

# User Manual PLC for CryoTrap Test

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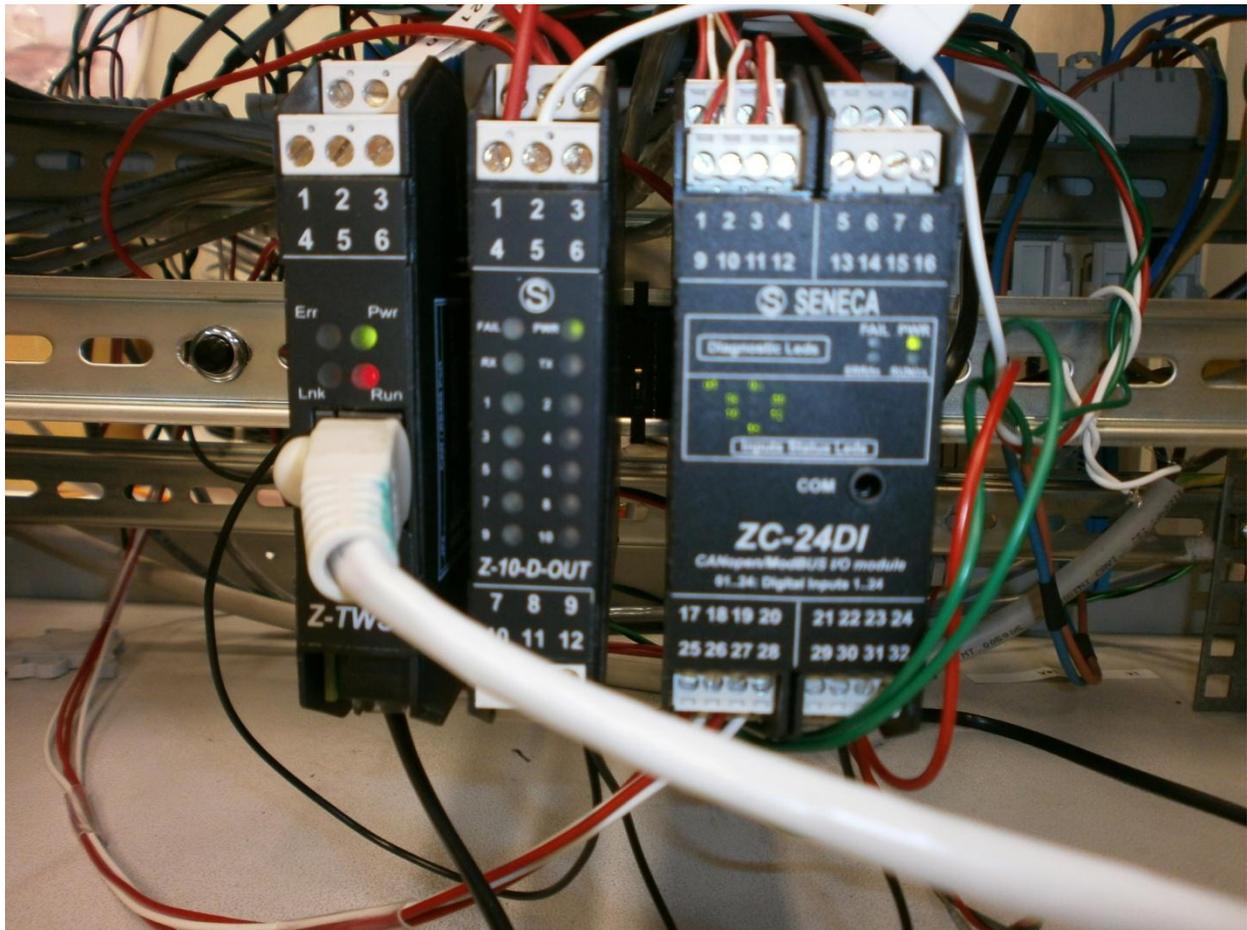
## Introduction

This user manual describes how to use the Seneca PLC ([www.seneca.it](http://www.seneca.it)) and its associated modules to test the Cryotrap which will be used in Advanced Virgo. The description of the Seneca PLC is not within the scope of this manual.

