**Brief description of the programming language**

***Introduction***

**variables:**

all variables must start and end with a dollar sign.

Example:

$x$

Variables are case sensitive, so $x$ is different from $X$

The variable $return$ is RESERVED. It is used to return values from macros.

Variables named $1$, $2$... are automatically assigned when parameters are sent to a macro.

To assign an initial value to a var the eval command must be used:

eval $x$,1

corresponds to $x$=1

**comments:**

line following the semicolon (;) are considered as comment and ignored

**log file:**

When program is executed and the connect button is pressed the variables (temperature etc.) will be automatically appended to log.txt file every 500 ms.

The following header is added first

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- PROCESS STARTS -

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date time

When the disconnect button is pressed the logging is interrupted and the following text is appended to log.txt:

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- PROCESS ENDED -

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date time

This helps to find the log data in the file.

***Commands list***

**log**

Print string to log file

use: log text

The command add the text to the log queue.

variables contained in text will be replaced automatically.

Example1:

log sample taken

it writes 'sample taken' into the log queue

Example2:

eval $x$,1

log x=$x$

it writes 'x=1' in the log queue

**buffer**

Buffer all commands; send later (with print). Used for long gcode sequences where the base command send will fail.

**print**

Send all buffered commands. Used for long gcode sequences where **send** will fail.

**ask**

Ask the insertion of a numerical input.

use: ask $varname$,title,question,initialvalue,minvalue,maxvalue

The procedure creates a window with title *title*, outputs the text contained in *question*, sets the initial value to *initialvalue* and limits the input range from *minvalue* to *maxvalue*

Example:

buffer

ask $ML$,Syringe 1,Enter how many ml to put,10,10,60

macro "syr1\_X\_ml"$ML$

print

**eval**

Evaluate a mathematical expression

use: eval $varname$,math\_expression

Example:

eval $ml$,185-$1$\*3.08334

macro "valve\_X\_exit\_2"0

send G1 Z$ml$,0;suck

send M400,0

macro "valve\_X\_exit\_1"0

macro "valve\_X\_exit\_2"1

send G1 Z185,0;eject

send M400,0

log loaded $ml$ ml from syringe 1

**exec**

Executes Python's code. Code might contain variables ($..$). Code on multiple lines must be separated with /n

use: exec code!,varname1=$var1$,...

**macro**

Call an existing macro

use: macro "macroname" var1,var2...

This command executes a macro with the name macroname.

All the macro files are saved in the directory macros with the extensions .txt and they can be edited with a plain text editor. Macro name can contain spaces.

It is possible to pass parameters to a macro by indicating their values: var1,var2...

Example:

macro "syr1\_X\_ml"20

If parameters are passed (var1,var2...) variables $1$... will be automatically created and assigned.

In the example above, the macro syr1\_X\_ml is called and the value 20 is inserted in the variable $1$ of the macro

**echo**

Print to the console. Variables are automatically substituted with their values before printing.

use: echo text $varname$

ask $X$,Vial X position,Enter vial X position,1,1,8

ask $Y$,Vial Y position,Enter vial Y position,1,1,6

eval $X$,58-($X$-1)\*15.71328

eval $Y$,121+($Y$-1)\*14.8

echo X=$X$ Y=$Y$

**send**

Send a Gcode command

use: send command,where

where indicates the number of the device for gcode output (0=SyringeBot, 1=Robot).

Example:

send G28 X Y,1

Please note that due to unsynchronized connections, only few commands (<10) can be sent in a sequence. For better performances and longer sequences use commands **buffer** and **print**

Example:

buffer

macro "syr1\_X\_ml"30

macro "syr1\_X\_ml"60

macro "syr1\_X\_ml"60

macro "purge syringe 1"

print