MITSUBISHI ELECTRIC
Changes for the Better

Automating the World

FACTORY AUTOMATION

NC EDM SYSTEMS
SG series

SG
series

Maisart

D-CUBES

Our Factory Automation business is focused on "Automating the World" to make it a better, more sustainable environment supporting manufacturing and society, celebrating diversity and contributing towards an active and fulfilling role.

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

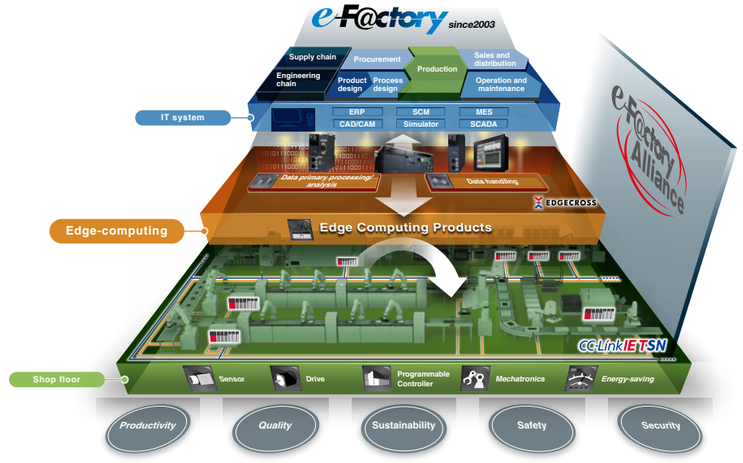
Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

SUSTAINABLE DEVELOPMENT GOALS

The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

Mitsubishi Electric continues the challenge to be the only one FA machine and systems supplier delivering total customer satisfaction.



Mitsubishi Electric is a world-leading general electrical and electronic products manufacturer with wide-ranging business reach, from appliances for the home to systems used in outer space. Global-scale business development is in five business domains: heavy electrical machinery and systems, industrial automation, information and communication systems, electronic devices, and home appliances. Producing general electrical machinery for over 90 years, as Mitsubishi Electric's Factory Automation Systems Business Group, we have supported manufacturing in Japan, China, and Asia, and around the globe. In doing so, we have accumulated and refined technologies for FA control, drive control, automation, and manufacturing that are utilized to expand and improve a vast product line-up, such as controllers, drives, and automation and power distribution control products. In addition to product components like those listed above, we are quick to propose systems such as e-F@ctory and iQ Platform as solutions for production site innovation. As a comprehensive supplier of FA products and systems, Mitsubishi Electric will continue to respond to the voice of customers and deliver products of the utmost quality throughout the world.

INDEX

History of Mitsubishi Electric EDMs is history of electrical-discharge machining

1964–

1964

DM201
Production started 1964
Thyristor power supply
Hydraulic servo system

1965

DM500+DE90T
Began shipment in Nov. 1965

1967

DM250+DE30T
Began shipment in Feb. 1967
Transistor pulse power supply

1971

DM100
Began shipment in Dec. 1971

1972

DM300N+EP120M
Began shipment in Jul. 1972

1974

DK700
Began shipment in Oct. 1974

1976

DK280
Began shipment in Apr. 1976

1978

DK140
Began shipment in Sep. 1978

1980–

1980

DK360NC
Began shipment in May 1980

1982

M30
Began shipment in Jan. 1982
Motor servo system

1982

M35C2
Began shipment in May 1982

1982

M55
Began shipment in Dec. 1982

1982

M25C3
Began shipment in Dec. 1982

1982

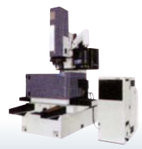
M55C6
Began shipment in Dec. 1982
Equipped with 16bit CNC

1986

M25KC4
Began shipment May 1986
Equipped with ultralow-wear power supply (slope control system)

1986

M35K
Began shipment in May 1986



1987

M85KW
Began shipment in Feb. 1987

1988

M115K
Began shipment in Jan. 1988

1988

EML20
Began shipment in Aug. 1988

1989

M35J
Began shipment in May 1989

1989

M35S
Began shipment in Dec. 1989

1990–

1990

M65E
Began shipment in Mar. 1990

1991

V35F
Began shipment in Feb. 1991
Equipped with 32bit CNC and FUZZY Control

1992

VP35F
Began shipment in Jun. 1992
NS powder specifications

1994

ADMAQ-E
Began shipment in Oct. 1994

1994

VX10
Began shipment in Dec. 1994

1995

VX20
Began shipment in Jan. 1995

1995

EX8
Began shipment in Jan. 1995

1996

EX30
Began shipment in Jun. 1996

1996

EDSCAN8E
Began shipment in May. 1996

1999

EA12E
Began shipment in Aug. 1999
Equipped with 64bit CNC

1999

EA8
Began shipment in Oct. 1999

2000–

2001

VA10
Began shipment in Apr. 2001

2001

MA2000
Began shipment in May 2001
Equipped with thermal displacement compensation

2004

EA8P
Began shipment in Feb. 2004

2004

EA12V
Began shipment in Apr. 2004
Equipped with V power supply (tungsten carbide circuit standard equipment)

2006

EA8PV
Began shipment in Jun. 2006
Equipped with ultrafine matte finish circuit (NP circuit)

2007

EA28V
Began shipment in Jan. 2007

2008

EA12V ADVANCE
Began shipment in Feb. 2008
Equipped with ADVANCE control device

2008

EA28V ADVANCE
Began shipment in Feb. 2008

2008

EA8PV ADVANCE
Began shipment in Feb. 2008

2010–

2014

EA8S
Began shipment in Feb. 2014

2015

EA12S
Began shipment in Mar. 2015

2016

EA8PS
Began shipment in Feb. 2016

2016

EA12PS
Began shipment in Feb. 2016

2018

SV12P
Began shipment in Aug. 2018

2019

SG12
Began shipment in May. 2019

2021

SG28
Began shipment in Nov. 2021

2023

SG8
Front door specifications

Future manufacturing built with AI

SG series

Die-sinker EDM pursuing high productivity

Maisart

D-CUBES

SG series

NC-EDM Systems

An extensive product line-up ready to support most diversified needs, from high-precision machining of small workpieces to highly productive machining of large workpieces. Mitsubishi Electric die-sinker EDMs offer comprehensive solutions that contribute to improving productivity of customers' facilities.

