G-Codes list

G-codes			
Code	**Description**	**Mill (M) Lathe(L) Cutting table (C)**	**Comments**
G00	Rapid Positioning		
G01	Linear Interpolation		
G02	Arc CCW Interpolation		
G03	Arc CW Interpolation		
G04	Dwell		
G5.1	~~Spline Inrepolation~~		
G5.2	~~Nurbs Inrepolation~~		
G5.3	~~Nurbs Inrepolation End~~		
G10	Data Set		
G11	Mirror Cancel		
G12	Mirror X		
G13	Mirror Y		
G14	Mirror XY		
G15	Polar coordinates Off		
G16	Polar coordinates On		
G17	Plane XY		
G18	Plane ZX		
G19	Plane YZ		
G20	Unit Inches		
G21	Unit Metric		
G28	G28 Home		
G28.1	Home Position Set		
G28.2	Home Position #1 Save		
G28.3	Home Position #2 Save		
G28.4	Home Position #3 Save		
G28.5	Home Position #1 Restore		
G28.6	Home Position #2 Restore		
G28.7	Home Position #3 Restore		
G28.7	Home Position #3 Restore		
G28.9	Home Position Address		
G30	G30 Home		
G30.1	G30 Home Set		
G33	Spindle Synchronization		
G33	Spindle Synchronization		
G38.2	G38.2 Probing		
G38.3	G38.3 Probing		
G38.4	G38.4 Probing		
G38.5	G38.5 Probing		
G38.9	Tool Measure		
G40	Tool Correction Cancel		

G-codes			
Code	**Description**	**Mill (M) Lathe(L) Cutting table (C)**	**Comments**
G41	Tool Correction Left		
G42	Tool Correction Right		
G43	G43 Tool Length Offset		
G44	G44 Tool Length Offset		
G49	G49 Cancel Tool Length Offset		
G50	G50 Scaling Cancel	M	
G51	G51 Scaling Set	M	
G50	G50 Set Max Spindle Speed (Lathe)	L	
G53	Machine Coordinates	M L	
G54	Use Coordinate System #1	M L	
G55	Use Coordinate System #2	M L	
G56	Use Coordinate System #3	M L	
G57	Use Coordinate System #4	M L	
G58	Use Coordinate System #5	M L	
G59	Use Coordinate System #6	M L	
G59.1	Use Coordinate System #7	M L	
G59.2	Use Coordinate System #8	M L	
G59.3	Use Coordinate System #9	M L	
G59	Set Hypertherm Power Source Parameters (Plasma Cutting table only)		
G61	~~Exact Stop~~	M	
G62	~~Corner Override~~	M	
G63	~~Mode Tapping~~	M	
G64	~~Mode Cutting~~	M	
G65	G-code macro	M	
G68	Rotation Coordinates Mode On	M	
G69	Rotation Coordinates Mode Off	M	
G73	Cycle Deep Hole Drilling	M	
G74	Cycle Left Hand Tapping	M	
G76	Cycle Lathe Thread	L	
G76	Motion Mode Cancel	L	
G80	Cancel Motion Mode		
G81	Cycle Drilling		
G82	Cycle Drilling Dwell		
G83	Cycle Peck Drilling		
G84	Cycle Right Hand Tapping		
G85	Cycle Boring No Dwell Feed Out		
G86	Cycle Boring Spindle Stop Rapid Out		
G87	Cycle Back Boring		
G88	Cycle Boring Spindle Stop Manual Out		
G89	Cycle Boring Dwell Feed Out		
G90	Absolute Programming		
G91	Incremental Programming		

G-codes			
Code	**Description**	**Mill (M) Lathe(L) Cutting table (C)**	**Comments**
G90.1	Arc Center Absolute Programming		
G91.1	Arc Center Incremental Programming		
G92	Set Work Position	M	
G92	Lathe Thread	L	
G94	Feedrate Per Minute	L	
G95	Feedrate Per Revolution		
G96	Lathe Surface Speed	L	(constant surface for lathe)
G97	Set Spindle Speed	L	(revolutions per minute)
G98	TURN_FEEDRATE_PER_MINUTE	L	
G99	TURN_FEEDRATE_PER_REVOLUTION	L	
G98	Canned Return Back	M	
G99	Canned Return R	M	
G70	Unit Inches (2)		
G71	Unit Metric (2)		
G150	Tool Correction Radius Set		
Miscellaneous M-codes			
Code	**Description**	**Implementation**	**Comments**
M00	~~Pause~~		
M01	Optional Stop	PLC	
M02	End Program	Native + PLC	
M03	Spindle On CW	PLC	
M04	Spindle On CCW	PLC	
M05	Spindle Stop	PLC	
M06	Change Tool	Macro	
M07	Mist On (Cutting On)	PLC	
M07	Plasma Dot Marking	PLC	
M08	Flood On (Cutting On)	PLC	
M08	Plasma table - Drill Marking	PLC	
M09	All Coolant Off (Cutting Off)	PLC	
M14	THC Off	Native + PLC	Cutting tables
M15	THC On	Native + PLC	Cutting tables
M19	Spindle Orientation On	PLC	Lathe
M20	Spindle Orientation Off	PLC	Lathe
M20	Start Cutting	PLC	Cutting Tables
M21	Stop Cutting	PLC	Cutting Tables
M23	Thread Finishing On	PLC	Lathe
M24	Thread Finishing Off	PLC	Lathe
M30	End Program with Rewind Pointer	Macro	
M41	Set Low Gears	PLC	
M41	Set High Gears	PLC	

