- **Parameters**

- **target**

- **Description** The target joint angles, in degrees.

- **Type** JointAnglesDegrees

- **velocity**

- **Description** The joint velocity to move at, in degrees per second.

- **Type** DegreesPerSecond

- **acceleration**

- **Description** The joint acceleration to move at, in

degrees per second squared.

Type DegreesPerSecondSquared

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

joint_velocity = 10.0 # degrees per second

joint_acceleration = 10.0 # degrees per second squared

# Joint angles, in degrees

joint_angles = [

    86.0, # j1

    0.0, # j2

    88.0, # j3

    0.0, # j4

    91.0, # j5

    0.0, # j6

]

my_robot.movej(

    joint_angles,

    joint_velocity,

    joint_acceleration,

)

```

movei

- **Description** Moves the robot to a specified Cartesian position.

- **Parameters**

- **target**

- **Description** The end effector's pose, in mm and degrees,

where the angles are extrinsic Euler angles in XYZ order.

****Type**** CartesianPose

****velocity****

****Description**** The velocity to move at, in mm/s.

****Type**** MillimetersPerSecond

****acceleration****

Description The acceleration to move at, in mm/s².

Type MillimetersPerSecondSquared

reference_frame

Description The reference frame to move relative to. If None,

the robot's base frame is used.

Type CartesianPose

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

linear_velocity = 100.0 # millimeters per second

linear_acceleration = 100.0 # millimeters per second squared

# Target Cartesian pose, in millimeters and degrees

cartesian_pose = [

    -1267.8, # x in millimeters

    -89.2, # y in millimeters

    277.4, # z in millimeters

    -167.8, # rx in degrees

    179.7, # ry in degrees

    -77.8, # rz in degrees

]

reference_frame = [

    23.56, # x in millimeters

    -125.75, # y in millimeters

    5.92, # z in millimeters

    0.31, # rx in degrees

    0.65, # ry in degrees

    90.00, # rz in degrees

]

my_robot.movel(

    cartesian_pose,

    linear_velocity, # Optional

    linear_acceleration, # Optional

    reference_frame, # Optional

)

```


- **Description** Set a callback to the log alarm.

- **Parameters**

- **callback**
 - **Description** A callback function to be called when a robot alarm is received.
 - **Type** Callable[[RobotAlarm], None]

- **Returns**

- **Description** The callback ID.
- **Type** int

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

# The function defined here is called when the specified alarm occurs

def handle_log_alarm(alarm):

    print(alarm.level, alarm.error_code, alarm.description)

my_robot.on_log_alarm(handle_log_alarm)
```

on_system_state_change

- **Description** Registers a callback for system state changes.

- **Parameters**

- **callback**
 - **Description** The callback function.
 - **Type** Callable[[RobotOperationalState, RobotSafetyState], None]

- **Returns**

- **Description** The callback ID.
- **Type** int

```

from machinelogic import Machine

from machinelogic.machinelogic.robot import RobotOperationalState, RobotSafetyState

machine = Machine()

my_robot = machine.get_robot("Robot")

# The function defined here is called when the specified state change occurs

def handle_state_change(robot_operational_state: RobotOperationalState, safety_state: RobotSafetyState):

    """

    A function that is called when the specified state change occurs.

    Args:

        robot_operational_state (RobotOperationalState): The current operational state of the robot.

        safety_state (RobotSafetyState): The current safety state of the robot.

    """

    print(robot_operational_state, safety_state)

callback_id = my_robot.on_system_state_change(handle_state_change)

print(callback_id)

```

reset

- **Description** Attempts to reset the robot to a normal operational state.
- **Returns**
 - **Description** True if successful.
 - **Type** bool

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

did_reset = my_robot.reset()

print(did_reset)

# Robot state should be 'Normal'

print(my_robot.state.operational_state)

```

set_payload

- **Description** Sets the payload of the robot.

- **Parameters**

- **payload**
 - **Description** The payload, in kg.
 - **Type** Kilograms

- **Returns**

- **Description** True if successful.
- **Type** bool

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

# Weight in Kilograms

weight = 2.76

is_successful = my_robot.set_payload(weight)

print(is_successful)
```

set_tcp_offset

- **Description** Sets the tool center point offset.

- **Parameters**

- **tcp_offset**
 - **Description** The TCP offset, in mm and degrees, where the angles

are extrinsic Euler angles in XYZ order.

****Type**** CartesianPose

****Returns****

****Description**** True if the TCP offset was successfully set, False otherwise.

****Type**** bool

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

# This offset will be applied in reference
# to the end effector coordinate system

cartesian_offset = [

    10.87, # x in millimeters

    -15.75, # y in millimeters

    200.56, # z in millimeters

    0.31, # rx degrees

    0.65, # ry degrees

    0.00, # rz degrees

]

is_successful = my_robot.set_tcp_offset(cartesian_offset)

print(is_successful)
```