High precision machine

SV-P series

High-end model incorporating AI technology (Maisart) to pursue both accuracy and productivity

Maisart

D-CUBES

High productivity machine

SG series (Automatic elevation working tank)

SG series (front door)

Supports various machining needs in pursuit of higher productivity

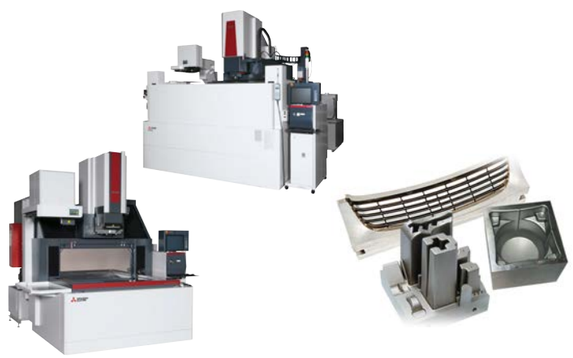
Maisart

D-CUBES

Large-size high performance machine

EA-V ADVANCE series

Standard model pursuing high performance and high productivity



Line-up

Equipped with latest IoT-compatible control unit for stable machining and higher productivity.

High productivity machine

SG8

(Automatic elevation working tank)

Maisart

D-CUBES

Automatic elevation working tank specifications

Model		SG8M
Axis travel	[mm]	X:300 Y:250 Z:250
Max workpiece dimensions(W x D x H)	[mm]	770×490×200
Max. workpiece weight	[kg]	550
Max. electrode weight	[kg]	25

SG8

(Front door)

Maisart

D-CUBES

Front door specifications

Model		SG8M
Axis travel	[mm]	X:300 Y:250 Z:250
Max workpiece dimensions(W x D x H)	[mm]	770×490×200
Max. workpiece weight	[kg]	550
Max. electrode weight	[kg]	25

Standard functions

- Adaptive control (Maisart/IDPM3)
- HGM2 circuit
- Thin LCD operation box
- SS Jump
- Built-in scheduler
- Machining Monitor Screen
- Dielectric fluid distributor

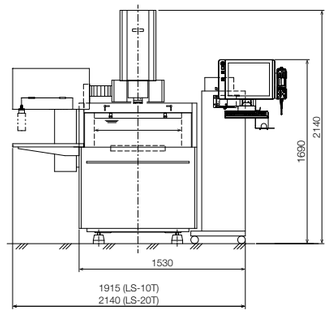
Option

- XY axis Liner scale
- Z axis Liner scale
- Automatic clamp
- High-rigidity C-axis
- LS type tool changer (For Automatic elevation tank)
- Shuttle type tool changer (4T) (For front door)
- SP power supply*
- 3D check function
- External signal output
- Warning light (Tower/Built-in)
- Anti-virus protection
- Dielectric fluid suction function
- Dielectric fluid emission automatic control function

* When SP power supply is used, machine installation dimensions differ.
Detail on the other page

SG8 <Automatic elevation working tank> (Unit: mm)

<Outline drawing>



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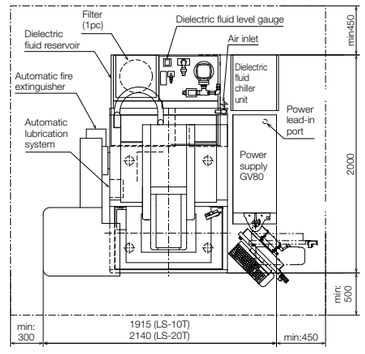


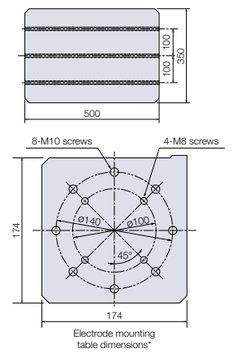
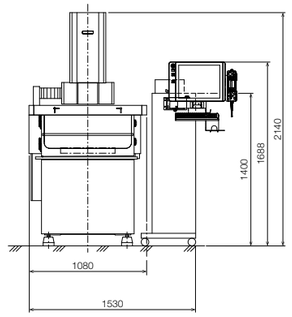


*Table above lists basic specifications.
Specifications are different from table above when High-rigidity C-axis/Automatic clamp (option) is attached.

SG8 <Front door> (Unit: mm)

<Outline drawing>



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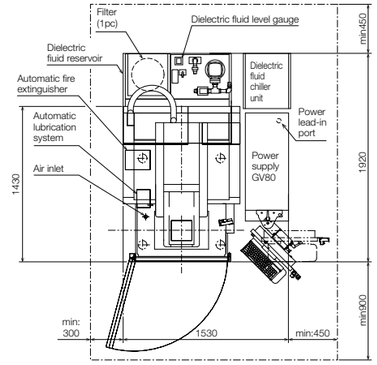

Machine main unit (Standard specifications without C-axis)

Model			SG8M	
			Automatic elevation tank	Front door
Machine main unit	Dimensions (W x D x H)	[mm]	1530 × 2000 × 2140	1530 × 1920 × 2140
	Total system weight	[kg]	2000	
Axial travel	(X × Y × Z)	[mm]	300 × 250 × 250	
Z-axis	Distance between table and electrode mounting surface	[mm]	150 to 400	
	Max. electrode weight	[kg]	25	
Working tank	System		Automatic elevation system	Hinge open-door
	Inner dimensions (W × D × H)	[mm]	800 × 520 × 300	
	Fluid level adjustment range (from top of table)	[mm]	60 to 250	110 to 250
Table	Dimensions (W×D)	[mm]	500 × 350	
	Max. workpiece dimensions (W × D × H)	[mm]	770 × 490 × 200	
	Distance between floor and top of table	[mm]	900	
	Max. workpiece weight	[kg]	550	
	T-slot	[mm]	Width 12, pitch 100, 3slots	
Dielectric fluid reservoir	Capacity (initial dielectric fluid supply amount)	[L]	260 (270)	260 (260)
	Filtering system		Paper filter 1pc	
	Dielectric fluid chiller unit		Unit cooler	

Distance between table and electrode mounting surface

			EROWA ITS	3R MACRO	3R Combi MACRO	3R Combi Jr
SG8M (Automatic elevation tank)	High-rigidity C-axis	[mm]	150 to 400	133 to 383	133 to 383	143 to 393
	Automatic clamp	[mm]	150 to 400	148 to 398	148 to 398	158 to 408
SG8M (Front door)	High-rigidity C-axis	[mm]	150 to 400	133 to 383	133 to 383	143 to 393
	Automatic clamp	[mm]	150 to 400	148 to 398	148 to 398	158 to 408

C-axis (Standard)/ ATC (Option)

				EROWA ITS	EROWA COMBI	3R MACRO	3R Combi
C-axis	Max. electrode weight	10*1	[kg]	○	○	○	○
	Speed (rpm)	1 to 30	[min⁻¹]				

*1 For macro Jr of 3R combi and Compact of EROWA COMBI, weight is 2.5 kg/ electrode.