## Architecture

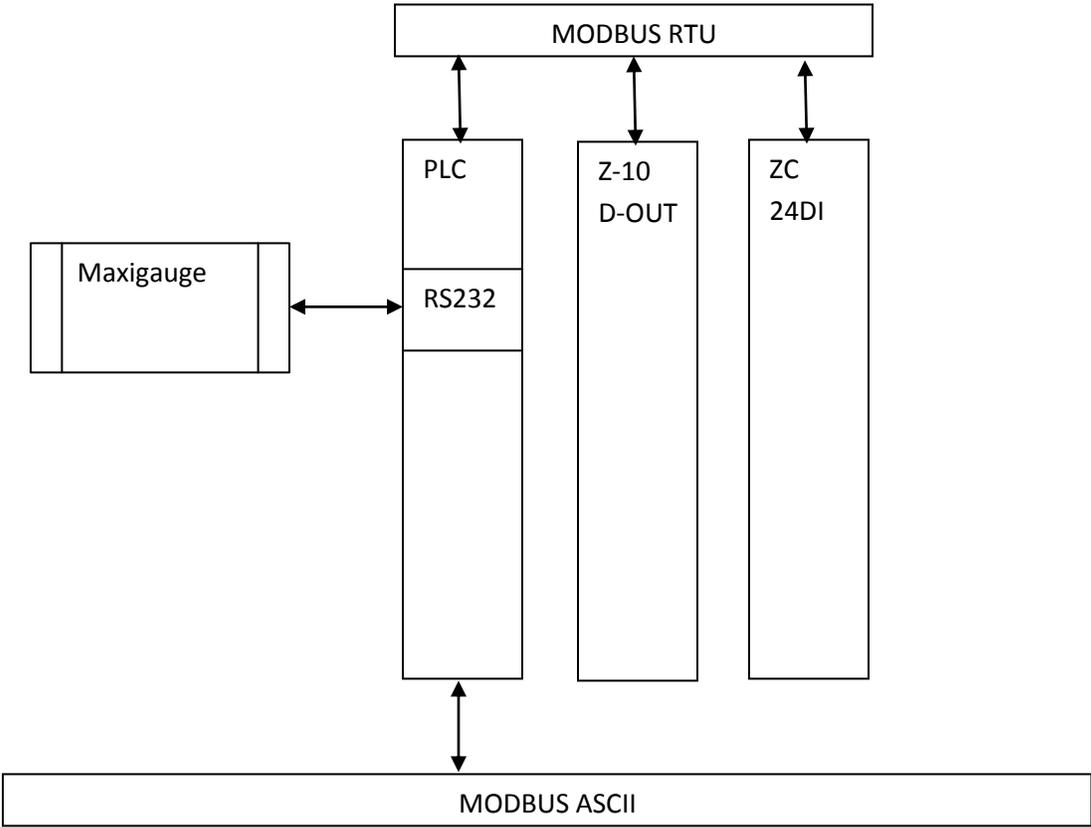
The electronic crate contains 3 Seneca modules:

1. PLC Z-TWS3, RTU Address=1. This is the “brain of the PLC. It implements the Modbus server and a web server. It also communicates with the MaxiGauge using an RS232 interface.
2. Z-10-D-OUT, RTU Address=2. This is the output module used to control the external devices
3. ZC-24DI, RTU Address=3. This is the input module used to read external devices



# Communication

We chose to use a Seneca PLC because it implements Modbus communication. This is a free communication interface/protocol.



The PLC can be connected directly to a PC or over the Ethernet cable and an application such as tango (<https://tds.ego-gw.it/ql/?c=9045>) can control the PLC using modbus/tcp protocol.