set_tool_digital_output

- **Description** Sets the value of a tool digital output.
- **Parameters**
 - **pin**
 - **Description** The pin number.
 - **Type** int
 - **value**
 - **Description** The value to set, where 1 is high and 0 is low.
 - **Type** int
- **Returns**
 - **Description** True if successful.
 - **Type** bool

```
from machinelogic import Machine

machine = Machine()

# New robot must be configured in the Configuration pane

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

# digital output identifier

output_pin = 1

value = 0

is_successful = my_robot.set_tool_digital_output(output_pin, value)

print(is_successful)
```

state

- **Description** The current Robot state.

teach_mode

- **Description** Put the robot into teach mode (i.e., freedrive).
 - **Returns**
 - **Description** A context manager that will exit teach mode when it is closed.
 - **Type** `_WithTeach`

```

import time

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

with my_robot.teach_mode(): # When all arguments inside this statement are complete, teach mode ends automatically

    print("Robot is now in teach mode for 5 seconds")

    time.sleep(5)

    # Robot should be in 'Freedrive'

    print(my_robot.state.operational_state)

    time.sleep(1)

time.sleep(1)

# Robot should be back to 'Normal'

print(my_robot.state.operational_state)

```

RobotState

A representation of the robot current state.

cartesian_position

- **Description** The end effector's pose, in mm and degrees, where the angles are extrinsic Euler angles in XYZ order.

```

from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0, 0])

end_effector_pose = my_robot.state.cartesian_position

end_effector_position_mm = end_effector_pose[:3]

end_effector_orientation_euler_xyz_deg = end_effector_pose[-3:]

print(f"End effector's pose: {end_effector_pose}")

print(f"End effector's Cartesian position: {end_effector_position_mm}")

print(f"End effector's Euler XYZ orientation: {end_effector_orientation_euler_xyz_deg}")

```

get_digital_input_value

- **Description** Returns the value of a digital input at a given pin.
 - **Parameters**
 - **pin**
 - **Description** The pin number.
 - **Type** int
 - **Returns**
 - **Description** True if the pin is high, False otherwise.
 - **Type** None

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.state.get_digital_input_value(0))
```

joint_angles

- **Description** The robot current joint angles.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

my_robot.set_tcp_offset([0, 0, 0, 0, 0])

print(my_robot.state.joint_angles)
```

operational_state

- **Description** The current robot operational state.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.state.operational_state)
```

safety_state

- **Description** The current robot safety state.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.state.safety_state)
```

RobotConfiguration

A representation of the configuration of a Robot instance. This configuration defines what your Robot is and how it should behave when work is requested from it.

cartesian_velocity_limit

- **Description** The maximum Cartesian velocity of the robot, in mm/s.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.configuration.cartesian_velocity_limit)
```

joint_velocity_limit

- **Description** The robot joints' maximum angular velocity, in deg/s.


```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.configuration.joint_velocity_limit)
```

name

- **Description** The friendly name of the robot.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.configuration.name)
```

robot_type

- **Description** The robot's type.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.configuration.robot_type)
```

uuid

- **Description** The robot's ID.

```
from machinelogic import Machine

machine = Machine()

my_robot = machine.get_robot("Robot")