				EROWA ITS	EROWA COMBI	3R MACRO	3R Combi
ATC	LS-10T*2	Max. electrode dimensions	54×54×200 [mm]	○*6	○*7	○	○*5 *8
		Max. electrode weight	5kg/ electrode*4 Magazine total: 20kg				
	LS-20T*2	Max. electrode dimensions	54×54×200 [mm]	○*6	○*7	○	○*5 *8
		Max. electrode weight	10kg/electrode*4 Magazine total: 40kg				
	Shuttle-4T*3	Max. electrode dimensions	70×70×100 [mm]	○	–	○	–
		Max. electrode weight	5kg/ electrode Magazine total: 20kg				

*2 Mountable only for machine with automatic elevation working tank.
*3 Mountable only for machine with front door.
*4 For MACRO of 3R Combi, weight is 5kg/ electrode, is 2.5kg/ electrode with MACRO Jr, and Compact of EROWA COMBI, weight is 2.5kg/ electrode.
*5 Magazine total of 3R Combi is 40Kg .
*6 Only ITS50 specifications is available, and centering plate 50 can be used.
*7 Centering plate 50 and Compact can be used each other.
*8 For 3R Combi Macro and Macro Jr can be used each other.

Delivery machine size

[mm]

		SG8M (Automatic elevation tank)		SG8M (Front door)	
		Width	Height	Width	Height
Without ATC		1080	2140	1080	2140
LS type	10T	1465	2140	–	–
	20T	1690	2140	–	–
Suttle type	4T	–	–	1416	2140

Line-up

SG12
(Automatic elevation working tank)

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Automatic elevation working tank specifications

Model		SG12M
Axis travel	[mm]	X:400 Y:300 Z:300
Max workpiece dimensions(W x D x H)	[mm]	900×650×350
Max. workpiece weight	[kg]	1000
Max. electrode weight	[kg]	50

SG12
(Front door)

Maisart
D-CUBES

Front door specifications

Model		SG12M
Axis travel	[mm]	X:400 Y:300 Z:300
Max workpiece dimensions(W x D x H)	[mm]	900×650×350
Max. workpiece weight	[kg]	1000
Max. electrode weight	[kg]	50

Standard functions

- Adaptive control (Maisart/IDPM3)
- HGM2 circuit
- Z axis Liner scale
- Thin LCD operation box
- SS Jump
- Built-in scheduler
- Machining Monitor Screen
- Dielectric fluid distributor

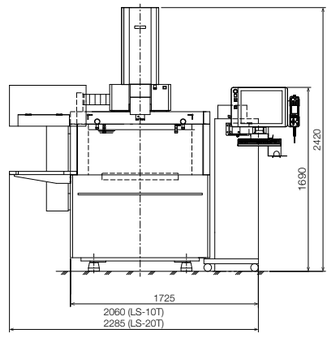
Option

- XY axis Liner scale
- Automatic clamp
- High-rigidity C-axis
- LS type tool changer (For automatic elevation tank)
- Shuttle type tool changer (4T) (For Front door)
- GV120 power supply
- SP power supply*
- 3D check function
- External signal output
- Warning light (Tower/Built-in)
- Anti-virus protection
- Dielectric fluid suction function
- Dielectric fluid emission automatic control function

* When SP power supply is used, machine installation dimensions differ.
Detail on the other page

SG12 <Automatic elevation working tank> (Unit: mm)

<Outline drawing>



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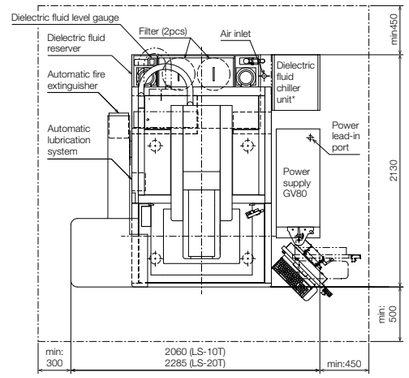
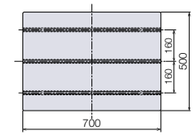




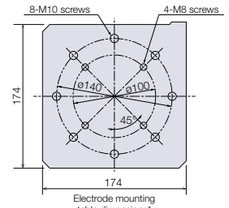
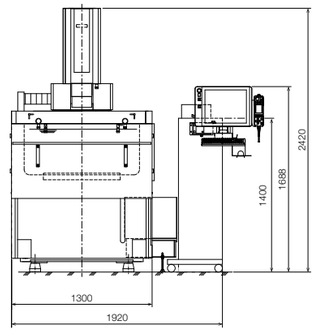


*Table above lists basic specifications.
Specifications are different from table above when High-rigidity C-axis/Automatic clamp (option) is attached.

SG12 <Front door> (Unit: mm)

<Outline drawing>



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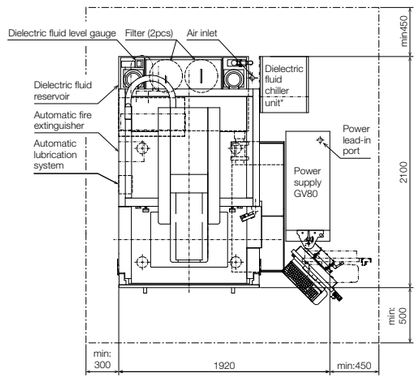

*When GV120 selected, it will be moved backward 60mm.

Machine main unit (Standard specifications without C-axis)

Model			SG12M	
			Automatic elevation tank	Front door
Machine main unit	Dimensions (W x D x H)	[mm]	1725 × 2130 × 2420	1920 × 2100 × 2420
	Total system weight	[kg]	3500	3400
Axial travel	(X × Y × Z)	[mm]	400 × 300 × 300	
Z-axis	Distance between table and electrode mounting surface	[mm]	200 to 500	300 to 600
	Max. electrode weight	[kg]	50	
Working tank	System		Automatic elevation system	Front door
	Inner dimensions (W × D × H)	[mm]	950 × 700 × 450	1050 × 700 × 450
	Fluid level adjustment range (from top of table)	[mm]	60 to 400	210 to 400
Table	Dimensions (W×D)	[mm]	700 × 500	
	Max. workpiece dimensions (W × D × H)	[mm]	900 × 650 × 350	
	Distance between floor and top of table	[mm]	900	
	Max. workpiece weight	[kg]	1000	
	T-slot	[mm]	Width 12, pitch 160, 3slots	
Dielectric fluid reservoir	Capacity (initial dielectric fluid supply amount)	[L]	360 (470)	550 (590)
	Filtering system		Paper filter 2pcs	
	Dielectric fluid chiller unit		Unit cooler	

Distance between table and electrode mounting surface

			EROWA ITS	3R MACRO	3R Combi MACRO	3R Combi Jr
SG12M (Automatic elevation tank)	High-rigidity C-axis	[mm]	200 to 500	183 to 483	183 to 483	193 to 493
	Automatic clamp	[mm]	200 to 500	198 to 498	198 to 498	208 to 508
SG12M (Front door)	High-rigidity C-axis	[mm]	265 to 565	248 to 548	248 to 548	258 to 558
	Automatic clamp	[mm]	316 to 616	298 to 598	298 to 598	308 to 608

C-axis (Standard)/ ATC (Option)

				EROWA		3R	
				ITS	COMBI	MACRO	Combi
C-axis	Max. electrode weight	50*1	[kg]	○	○	○	○
	Speed (rpm)	1 to 30	[min⁻¹]				

*1 For macro Jr of 3R combi and Compact of EROWA COMBI, weight is 2.5 kg/ electrode.

