In the following text you can find the initial instruction in order to make a **linuxcnc** interface to control the different drivers:

1. Install the operating system Debian 12 using the corresponding image.
2. **sudo apt update** && **sudo apt upgrade** && **sudo reboot**.
3. Be sure to have the python on the system: **python3 –version**.
4. Install pyqt5 package: **sudo apt-get install python3-pyqt5**.
5. Install pyqt5 designer using the following two instructions:

**sudo apt-get install qttools5-dev-tools.**

**sudo apt-get install qttools5-dev**.

1. Install pip and git for the python using the two following instructions:

**sudo apt install python3-pip.**

**sudo apt install git**.

1. Install qt creator using the following two instructions:

**sudo apt install qtcreator python3-pyqt5.**

**pip install pyside6-essentials --break-system-packages**.

1. Install Python ethercat library using the following instruction:

**pip install pysoem --break-system-packages**.

1. Install the python .exe creator:

**pip install PyInstaller --break-system-packages**.

1. This .exe creator can be used as follows:

**python3 -m PyInstaller widget.py**.

1. Install AutoComplete for python instructions:

**pip install python-lsp-server[all] --break-system-packages**.

1. Install linux-headers that match installed kernel:

**sudo apt install --reinstall linux-headers-$(uname -r)**.

1. Install toolchain:

**sudo apt install mercurial build-essential automake tree dkms bison flex**.

1. EtherCAT Master Stack Installation:

**git clone https://gitlab.com/etherlab.org/ethercat.git ethercat-hg**

**cd ethercat-hg**

**git checkout stable-1.5**

**sudo ./bootstrap**

**cd ..**

**sudo mv ethercat-hg /usr/local/src/**

**cd /usr/local/src/**

**sudo ln -s /usr/local/src/ethercat-hg ~/ethercat**.

1. Move into the source directory:

**cd ~/ethercat**.

1. If you want to use generic driver, configuration below will work fine for you:

**sudo ./configure --enable-8139too=no --prefix=/opt/etherlab**

**sudo -s**

**make**

**make modules**

**make install**

**make modules\_install**.

1. After succesfull (error free) installation, we'll need to check HWAddr (Hardware Address, also known as the MAC Address) of the NIC we'd like to use (example: eth0) and record it. We'll need to type it in later. You can check your NIC's MAC address by:

**ip link**.

1. and now copy MAC address (HWAddr), we will use it in the next step. Note don't copy wirelles adapter's MAC Address, when you type when you type command above there'll be three different sections. Copy the MAC Address of the one starting with letter e, not the wireless adapter that starts with w. Be careful to choose correct one.
2. Create configuration file for the ethercat:

**sudo mkdir /etc/sysconfig/**

**sudo cp /opt/etherlab/etc/sysconfig/ethercat /etc/sysconfig/**

**sudo nano /etc/sysconfig/ethercat**.

1. You need to change the values for MASTER0\_DEVICE and DEVICE\_MODULES, MASTER0\_DEVICE value must be the MAC address of the Ethernet card you've selected, and DEVICE\_MODULES value must be the driver you'd like to use for that device, in this case it will be generic.

For a development system, "generic" is fine. For better real-time performance, native drivers must be used. However not all NIC drivers are supported by IgH.

**So change these inside the ethercat file**:

**MASTER0\_DEVICE="XX:XX:XX:XX:XX:XX"**

**DEVICE\_MODULES="generic"**.

1. Go to etherlab dirct:

**cd /opt/etherlab**.

1. Copy the initialization script (If this doesn't work, make sure that there isn't a /etc/init.d/ethercat already. If so, remove it), change its ownership properties:

**sudo cp ./etc/init.d/ethercat /etc/init.d/**

**sudo chmod a+x /etc/init.d/ethercat**

**sudo ln -s /opt/etherlab/bin/ethercat /usr/local/bin/ethercat**

**sudo nano /etc/udev/rules.d/99-EtherCAT.rules**.

1. Enter the following contents in the 99-Ethercat.rules file:

**KERNEL=="EtherCAT[0-9]\*", MODE="0664", GROUP="users"**.

1. save and exit, then:

**sudo udevadm control --reload**

**sudo cp /etc/sysconfig/ethercat /etc**

**cd /etc**

**sudo mv ethercat ethercat.conf**.

1. execute the following instruction:

**depmod**.

1. Now we can test our installation:

**sudo /etc/init.d/ethercat start**.

1. Now check the master work for ethercat protocol:

**ethercat master**.

1. Install linuxcnc dev version:

**sudo apt install linuxcnc-uspace-dev**.

1. Download, build and install linuxcnc-ethercat:

**git clone https://github.com/sittner/linuxcnc-ethercat**

**cd linuxcnc-ethercat**

**make configure**

**make**

**sudo make install**.

1. Run linuxcnc:

**linuxcnc**.

1. Follow Test linuxcnc with Ethercat from the following site:

<https://gist.github.com/Bouni/8b4532d0bdf012bd83c65d3eb62f8aa2>.