## Startup

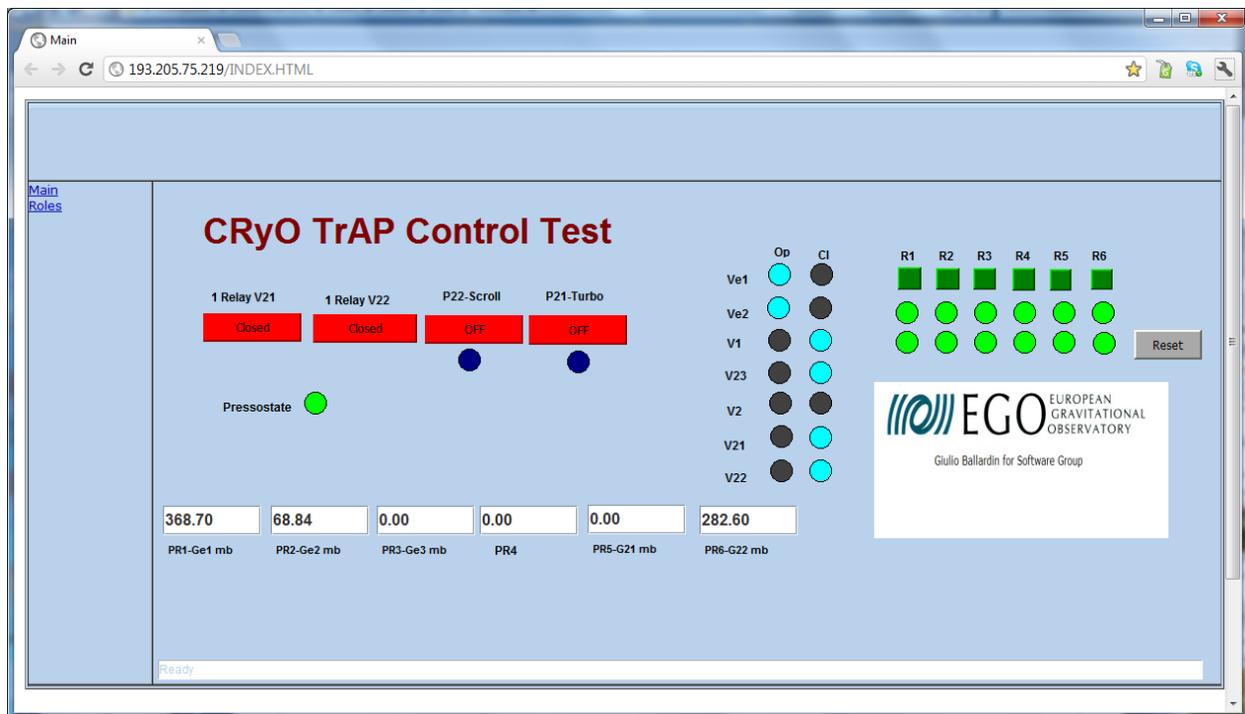
At startup the PLC starts the communication with MaxiGauge and also with the other two Seneca modules using the application running on the PLC. The MaxiGauge must be switched on before the PLC is started. This condition is satisfied by turning on the crate.

## Communication with MaxiGauge

The Seneca PLC communicates with Maxigauge using the RS232 port #0. We built a special cable as indicated in the doc: <http://senecainstruments.com/datasheets/io-system/manuals/seneca-z-tws-3-manual.pdf> in the section “RS232 & RS485 cable assembling”.

In this first version of the software it is necessary to use channels 1, 2,3,5,6 of the MaxiGauge device.

To check the correct functionality of PLC, it is sufficient to open a browser and type



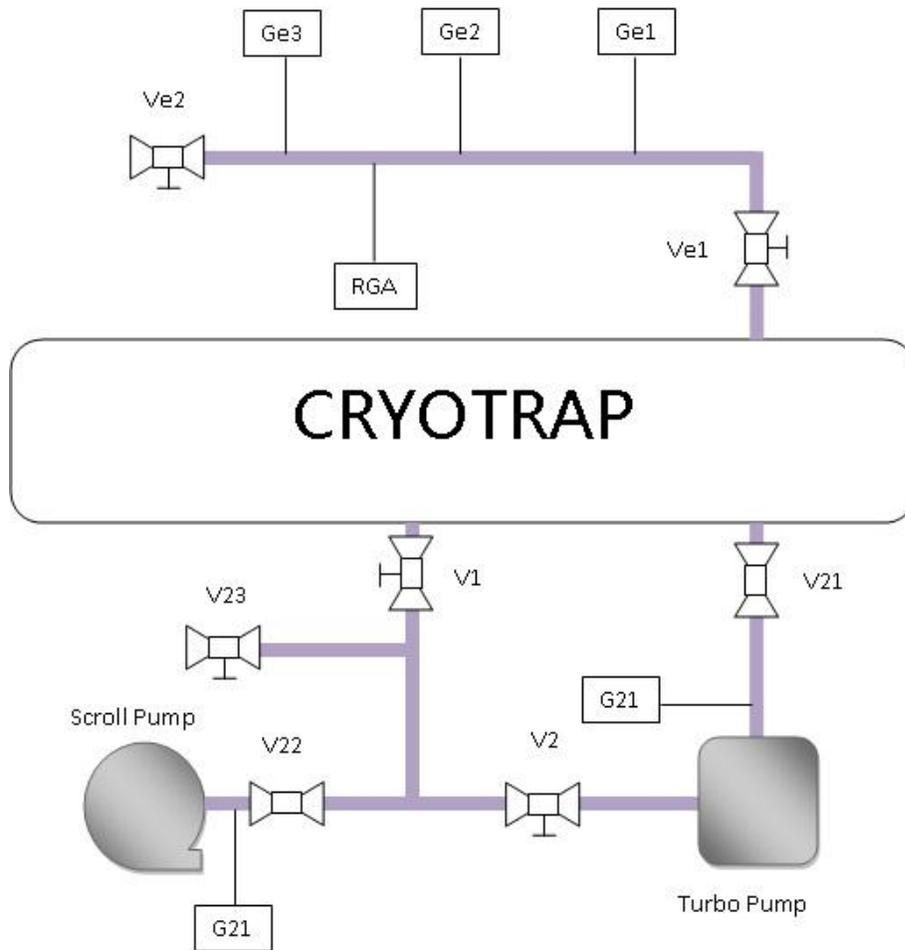
The IP address of PLC (i.e.: <http://193.205.75.219>). A web interface will appear and in the bottom part the value of the five pressures expressed in mbar can be seen. It is necessary to use the last version of java virtual machine (now we are using the version 7) to avoid problems.