					EROWA		3R	
					ITS	COMBI	MACRO	Combi
ATC	LS-10T*2	Max. electrode dimensions	54×54×200	[mm]	○*6	○*7	○	○*5 *8
		Max. electrode weight	5kg/ electrode*4 Magazine total: 20kg					
	LS-20T*2	Max. electrode dimensions	54×54×200	[mm]	○*6	○*7	○	○*5 *8
		Max. electrode weight	10kg/electrode*4 Magazine total: 40kg					
	Shuttle-4T*3	Max. electrode dimensions	70×70×100	[mm]	○	–	○	–
		Max. electrode weight	5kg/ electrode Magazine total: 20kg					

*2 Mountable only for machine with automatic elevation working tank.
*3 Mountable only for machine with front door.
*4 For MACRO of 3R Combi, weight is 5kg/ electrode, is 2.5kg/ electrode with MACRO Jr, and Compact of EROWA COMBI, weight is 2.5kg/ electrode.
*5 Magazine total of 3R Combi is 40Kg.
*6 Only ITS50 specifications is available, and centering plate 50 can be used.
*7 Centering plate 50 and Compact can be used each other.
*8 For 3R Combi Macro and Macro Jr can be used each other.

Delivery machine size

[mm]

		SG12M (Automatic elevation tank)		SG12M (Front door)	
		Width	Height	Width	Height
Without ATC		1280	2420	1505	2420
LS type	10T	1615	2420	–	–
	20T	1840	2420	–	–
Suttle type	4T	–	–	1788	2420

Line-up

SG28

Maisart

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Automatic elevation working tank specifications (standard)

Model		SG28M
Axis travel	[mm]	X:650 Y:450 Z:400
Max workpiece dimensions(W x D x H)	[mm]	1050×760×350
Max. workpiece weight	[kg]	2000
Max. electrode weight	[kg]	200

Standard functions

- Adaptive control (Maisart/IDPM3)
- HGM2 circuit
- Z axis Liner scale
- Thin LCD operation box
- Thermal displacementcompensation system
- Automatic elevation working tank
- SS Jump
- Built-in scheduler
- Machining Monitor Screen
- Dielectric fluid distributor

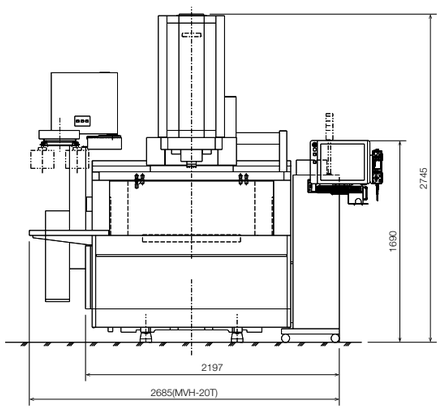
Option

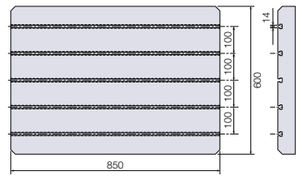
- XY axis Liner scale
- High-rigidity C-axis
- High-accuracy built-in spindle
- Automatic clamp
- LS /MVH type tool changer
- Large electrode adaptor (T slot/ Dovetail)
- GV120 power supply
- NP2 circuit
- 3D check function
- External signal output
- Warning light (Tower/Built-in)
- Anti-virus protection
- Dielectric fluid suction function
- Dielectric fluid emission automatic control function

Detail on the other page

SG28

<Outline drawing>





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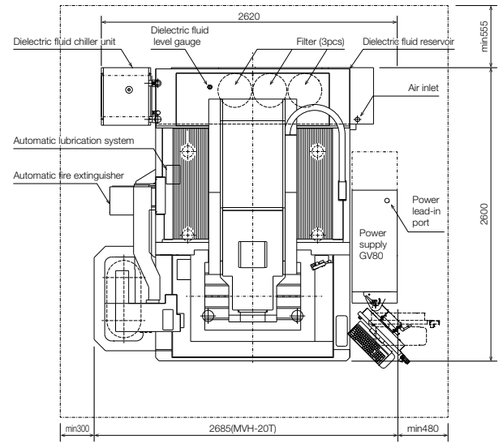
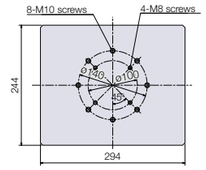
(Unit: mm)





Electrode mounting table dimensions*

* Table above lists basic specifications.
Specifications are different from table above when High-rigidity C-axis/Built-in spindle/Automatic clamp (option) is attached.

Machine main unit (Standard specifications without C-axis)

Model			SG28M
Machine main unit	Dimensions (W x D x H)	[mm]	2620 × 2600 × 2745
	Total system weight	[kg]	5600
Axial travel	(X × Y × Z)	[mm]	650 × 450 × 400
Z-axis	Distance between table and electrode mounting surface	[mm]	280 to 680
	Max. electrode weight	[kg]	200
Working tank	System		Automatic elevation system
	Inner dimensions (W × D × H)	[mm]	1100 × 810 × 450
	Fluid level adjustment range (from top of table)	[mm]	75 to 400
Table	Dimensions (W × D)	[mm]	850 × 600
	Max. workpiece dimensions (W × D × H)	[mm]	1050 × 760 × 350
	Distance between floor and top of table	[mm]	900
	Max. workpiece weight	[kg]	2000
	T-slot	[mm]	Width 14, pitch 100, 5slots
Dielectric fluid reservoir	Capacity (initial dielectric fluid supply amount)	[L]	390 (595)
	Filtering system		Paper filter 3pcs
	Dielectric fluid chiller unit		Unit cooler

Distance between table and electrode mounting surface

			EROWA ITS	3R MACRO	3R Combi	
					MACRO	Jr
SG28M	High-rigidity C-axis	[mm]	175 to 575	158 to 558	158 to 558	168 to 568
	Spindle	[mm]	154 to 554	137 to 537	137 to 537	147 to 547
	Automatic clamp	[mm]	175 to 575	158 to 558	—	—

C-axis (Standard)/ ATC (Option)

					EROWA		3R	
					ITS	COMBI	MACRO	Combi
C-axis		Max. electrode weight	50*1	[kg]	○	○	○	○
		Speed (rpm)	1 to 30	[min⁻¹]				
	Spindle type	Max. electrode weight	10*1	[kg]	○	○	○	○
		Speed (rpm)	1 to 1500	[min⁻¹]				

*1 For macro Jr of 3R combi and Compact of EROWA COMBI, weight is 2.5 kg/ electrode.