print(my_robot.configuration.uuid)
```

RobotOperationalState

The robot's operational state.

Possible values:

- `Offline`
- `NonOperational`
- `Freedrive`
- `Normal`

RobotSafetyState

The robot's safety state.

Possible values:

- `Normal`
- `ProtectiveStop`
- `EmergencyStop`
- `ReducedSpeed`
- `SafeguardStop`
- `Unknown`

SequenceBuilder

A builder for a sequence of moves.

append_movej

- **Description** Append a movej to the sequence.
- **Parameters**
 - **target**
 - **Description** The target joint angles, in degrees.
 - **Type** JointAngles
 - **velocity**
 - **Description** The velocity of the move, in degrees per second.
 - **Type** DegreesPerSecond
 - **Default** 10.0
 - **acceleration**
 - **Description** The acceleration of the move, in degrees per second squared.
 - **Type** DegreesPerSecondSquared
 - **Default** 10.0
 - **blend_radius**
 - **Description** The blend radius of the move, in millimeters.
 - **Type** Millimeters

- **Default** 0.0
- **Returns**
 - **Description** The builder.
 - **Type** SequenceBuilder

append_move

- **Description** Append a move to the sequence.
- **Parameters**
 - **target**
 - **Description** The target pose.
 - **Type** CartesianPose
 - **velocity**
 - **Description** The velocity of the move, in millimeters per second.
 - **Type** MillimetersPerSecond
 - **Default** 100.0
 - **acceleration**
 - **Description** The acceleration of the move, in millimeters per second squared.
 - **Type** MillimetersPerSecondSquared
 - **Default** 100.0
 - **blend_radius**
 - **Description** The blend radius of the move, in millimeters.
 - **Type** Millimeters
 - **Default** 0.0
 - **reference_frame**
 - **Description** The reference frame for the target pose.
 - **Type** CartesianPose
 - **Default** None
- **Returns**
 - **Description** The builder.
 - **Type** SequenceBuilder

DigitalInput

A software representation of an DigitalInput. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance.

configuration

- **Description** DigitalInputConfiguration: The configuration of the DigitalInput.

state

- **Description** DigitalInputState: The state of the DigitalInput.

```
from machinelogic import Machine

machine = Machine()

my_input = machine.get_input("Input")

if my_input.state.value:

    print(f"{my_input.configuration.name} is HIGH")

else:

    print(f"{my_input.configuration.name} is LOW")
```

DigitalInputState

Representation of the current state of an DigitalInput/DigitalOutput instance.

value

- **Description** bool: The current value of the IO pin. True means high, while False means low. This is different from active/inactive, which depends on the active_high configuration.

DigitalInputConfiguration

Representation of the configuration of an DigitalInput/DigitalOutput. This configuration is established by the configuration page in MachineLogic.

active_high

- **Description** bool: The value that needs to be set to consider the DigitalInput/DigitalOutput as active.

device

- **Description** int: The device number of the DigitalInput/DigitalOutput.

ip_address

- **Description** str: The ip address of the DigitalInput/DigitalOutput.

name

- **Description** str: The name of the DigitalInput/DigitalOutput.

port

- **Description** int: The port number of the DigitalInput/DigitalOutput.

uuid

- **Description** str: The unique ID of the DigitalInput/DigitalOutput.

DigitalOutput

A software representation of an Output. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance.

configuration

- **Description** OutputConfiguration: The configuration of the Output.

write

- **Description** Writes the value into the Output, with True being high and False being low.
 - **Parameters**
 - **value**
 - **Description** The value to write to the Output.
 - **Type** bool
 - **Raises**
 - **Type** DigitalOutputException
 - **Description** If we fail to write the value to the Output.

```
from machinelogic import Machine, MachineException, DigitalOutputException

machine = Machine()

my_output = machine.get_output("Output")

my_output.write(True) # Write "true" to the Output

my_output.write(False) # Write "false" to the Output
```

DigitalOutputConfiguration

Representation of the configuration of an DigitalInput/DigitalOutput. This configuration is established by the configuration page in MachineLogic.

active_high

- **Description** bool: The value that needs to be set to consider the DigitalInput/DigitalOutput as active.

device

- **Description** int: The device number of the DigitalInput/DigitalOutput.

ip_address

- **Description** str: The ip address of the DigitalInput/DigitalOutput.

name

- **Description** str: The name of the DigitalInput/DigitalOutput.

port

- **Description** int: The port number of the DigitalInput/DigitalOutput.

uuid

- **Description** str: The unique ID of the DigitalInput/DigitalOutput.

Pneumatic

A software representation of a Pneumatic. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance:

E.g.:

```
machine = Machine()

my_pneumatic = machine.get_pneumatic("Pneumatic")
```

In this example, "Pneumatic" is the friendly name assigned to a Pneumatic in the MachineLogic configuration page.

configuration

- **Description** PneumaticConfiguration: The configuration of the actuator.

idle_async

- **Description** Idles the Pneumatic.
 - **Raises**
 - **Type** PneumaticException
 - **Description** If the idle was unsuccessful.

pull_async

- **Description** Pulls the Pneumatic.
 - **Raises**
 - **Type** PneumaticException
 - **Description** If the pull was unsuccessful.

push_async

- **Description** Pushes the Pneumatic.
 - **Raises**
 - **Type** PneumaticException
 - **Description** If the push was unsuccessful.

state

- **Description** PneumaticState: The state of the actuator.

PneumaticConfiguration

Representation of a Pneumatic configuration.

device

- **Description** int: The device of the axis.

input_pin_pull

- **Description** Optional[int]: The optional pull in pin.

input_pin_push

- **Description** Optional[int]: The optional push in pin.

ip_address

- **Description** str: The IP address of the axis.

name

- **Description** str: The name of the Pneumatic.

output_pin_pull

- **Description** int: The pull out pin of the axis.

output_pin_push

- **Description** int: The push out pin of the axis.

uuid

- **Description** str: The ID of the Pneumatic.

ACMotor

A software representation of an AC Motor. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance:

E.g.:

