# ruediPy documentaion

Matthias Brennwald

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**Abstract**

ruediPy is a collection of Python programs for instrument control and data acquisition using RUEDI instruments(?). ruediPy also includes some GNU Octave (or Matlab) tools to load, process, and manipulate RUEDI data acquired with ruediPy Python classes.

ruediPy is distributed as free software under the GNU General Public License (see LICENSE.txt).

This document describes the ruediPy software only. The RUEDI instrument is described in a separate document(?).

# Contents

# 1 Overview

ruediPy is a collection of Python programs for instrument control and data acquisition using RUEDI instruments. ruediPy also includes some GNU Octave (or Matlab) tools to load, process, and manipulate RUEDI data acquired with ruediPy Python classes. The RUEDI instrument itself is described in a separate document(?).

The Python classes for instrument control and data acquisition are designed to reflect the different hardware units of a RUEDI instrument, such as the mass spectrometer, selector valve, or probes for total gas pressure or temperature. These classes, combined with additional helper classes (e.g., for data file handling), allow writing simple Python scripts that perform user-defined procedures for a specific analysis task.

The GNU Octave tools (m-files) are designed to work hand-in-hand with the data files produced by the data acquisition parts of the Python classes. ⋆[1]

ruediPy is developed on Linux and Mac OS X systems, but should also work on any other system that run Python and GNU Octave.

# 2 Obtaining and installing ruediPy

ruediPy can be downloaded from http://brennmat.github.io/ruediPy either as a compressed archive file, or using Subversion or Git version control systems. ruediPy can be installed to just about any directory on the computer that is used for instrument control – but the user home directory (~/ruediPy) may seem like a sensible choice, and that's what is assumed throughout the examples shown in this manual.

As an example, here's a step-by-step list of terminal commands to install ruediPyon a Linux computer running Ubuntu 16.04. Other Linux distributions will be similar. The user account name in this example is "brennmat", and this user account is enabled for sudo operations (i.e., it has 'admin' rights):

1. Update system software to latest versions and install basic software requirements for ruediPy:

```
sudo apt-get update
sudo apt-get upgrade
sudo apt-get install subversion python-pip python-serial python-matplotlib
python-scipy
```

[1] TO DO: expand this: load raw data, process / calibrate data, etc.

```
pip install pydigitemp
```

2. Download ruediPy:

   ```
   svn co https://github.com/brennmat/ruediPy.git/trunk  /ruediPy
   ```

3. Permanently add `ruediPy` to the Python searchpath (this requires the user to log out and log back in to become active):

   ```
   echo export PYTHONPATH= /ruediPy/python >> .profile
   ```

4. Set permission to access the serial ports (this requires the user to log out and log back in to become active):

   ```
   sudo usermod -a -G dialout brennmat
   ```

5. Prepare directory for ruediPy data files:

   ```
   mkdir  /ruedi_data
   ```

Log out and log back in to make the above changes active. You should also consider setting up the computer to avoid going to 'sleep' mode, because this might interrupt the measurement procedure.

# 3 Python classes

## 3.1 Overview

The Python classes are used to control the various hardware units of the RUEDI instruments, to acquire measurement data, and to write these data to well-formatted and structured data files.

Currently, the following classes are implemented:

- `rgams_SRS.py`: control and data acquisition from the SRS mass spectrometer
- `selectorvalve_VICI.py`: control of the VICI inlet valve
- `pressuresensor_WIKA.py`: control and data acquisition from the WIKA pressure sensor
- `datafile.py`: data file handling
- `misc.py`: helper functions

The Python class files are located at `~/ruediPy/python/classes/`. To make sure Python knows where to find the `ruediPy` Python classes, set your `PYTHONPATH` environment variable accordingly.[2]

These classes are continuously expanded and new classes are added to `ruediPy` as required by new needs or developments of the RUEDI instruments. The various methods / functions included are documented in the class files. Due to the ongoing development of the code, it seems futile to keep an up-to-date copy of the methods / functions documentation in this manual. Please refer to the detailed documentation in the class files directly.

### 3.2 Python classes reference

# 4 GNU Octave tools

$\star$[3]

# 5 Examples

$\star$[4]

[2] A convenient method to achieve this on Linux or similar UNIXy systems is to put the following line to the `.profile` file: `export PYTHONPATH=~/ruediPy/python`

[3] TO DO: add content

[4] TO DO: add content