					EROWA		3R	
					ITS	COMBI	MACRO	Combi
ATC	LS-10T	Max. electrode dimensions	54×54×200	[mm]	○*4	○*6	○	○*7
		Max. electrode weight	5kg / electrode*2 Magazine total: 20kg					
	LS-20T	Max. electrode dimensions	54×54×200	[mm]	○*4	○*6	○	○*7
		Max. electrode weight	10kg/ electrode*2 Magazine total: 40kg					
	MVH-20T	Max. electrode dimensions	70×70×200	[mm]	○*5	×	○	○*7
		Max. electrode weight	10kg/ electrode*2 Magazine total: 80Kg*3					
	MVH-40T	Max. electrode dimensions	70×70×200	[mm]	○*5	×	○	○*7
		Max. electrode weight	10kg / electrode*2 Magazine total: 80Kg*3					

*2 For MACRO of 3R Combi, weight is 5kg/ electrode, is 2.5kg/ electrode with MACRO Jr, and Compact of EROWA COMBI, weight is 2.5kg / electrode.
*3 For MACRO and MACRO Jr of 3R Combi, magazine total is 40kg .
*4 Only ITS50 specifications is available, and centering plate 50 can be used.
*5 ITS50 or ITS100 specifications available. For ITS100 specifications, Centering plate 100 and 50 can be used.
*6 Centering plate 50 and Compact can be used each other.
*7 For 3R Combi Macro and Macro Jr can be used each other.

Delivery machine size

[mm]

		SG28M	
		Width	Height
Without ATC		1990	2745
LS type	10T	2346	2745
	20T	2395	2745
MVH type	20T	2475	2745
	40T*8	2281	2745

*8 MVH-40T is shipped with the ATC body removed, so a crane is required for installation.

Functions and Features

New functions to further innovate machining performance.

Maisart D-CUBES

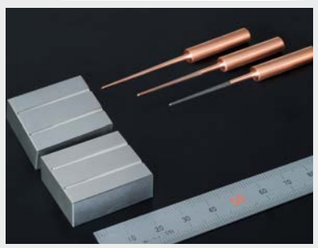
High productivity

Refer to P19 to P20

AI adaptive control: Maisart

Automatic depth recognition improves stability in deep machining such as gate machining.

- Optimal machining control with AI and high-speed jump significantly improve machining efficiency.

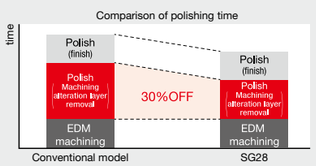


Surface quality improvement <SG28>

- High rigidity structure and new power supply etc. improve machining surface quality.
- A small number of pinholes and small pinholes on surface are realized.

IDPM3

- Machining speed is up to 50% faster with combination of highly accelerated (1.6G) jump control and adaptive control “IDPM3”.
- Suppresses edge wear enables single electrode machining. Electrode cost, setup and machining time are significantly reduced.



Workability

Refer to P22

3-sided automatic

- Elevation working tank provides high accessibility to machine for setup and easily automated.
- Visualization of machine's operation status with built-in warning light (option).
- Large electrode can be exchanged easily by electrode remove/mount timer.
- Condition of back side of workpiece is possible to check by installing stainless steel plate at back of working tank. (SG28)
- Heights of working tank and fluid level are adjusted automatically according to height of the head.

3-sided automatic elevation working tank

Steel plate at back of working tank (SG28 compatible)

Operability

Refer to P21 to P24

- 19 inch touch screen.
- HOME Screen is like a smartphone. Possible to reach various screen by “short-cut menu”.
- Navigation menu supports operation from setup to machining.
- New thin operation box is a standard equipment.
- Optimal conditions can be searched by refined search. selected machining conditions can be easily adjusted with adjustment bar.

HOME monitor

New operation box

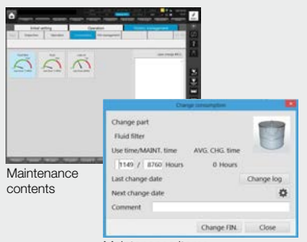
Visualization monitor

Condition search screen

- “Action menu” helps your operation. Table form programing display “ESPER D-CUBES”.

ESPER

- Centralized management of consumables. Consumables screen manages usage time and replacement log of consumables.
- Power saving function to reduce power consumption. Reduces standby power consumption during idling at night, etc.



Maintenance contents

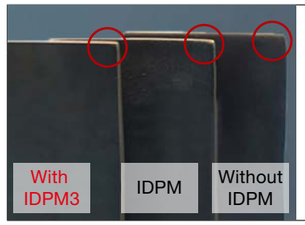
Maintenance items

e-Factory

Maisart

D-CUBES

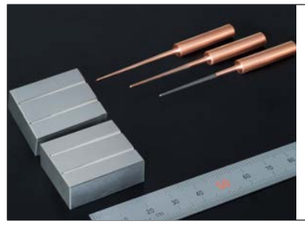
Samples



High speed machining with low electrode wear by IDPM3+SS jump

Model	SG12
Electrode	Graphite (TTK5)
Workpiece	Steel (SKD61)
Surface Roughness	Rz12.0μm/ Ra2.0μm
Machining accuracy	±0.010mm

- High speed machining with Maisart. (machining depth: 40 mm, rough machining: 1.6 hours).
- Ultimate Low wear machining with IDPM3.(Electrode wear length: reduction by 50% or more compared with conventional model)



Up to 30% faster submarine gate machining

Model	SG8
Electrode	Copper (ø1.2mm)
Workpiece	Steel (STAVAX)
Surface Roughness	Rz4.0μm/ Ra0.6μm
Machining accuracy	±0.003mm

- Automatic depth recognition and stable servo control with Maisart improve machining stability.
- Jump control according to machining progress raises discharging efficiency of sludge, shortening machining time (reduced by up to 30% compared with conventional model).

Machining time reduced by 30% by machining stabilization control

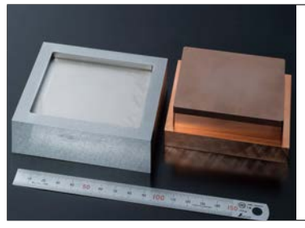
Model	SG12
Electrode	Copper (ø20/ ø30mm)
Workpiece	Steel (STAVAX)
Surface Roughness	Rz4.0μm/ Ra0.5μm
Pre-machining left margin	±0.15mm

- Stable finish surface machining is possible with newly installed stabilization control.
- Achieving both stabilization of machining and shortening of machining time by AI technology “Maisart”.

Machining time reduced by up to 25%

Model	SG12
Electrode	Graphite (TTK9)
Workpiece	Steel (SKD11)
Surface Roughness	Rz10μm/ Ra1.4μm
Machining accuracy	±0.010mm

- Maisart's automatic depth recognition /discrimination function and servo stability control reduce machining time by up to 25%.
- Electrode length wear of up to 50% with IDPM3.