G-codes			
Code	**Description**	**Mill (M) Lathe(L) Cutting table (C)**	**Comments**
M45	Start Plasma Marking	PLC	Cutting Tables
M46	Stop Plasma Marking	PLC	Cutting Tables
M50 (1)	THC Off	PLC	Cutting Tables
M50 (2)	Hypertherm HPR source Off On-the-fly	Native + PLC	Cutting Tables
M50 (3)	Feed Override On/Off	Native + PLC	
M51	THC On	PLC	Cutting Tables
M62	Turn On binary output pin	PLC	
M63	Turn Off binary output pin	PLC	
M64	Turn On binary output pin	PLC	
M65	Turn Off binary output pin	PLC	
M71	Start Cutting	PLC	Cutting Tables
M72	Begin Plasma Marking Section	PLC	Cutting Tables
M73	End Plasma Marking Section	PLC	Cutting Tables
M74	Stop Cutting	PLC	Cutting Tables
M75-M88	User defined M-codes (Section 1)		
M92	Start Cutting	PLC	Cutting Tables
M93	Stop Cutting	PLC	Cutting Tables
M89	Start Marking	PLC	Cutting Tables
M90	Stop Marking	PLC	Cutting Tables
M98	Subroutine Run	Native	Cutting Tables
M99	Subroutine End	Native	Cutting Tables
M101-199	User defined M-codes (Section 2)		
M200-999	User defined M-codes (Section 3)		
Misc Macros			
Code	**Description**	**Implementation**	**Comments**
Homing			
M131	Homing X axis	Macro	
M132	Homing Y axis	Macro	
M133	Homing Z axis	Macro	
M134	Homing A axis	Macro	
M135	Homing B axis	Macro	
M136	Homing C axis	Macro	
M138	Homing All axes	Macro	
Tool Measure			
M131	Homing X axis	Macro	
M132	Homing Y axis	Macro	
M133	Homing Z axis	Macro	
M134	Homing A axis	Macro	
M135	Homing B axis	Macro	
M136	Homing C axis	Macro	
M138	Homing All axes	Macro	

G10 Data Set

G10 L P Q X Y Z A B C U V W

- G10 - data set
- L - code operation
- P - Parameter #1
- Q - Parameter #2
- X,Y,Z,A,B,C,U,V,W - coordinates/values

1. **L70** - set position to given values
    1. **P0** - Set **Machine Position** to given values

```
G10L70 P0 X0 Y0 (Set Machine coordinates X=0, Y=0)
```

    2. **P1** - Set Work Position in **G54** Coordinates system to given values

```
G10L70 P1 X10 Y20 Z30 (Set G54/Work coordinates X=10, Y=20, Z=30)
```

```
G10L70 P1 X0 Y0 Z0 A0 B0 C0 (Set G54/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

    3. **P2** - Set Work Position in **G55** Coordinates system to given values

```
G10L70 P2 X0 Y10 Z20 (Set G55/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P2 X0 Y0 Z0 A0 B0 C0 (Set G55/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

    4. **P3** - Set Work Position in **G56** Coordinates system to given values

```
G10L70 P2 X0 Y10 Z20 (Set G56/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P2 X0 Y0 Z0 A0 B0 C0 (Set G56/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

    5. **P4** - Set Work Position in **G57** Coordinates system to given values

```
G10L70 P4 X0 Y10 Z20 (Set G57/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P4 X0 Y0 Z0 A0 B0 C0 (Set G57/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

    6. **P5** - Set Work Position in **G58** Coordinates system to given values

```
G10L70 P5 X0 Y10 Z20 (Set G58/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P5 X0 Y0 Z0 A0 B0 C0 (Set G58/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

    7. **P6** - Set Work Position in **G59** Coordinates system to given values