## WEB Interface

As shown in the picture above the PLC works as a web server.

The interface should be self explanatory and should only be used for laboratory tests.

At the top there are 4 buttons to control two pumps and two valves: Scroll pump, turbo pump, V22 connected to the Scroll pump, and V21 connected to the Turbo pump.



Below the last two buttons, there are two leds. When a led is ON (light blue), it means that the respective pump is working correctly.

At the center of the web interface there are 2 columns of leds to show the state of the valves.

A valve can be open, closed, or moving (both leds are OFF) or in error state (both leds are ON).

In the picture Ve1 is open, V1 is closed and V2 is in moving state.

On the right side of the web interface there is the security control. At top level there are 7 buttons to switch on/off the security. The second line contains the status of each security (green-> security is working, red->security problem). The third indicates whether an error has occurred in the past.

The reset button resets past errors.

At the end is the pressure status \*. If the color is green it means that there is a good pressure to command valves, otherwise the color is red

## Special commands

It's also possible to use the PLC as a bridge RS232/Modbus to send command or receive data from MaxiGauge. It's possible to use all commands specified in the doc at: [http://www.mpi-hd.mpg.de/gerda/TG04\\_TECHNICAL/manuals/bg805186be\\_b\\_web.pdf](http://www.mpi-hd.mpg.de/gerda/TG04_TECHNICAL/manuals/bg805186be_b_web.pdf) starting from page 86.

To send a command you need to write the command starting from the register #102 and after write the length of the command in the register #100.

To receive information you need to write the command starting from the register #102, and after write the length of the request in the register #100. After that you need to wait till the register #101 changes from 0. The answer can be read starting from #102.

## Memory Map

Into the next table you can see the more important registers for communication with PLC. This communication method with the PLC should be used only by expert users.

Address	Name	Type	Comment
0	starRS232	WORD	If set to 1, the RS232 interface is reset. After the reset startRS232 is set to 0.
1	errorRS232	WORD	Contains the number of error in initializing RS232 interface
2	errorNAK	WORD	Contains the number of loss ACK in RS232 communication
30	sen	WORD	Contains the pressure channels to read from MaxiGauge; sen.0=Ch1; sen.1=Ch2...sen.5=Ch6
4	PR	Array of Real	It's the first register containing the pressure
46	Role	WORD	Role.0=Sec1; Role.1=Sec2...etc
48	RoleRT	WORD	Contains the status of the security: RoleRT.0=Sec1, etc...
47	RoleRem	WORD	Contains the rem status of the security:RoleRem.0=Rem of Sec1...
51	val	Array of Word	Contains the array of the status of valves: val[0]=Ve1, Val[1]=Ve2;val[2]=v1;val[3]=v23;val[4]=v2;val[5]=v21; val[6]=v22.
100	nByteIN	WORD	It's the register where write the length of command to communicate with a MaxiGauge device.
101	nByteOUT	WORD	It's the register wrote by PLC, containing the length of the answer.
102	dataIO	Array of Word	Contains both the command and the answer.