70×80mm cavity machining

Model	SG12
Electrode	Copper (70×80mm)
Workpiece	Steel (S-STAR)
Surface Roughness	Rz5.0μm/ Ra0.7μm
Machining accuracy	Bottom flatness 5μm or less

- Automatic depth recognition and stable servo control with Maisart make uniform surface finish, reduction copper electrode low wear, reduction of burr and shortening of machining.
- Bottom of large area is machinable to a flatness within 5μm, Copper electrode wear and burrs are reduced thanks to higher rigidity and thermal buster function.

Graphite machining

Model	SG28
Electrode	Graphite (TTK5&9)
Workpiece	Steel (SKD61)
Surface Roughness	Rz6 to 7μm (Side, Bottom)
Machining depth	50mm

- Stable machining is possible by high responsive servo and uniform surfaces of side and bottom are improved.
- Thermal displacement for machine is controlled and stable accuracy for long-time machining is kept by thermal displacement compensation.
- Hole on electrode to release gas which is particular for large shape is unnecessary by jump function with AI.

Machining Accuracy

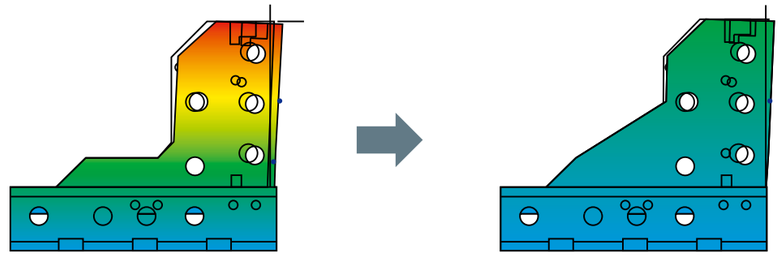
Machining from fine to large size can be realized with high accuracy and high productivity.

High Rigidity Construction

- High rigidity construction is realized by structural change of cast.
  - Middle-Large area machining performance is improved.

<SG28>

- New model structure that Corresponds high speed jump, Z axis long stroke and lowering of distance between table and electrode mounting surface is adopted.
- Tracking performance to command value is improve by reviewing Z axis drive servo system.

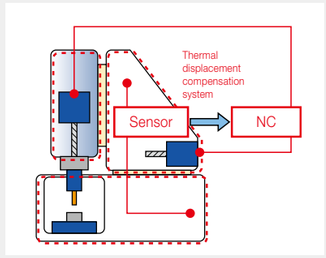


Conventional model　　SG series

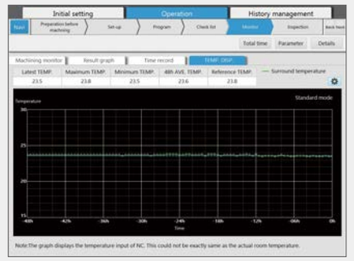
Thermal displacement compensation system (Only SG28 compatible)

- Thermal displacement of machine is reduced by Thermal displacement compensation system.
- Temperature change can visualized with 'visualization monitor'.
- High accuracy wide stroke pitch machining is realized with in-house NC equipments + original servo.

Explanatory view of thermal displacement compensation system

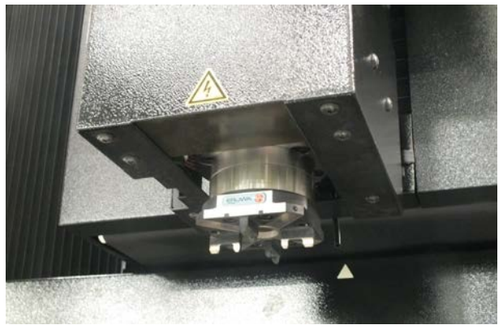


Temperature display screen



High-rigidity C-axis/ High precision spindle (SG28 Option)

- Highly accurate helical machining and index machining are possible.
- High-accuracy, high-rigidity C-axis with increased permission moment of inertia.



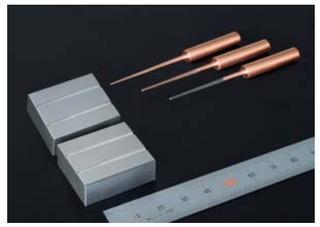
Productivity

Sensing technology (D-CUBES) and AI technology (Maisart) optimize machining in real time.

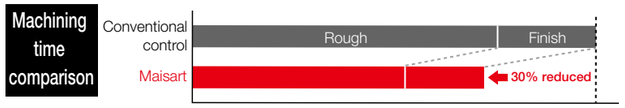
AI adaptive control: Maisart

Automatic depth recognition improves stability in deep machining such as gate machining

- Optimal machining control by AI and high-speed jump significantly improve machining efficiency.



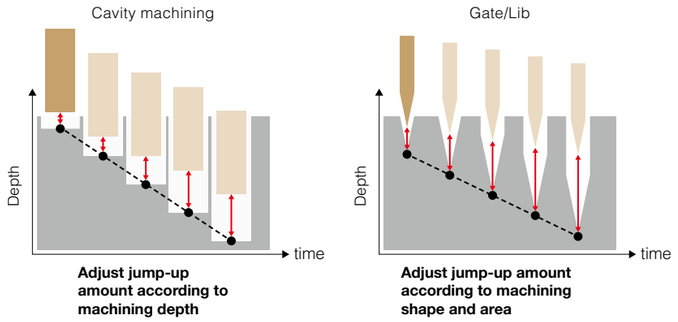
AI adaptive control that enables stable gate machining at high speed



Machining state self-judgement

Control to stabilize machining is optimized due to judging machining state by itself with AI.

- Machining conditions are automatically adjusted according to prioritizing setting machining speed or electrode wear.
- Concentrated discharge is judged for each jump, and concentrated discharge is detected and suppressed at an early stage to improve machining stabilization and machining speed.



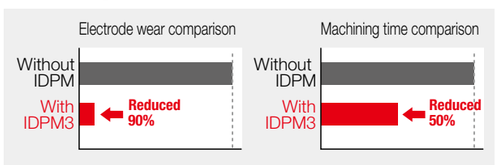
Adjust jump-up amount according to machining depth

Adjust jump-up amount according to machining shape and area

Machining adaptive control: IDPM3

High-speed/ Low-wear machining with graphite electrodes

- High speed and low wear improve productivity even when machining with multiple electrodes.
- Suppresses edge wear, enables single electrode machining.