```
G10L70 P6 X0 Y10 Z20 (Set G59/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P6 X0 Y0 Z0 A0 B0 C0 (Set G59/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

8. **P7** - Set Work Position in **G59.1** Coordinates system to given values

```
G10L70 P7 X0 Y10 Z20 (Set G59.1/Work coordinates X=0, Y=10, Z=20)
```

```
G10L70 P7 X0 Y0 Z0 A0 B0 C0 (Set G59.1/Work coordinates
X=0,Y=0,Z=0,A=0,B=0,C=0)
```

9. **P8** - Set Work Position in **G59.2** Coordinates system to given values
10. **P9** - Set Work Position in **G59.3** Coordinates system to given values
11. Current coordinates number is stored in Global variables register #5220. This register can be used to set Work coordinates in **the Current Coordinates System**

```
G10L70 P#5220 X0 Y10 Z20 (Set The Current Work coordinates X=0,
Y=10, Z=20)
```

```
G10L70 P#5220 X0 Y0 Z0 A0 B0 C0 (Set The Current Work coordinates
to X=0,Y=0,Z=0,A=0,B=0,C=0)
```

2. L80 - **Assign** value from **Q** to Register Address **P**

```
G10L80 P100 Q10 (//Assign "10" to Register #100 // #100=10 //)
```

3. L81 - **Copy** value from Register Address **Q** to Register Address **P**

```
G10L81 P100 Q10 (//Assign a value of Register #10 to Register #100 //
#100=#10 //)
```

4. L180 - **Add Q** value to Register Address **P** and store the result to Register Address **P**

```
G10L180 P100 Q10 (//Add 10 to Register #100 // #100=#100 + 10 //)
```

5. L181 - **Subtract Q** value from Register Address **P** and store the result to Register Address **P**

```
G10L181 P100 Q10 (//Subtract 10 from Register #100 // #100=#100 - 10
//)
```

6. L182 - **Mul** Register Address **P** by **Q** value and store the iresult to Register Address **P**

```
G10L180 P100 Q10 (//Multiply Register #100 by 10 // #100=#100 * 10 //)
```

7. L183 - **Divide** Register Address **P** to **Q**value and store the result to Register Address **P**

```
G10L180 P100 Q10 (//Divide Register #100 by 10 // #100=#100 / 10 //)
```

8. L184 - **Binary AND** value **Q** with Register Address **P** and store the result to Register Address **P**

```
G10L184 P100 Q66 (//Binary AND Register #100 with 66 // #100=#100 & 66
//)
```

9. L185 - **Binary OR** value **Q** with Register Address **P** and store the result to Register Address **P**

```
G10L185 P100 Q66 (//Binary OR Register #100 with 66 // #100=#100 | 66 //)
```

10. L186 - **Binary XOR** value **Q** with Register Address **P** and store the result to Register Address **P**

```
G10L186 P100 Q77 (//Binary XOR Register #100 with 77 // #100=#100 ^ 77 //)
```

11. L190 - **Add** value from Register Address **Q** with Register Address **P** and store the result to Register Address **P**

```
G10L190 P100 Q101 (//Add Register #100 with Register #101 // #100=#100 + #101 //)
```

12. L191 - **Subtract** value from Register Address **Q** from Register Address **P** and store the result to Register Address **P**

```
G10L191 P100 Q101 (//Subtract Register #101 from Register #100 // #100=#100 - #101 //)
```

13. L192 - **Mul** value from Register Address **Q** by Register Address **P** and store the result to Register Address **P**

```
G10L192 P100 Q105 (//Multiply Register #100 by Register #105 // #100=#100 * #105 //)
```

14. L193 - **Divide** value from Register Address **P** to Register Address **Q** and store the result to Register Address **P**

```
G10L193 P100 Q101 (//Divide Register #100 to Register #101 // #100=#100 / #101 //)
```

15. L194 - **ABS** calculate absolute value of Register Address **P** and store the result to Register Address **P**

```
G10L194 P100 (//Absolute value of Register #100 // #100=ABS(#100) //)
```

M07 - Plasma Dot Marking

M07 is used as Plasma Dot Marking. Dot Marking procedure is -

- Plasma Torch moves down till probe sensor activated
- The torch moves up to **Ignition Height**
- Plasma Power source is turned ON
- System wait Dot Time which is sum of **Plasma Power Source Delay Time** and **Dot Time**
- Plasma Power source is OFF
- Torch moves up to 20mm