```
machine = Machine()

my_ac_motor = machine.get_ac_motor("AC Motor")
```

In this example, "AC Motor" is the friendly name assigned to an AC Motor in the MachineLogic configuration page.

configuration

- **Description** ACMotorConfiguration: The configuration of the ACMotor.

move_forward

- **Description** Begins moving the AC Motor forward.
 - **Raises**
 - **Type** ACMotorException
 - **Description** If the move was unsuccessful.

```
from time import sleep

from machinelogic import Machine

machine = Machine()

my_ac_motor = machine.get_ac_motor("AC Motor")

my_ac_motor.move_forward()

sleep(10)

my_ac_motor.stop()
```

move_reverse

- **Description** Begins moving the AC Motor in reverse.
 - **Raises**
 - **Type** ACMotorException
 - **Description** If the move was unsuccessful.

```
import time

from machinelogic import Machine

machine = Machine()

my_ac_motor = machine.get_ac_motor("AC Motor")

# Move the AC motor in reverse

my_ac_motor.move_reverse()

# The AC motor will stop moving if the program terminates

time.sleep(10)
```

stop

- **Description** Stops the movement of the AC Motor.
 - **Raises**
 - **Type** ACMotorException
 - **Description** If the stop was unsuccessful.

```
import time

from machinelogic import Machine

machine = Machine()

my_ac_motor = machine.get_ac_motor("AC Motor")

# Move the AC Motor forwards

my_ac_motor.move_forward()

# Do something here

time.sleep(10)

my_ac_motor.stop()
```

ACMotorConfiguration

Representation of a ACMotor configuration.

device

- **Description** int: The device of the axis.

ip_address

- **Description** str: The IP address of the axis.

name

- **Description** str: The name of the Pneumatic.

output_pin_direction

- **Description** int: The push out pin of the axis.

output_pin_move

- **Description** int: The pull out pin of the axis.

uuid

- **Description** str: The ID of the Pneumatic.

BagGripper

A software representation of a Bag Gripper. It is not recommended that you construct this object yourself. Rather, you should query it from a Machine instance:

E.g.:

```
machine = Machine()

my_bag_gripper = machine.get_bag_gripper("Bag Gripper")
```

In this example, "Bag Gripper" is the friendly name assigned to a Bag Gripper in the MachineLogic configuration page.

close_async

- **Description** Closes the Bag Gripper.
 - **Raises**
 - **Type** BagGripperException
 - **Description** If the Bag Gripper fails to close.

```
import time

from machinelogic import Machine

machine = Machine()

my_bag_gripper = machine.get_bag_gripper("Bag Gripper")

# Open the Bag Gripper

my_bag_gripper.open_async()

# You can do something while the Bag Gripper is open

time.sleep(10)

# Close the Bag Gripper

my_bag_gripper.close_async()
```

configuration

- **Description** BagGripperConfiguration: The configuration of the actuator.

open_async

- **Description** Opens the Bag Gripper.
 - **Raises**
 - **Type** BagGripperException
 - **Description** If the Bag Gripper fails to open.

```
import time

from machinelogic import Machine

machine = Machine()

my_bag_gripper = machine.get_bag_gripper("Bag Gripper")

# Open the Bag Gripper

my_bag_gripper.open_async()

# You can do something while the Bag Gripper is open

time.sleep(10)

# Close the Bag Gripper

my_bag_gripper.close_async()
```

state

- **Description** BagGripperState: The state of the actuator.

BagGripperConfiguration

Representation of a Bag gripper configuration.

device

- **Description** int: The device of the Bag gripper.

input_pin_close

- **Description** int: The close in pin of the Bag gripper.

input_pin_open

- **Description** int: The open in pin of the Bag gripper.

ip_address

- **Description** str: The IP address of the Bag gripper.

name

- **Description** str: The name of the Bag gripper.

output_pin_close

- **Description** int: The close out pin of the Bag gripper.

output_pin_open

- **Description** int: The open out pin of the Bag gripper.

uuid

- **Description** str: The ID of the Bag gripper.