

INSTRUCTION MANUAL

WIRE ELECTRICAL DISCHARGE MACHINE

MGW-G
MGW-H

PROGRAMMING

MAKINO MILLING MACHINE CO., LTD.

5WC1-NF02-9407(E)

TABLE OF CONTENTS

	Page
1. INPUT OF PROGRAMS	1-1
1.1 Tape Code	1-2
1.2 Characters Used in a Program	1-2
2. PROGRAM COMPOSITION	2-1
2.1 Leader	2-2
2.2 Taper Start	2-2
2.3 Program Start Area	2-2
2.4 Program Area	2-3
2.5 Program End	2-3
2.6 Tape End Area	2-3
3. PROGRAM AREA COMPOSITION	3-1
3.1 Blocks	3-1
3.2 Program Number	3-2
3.3 Comment Area	3-2
3.4 Sequence Number (N)	3-3
3.5 Block Skip (/)	3-4
4. ADDRESS WORDS	4-1
4.1 Kinds of Address Words	4-1
4.2 Input Format and Range of Command Values	4-2
4.3 Decimal Point Input	4-6
5. COORDINATE WORDS AND COMMAND METHODS	5-1
5.1 Kinds of Coordinate Words	5-1
5.2 Least Input Increment	5-2
5.3 Machine Coordinate System and Workpiece Coordinate System	5-3
5.4 Absolute and Incremental Commands	5-6
6. FEED RATE	6-1
6.1 Kinds of Feed Rate	6-1
6.2 Rapid Traverse	6-1
6.3 Dry Run Feed	6-2
6.4 F4 Digit Feed	6-2
6.5 Machining Feed	6-3
6.6 Touch Sensing Feed	6-3

7. PREPARATORY FUNCTIONS (G CODES)	7-1
7.1 Kinds of Preparatory Functions	7-1
7.2 Coordinate System Setting (G92)	7-6
7.3 Absolute and Incremental Commands (G90 and G91)	7-15
7.4 Rapid Traverse Linear Interpolation (G00)	7-16
7.5 Machining Linear Interpolation (G01)	7-17
7.6 Machining Circular Interpolation (G02, G03)	7-18
7.7 Wire Radius Compensation (G40, G41 and G42)	7-21
7.8 Taper Machining (G50, G51 and G52)	7-37
7.9 Dwell (G04)	7-51
7.10 Change of Setting Data (G10)	7-52
7.11 Work Limit (G22 and G23)	7-57
7.12 Taper Corner Arc Insertion (G24)	7-60
7.13 Spiral Interpolation (G25)	7-66
7.14 Rotation Copying (G26)	7-69
7.15 Automatic Return to and from the Reference Point (G28 and G29)	7-78
7.16 Return to 2nd – 4th Reference Point (G30)	7-81
7.17 Corner Shape Control (G43 and G44)	7-82
7.18 Corner Override (G45, G46)	7-84
7.19 Scaling (G47 and G48)	7-86
7.20 Same radius on the top and the bottom faces (G49)	7-90
7.21 Machining Coordinate System (G53)	7-92
7.22 Work Coordinate System Selection (G54 – G61)	7-93
7.23 Rotation (G68 and G69)	7-96
7.24 Mirror Image (G70 and G71)	7-101
7.25 X/Y axis change (G72 and G73)	7-106
7.26 C-Axis Centering (G75) (For W-PG1 only)	7-110
7.27 Workpiece Edge Positioning (G76)	7-111
7.28 Hole Centering (G77)	7-114
7.29 Wire Vertical Adjustment (G78)	7-116
7.30 Corner Edge Positioning (G79)	7-118
7.31 Groove Width Centering Positioning (G80)	7-121
7.32 Plate Width Centering in X axis (G81)	7-122
7.33 Plate Width Center Positioning on the Y axis (G82)	7-124
7.34 Cylinder Center-Measurement (G83)	7-125
7.35 Workpiece Parallelism Measurement on the X axis (G84)	7-128

7.36	Work Parallelism Measurement on the Y axis (G85)	7-130
7.37	Automatic Measurement Machining (G86, G87)	7-131
7.38	Automatic Wire (G89) → Automatic Wire Threading	7-139
7.39	Z Axis Position Control (G95)	7-142
7.40	Output to RS232C (G150 – G153)	7-144
7.41	Drawing Restriction (G580 – G583)	7-148
7.42	Inch Mode Diameter Compensation x 10 Resolution (G918, G919)	7-150
8.	DIRECTIONS ON A MULTIPLE COMMAND OF G26, G48, G68, G71, G73, ETC.	8-1
8.1	Multiple Command Processing Procedures	8-1
8.2	Coordinate System Changeover at the Time a Multiple Command is Executed (When mirror axis locking is off)	8-2
8.3	Coordinate System Setting at the Time a Multiple Command is Executed (Except for coordinate system rotation, mirror axis locking)	8-5
8.4	Mirror Axis Locking	8-5
9.	MISCELLANEOUS FUNCTIONS (M CODES)	9-1
9.1	Kind of Miscellaneous Functions	9-1
9.2	Program Stop (M00)	9-3
9.3	Optional Stop (M01)	9-4
9.4	End of Program (M02)	9-5
9.5	Discharge off (M05)	9-5
9.6	Automatic Wire Loading (M06)	9-6
9.7	Automatic Wire Threading Position Update (M06L1)	9-9
9.8	Intermediate Point Programming Function for Wire Break/ Power Failure Recovery (M06P_Q_R_)	9-10
9.9	Automatic Wire Cutoff (M07)	9-12
9.10	Machining ON/OFF (M17 and M18)	9-14
9.11	Initial Hole Machining (M20)	9-15
9.12	Work Tank Filling ON/OFF (M28 and M29)	9-15
9.13	End of Program and Rewind (M30)	9-17
9.14	Water Conductivity Check (M40) (Invalid by UPH-1)	9-17
9.15	Work Tank Down, Work Tank Up (M58, M59)	9-20
9.16	Automatic Work Changer (W, M66, M67, M68)	9-22
9.17	Water Flow Rate Control (M72)	9-25
9.18	Process Skip and Additional Machining (M74)	9-26
9.19	Reference Hole Retry (M75)	9-30

9.20 Subprograms (M98 and M99)	9-32
10. MACHINING CONDITION SELECTION (E NUMBER)	10-1
10.1 Machining Condition Selection Method	10-1
10.2 Directions on Programming E Numbers	10-2
11. OTHER FUNCTIONS	11-1
11.1 Vertical Irregular Shape Mode (P0, P1, P2)	11-2
12. PREPARATION AND EDITING OF PROGRAMS BY AN AUTOMATIC PROGRAMMING DEVICE	12-1
12.1 Classification of Addresses Used by this NC Device	12-1
12.2 Preparation of Programs by an Automatic Programming Device	12-1
12.3 Program Editing Methods	12-2
12.4 Examples of Program Editing	12-4
13. METRIC SYSTEM, INCH SYSTEM AND RESOLUTION	13-1
14. INQUIRY	14-1