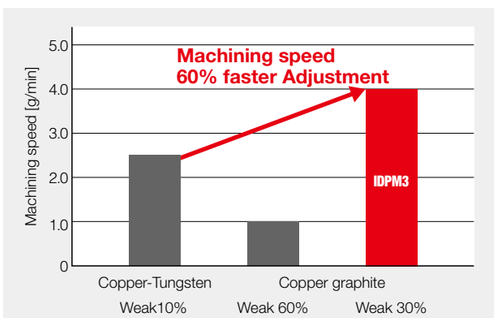


Conventional model:EA-V ADVANCE

Workpiece
Steel (SKD11)
Electrode
Graphite (TTK5)
Machining depth
30mm
Surface roughness
Rz12μm/Ra2.0μm

Tungsten carbide high-speed machining

- Machining speed is improved up to 60% with copper-graphite electrode and IDPM3.

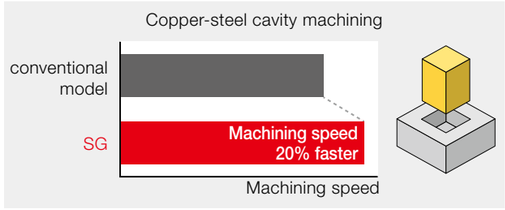


* Machining performance may vary depending on machine specifications and electrode materials.

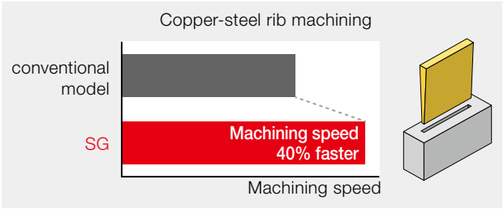
Machining speed improved with IDPM3 advanced adaptive control and SS Jump control

- Mitsubishi Electric's IDPM3 adaptive control is utilized not only for graphite electrode machining, but widely applied for copper electrode machining as well.
- Machining speed increased up to 40% by raising speed and acceleration of SS Jump control function.

▶SS Jump comparison video



Machining speed for SQ30mm: depth 9mm machining



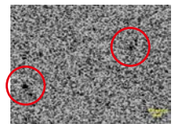
Machining speed for width 20mm: thickness 1mm: depth 20mm machining

Improved surface quality for medium and large area machining <SG28>

- High rigidity structure and new power supply etc. improve machining surface quality.
- Realizes machined surface with few pinholes and reduced post-process polishing.

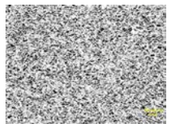
Electrode :Graphite (TTK5) 2 pcs
Workpiece :Steel (SKD61)
Size :SQ150mm (with rough-cut)
Under size :0.2mm
Depth :6mm
Roughness :Rz10.0μm (mark)

[Conventional model]



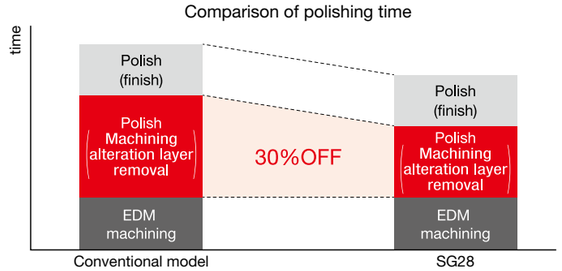
Some pinholes

[SG28]



A small number of pinholes

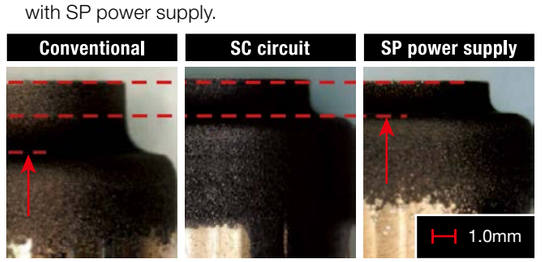
Comparison of polishing time

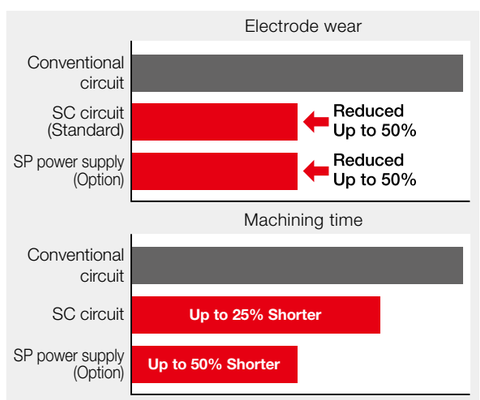


Even if machining in same time as conventional machine, polishing time is shortened.

Tungsten carbide machining (SP power supply:Option)

- Electrode wear of copper electrode dramatically improved even standard SC circuit.
- Tungsten carbide machining speed is improved up to 50 % with SP power supply.





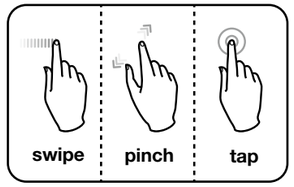
Operability

NUI Natural User Interface

D-CUBES

Control unit

- Information is displayed on a new large19-inch touch screen.
- Keyboard and mouse are standard.
- Intuitive operation is performed by gestures on a multi-touch supporting panel.



Thin LCD operation box

- New design of thin liquid crystal manual pendant box improves workpiece setup and saves time.
- Hand-held operation box is equipped with an LED flash light on back.

●Magnified view of coordinates

●Various setup functions
●Screen customization

●Teaching function

Table

SG8

SG12

SG28

●Increased number of T-slot to improve setup.

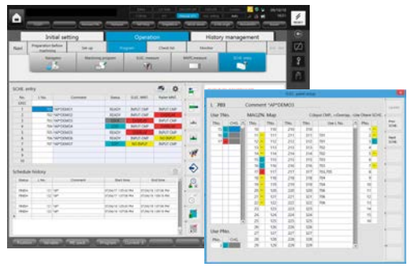
3-sided automatic elevation working tank

●3-sided automatic elevation working tank standardized.
Improved access for workpiece setup.

Automatic working tank fluid level adjustment (ATA) (Automatic elevation tank compatible)

●Height of working tank and fluid level are adjusted automatically according to height of head.

Built-in scheduler



●Continuously run multiple programs on a schedule.
- Continuous automatic operation can be executed even with one machine without connecting to external equipment.
- Easy to check if no multiple times usage of electrode.

●Schedules can be added and edited during machining.
- Schedules can be skipped and registered status (such as waiting) can be changed easily.

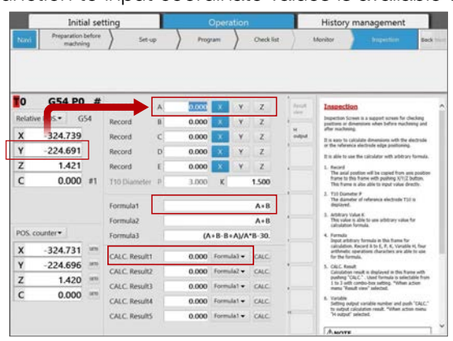
Movement speed <SG8, 12>

A&ES Auto & Easy Setup

●Setup time reduced by faster jog speed.
Jog speed can customizable.