M07 PLC procedure source code is below

M07.plc

```
#include pins.h
#include vars.h
#include func_ihc.h

main()
{
  portclr (OUTPUT_MARKER1);
  portclr (OUTPUT_MARKER2);

  do_plasma_probe();

  if (marker_ihc_dot_height<10) {marker_ihc_dot_height=10;}; //fix dot
height parameter is not correct

  gvarset(7080,ihc_move_down_speed);//set speed;

  g0moveA(0x0,0x4,marker_ihc_dot_height); //Z axis, ignition_height
  timer=100;do{ timer--; }while(timer>0); //wait 0.1sec till motion
started
  do { code=gvarget(6060); }while(code!=0x4d);//wait till motion
finished

  portset(OUTPUT_PLASMA); //PLASMA ON
  portset(OUTPUT_MARKER1);

  timer=marker_dot_time; //dot time
  timer=timer+marker_dot_delay; do{ timer--;}while(timer>0); //dot time
delay

  portclr(OUTPUT_PLASMA); //PLASM OFF
  portclr(OUTPUT_MARKER1);

  g0moveA(0x0,0x4,2000); //Z axis, ignition_height 20mm up
  timer=100;do{timer--;}while(timer>0); //pause 0.1sec for motion
starts
  do { code=gvarget(6060); }while(code!=0x4d);//wait till motion
finished

  proc=plc_proc_idle;
  exit(99);
};
```

M08 - Plasma cutting table - Drill Marking

M08 is used for Drill Marking operations on Plasma Cutting machines which have drill head. Drill Marking procedure is the following:

- Drill Head Cylinder and Drill Power turned ON
- Drill Head moves down on **Probing Speed** until **Drill probe sensor** activated
- Moving speed switched to **Drill Speed** and the Head move lower to programmed **Drill Depth**
- Drill Head moves up to **Lift Height**
- Drill Head Cylinder and Drill Power turned OFF

M08 PLC source code example is shown below

M08.plc

```
#include pins.h
#include vars.h
main()
{
  portset(OUTPUT_DRILL_VALVE);
  portset(OUTPUT_DRILL_POWER);

  gvarset(7080,drill_probe_speed ); //set speed;
  timer=200;do{timer--;}while(timer>0); //wait till drill head down

  sens=portget(INPUT_DRILL);
  if (sens==0)
  {
    g0moveA(0x0,0x4,0-30000); //Z axis
    timer=100;do{timer--;}while(timer>0); //wait till motion started
    do{
        code=gvarget(6060);
        sens=portget(INPUT_DRILL);
        if (sens!=0)
        {
          code=1;
          message=PLCCMD_LINE_STOP;//skip line
        };
      }while (code==0);
      do { code=gvarget(6060); }while(code!=0x4d); //wait till motion
finished
  };

  gvarset(7080,drill_speed);//set speed;
  if (drill_depth>50)
  {
    depth=0-drill_depth;
    g0moveA(0x0,0x4,depth);  //Z axis
    timer=200;do{timer--;}while(timer>0);   //wait till motion started
    do{code=gvarget(6060);}while(code!=0x4d);//wait till motion
finished
  };

  gvarset(7080,1000);//set speed up;

  if (drill_lift_height<100)
```

```
  {
    drill_lift_height=100;
  };

  g0moveA(0x0,0x4,drill_lift_height);   //drill head lift height
  timer=200;do{timer--;}while(timer>0); //wait till motion started
  do { code=gvarget(6060); }while(code!=0x4d); //wait till motion
finished

  portclr(OUTPUT_DRILL_VALVE);
  portclr(OUTPUT_DRILL_POWER);

  exit(99);
};
```

M45 - Start Plasma Marking

M45 - Start Plasma Marking is implemented through Hardware PLC procedure. The M45 source example is listed below. Functions should be described in include files “func_ihc.h” and “func_plasma.h”

- do_plasma_probe();
- do_move_ignition_height();
- do_wait_plasma();
- do_move_pcutting_height();

M45.plc

```
#include pins.h
#include vars.h
#include "func_ihc.h"
#include "func_plasma.h"

main()
{

    portclr (OUTPUT_MARKER1);
    portclr (OUTPUT_MARKER2);

    do_plasma_probe();
    do_move_ignition_height();

    portset(OUTPUT_PLASMA);
    portset(OUTPUT_MARKER1);

    do_wait_plasma();
    do_move_cutting_height();
```

```
    texit=timer+ihc_pierce_time;
    do{timer++;}while(timer<texit);

    start_thc();

    //set OK message and exit
    proc=plc_proc_plasma;
    message=PLC_MESSAGE_PLASMA_OK;
    exit(99);
};
```

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