Dimensional check support function (Only SG28 compatible)

●Support manual confirmation work of machining results.
(Notes function to input coordinate values is available on screen)



Operability

“Fast” and “Ergonomic”operation.
Excellent performance with “Easy operation”,“human error reduction” and “connect ability” supporting productivity improvement for customers.

D-CUBES

HOME

Easy to understand machining progress and screen selection.
- Machining progress status can be understood at a glance. (machining path, remaining time,consumables)
- Operation screens are intuitively selected by one-touch on screen buttons.

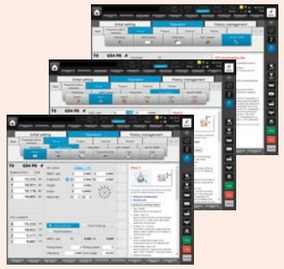
Operation

■Pre-machining preparation
- Machines support inspection history management.
- Reduction in machine down time from insufficient maintenance.

■Setup
Changing electrodes, moving axes, and setting working tank height.
- **Workpiece measurement**

Positioning workpieces, measuring workpiece offset, and checking dimensions.
- **Electrode measurement**

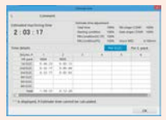
Measurement of electrode center, dimension check.



■Program
- “Action menu” helps your operation. Table form programing display “ESPER D-CUBES”.

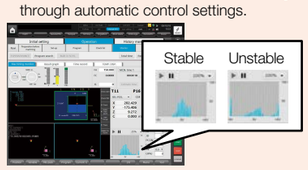
Search machining condition
- Suitable condition is selected by factor selection and narrow down search.
- Adjustment bar for choosing “Speed” or “Uniformity”.

Machining time estimation function
- Simply estimates machining time.
- Corrects estimated time for improve estimated accuracy.

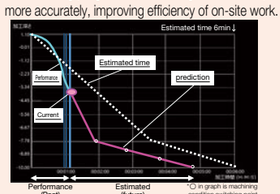


■Check list
All necessary operations to be performed before machining can be checked.
Check list
- Pre-machining checklist is displayed.
- Machine cannot be started if any checklist item has been skipped.
- Errors by operators who are not accustomed to using machine are prevented.

■Machining Monitor Screen
Maisart realized visualization of operation status on screen.
Automatic setting of adaptive control
- Our EDM know-how optimizes machining through automatic control settings.

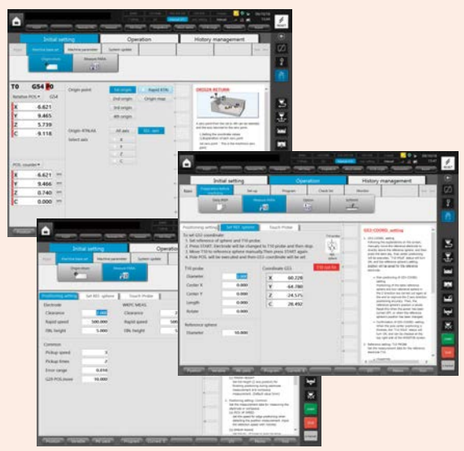


- As machining progresses, machining end time is updated more accurately, improving efficiency of on-site work.



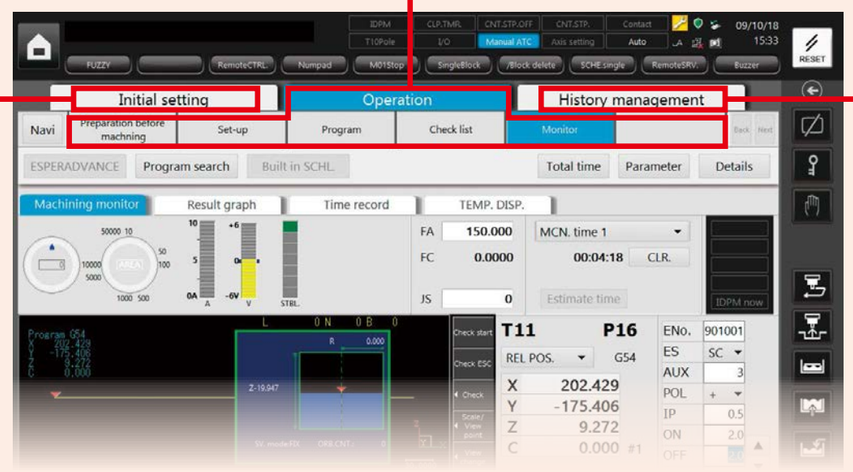
Initial setting

To set items which do not change daily like probe information, origin position, jog movement speed e.t.c.
- Basic machine settings, such as axis movement speed, measurement operation, and ATC operation.



Main menu

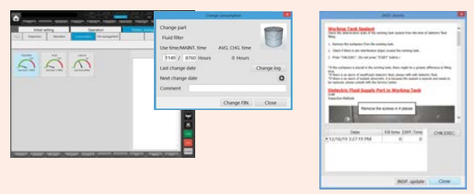
Navigate you by three tabs to set and check setting quickly.
This enables anyone to use information easily without any confusion about operating procedures and operation methods.



Machine log management

Manage operation history, inspection / maintenance history, consumables, and costs.

■Consumables management
- Consumables screen manages usage time and replacement log of all consumables.
- Machine supports management of consumable usage time and replacement history.
- Prevent forgetting replacement by screen message.
- Predict machining tank seal life on screen.



Power Supply/ Control Specifications and Options

Power Supply and Control Specifications

Model		SG8M	SG12M/ SG28M
Power supply unit	Power supply model	GV80	GV80 (option GV120)
	Maximum machining current peak [A]	80	80 (option 120)
	Standard machining circuit and functions	Transfer pulse circuit (TP circuit), Ultralow-wear machining circuit (SC, α-SC circuit), Fine-matte finish circuit (PS circuit), Glossy mirror-finish circuit (HGM2 circuit), Narrow gap circuit, SS Jump, AI Adaptive control (Maisart/IDPM3)	
	Power supply system	Compact, resistor-less, low-heat generation, power regenerating energy-saving method	
	Cooling system	Indirect cooling	
Control unit	Control unit	C41EA-2	
	Input method	Keyboard, USB flash memory, Ethernet	
	Pointing device	Touch panel, mouse	
	Display	19-in color TFT-LCD	
	Display characters	Alphanumeric characters	
	Number of control axes	Maximum at same time 4 axes	
	Setting (command) unit	XYZ···0.0001mm, C (rotary axis)···0.0001deg	
	Minimum drive unit	XYZ···0.0001mm, C (rotary axis)···0.0001deg	
	Manual feed	High-speed, low-speed, inching 0.001mm/ 0.01mm, extension mode (high-speed, low-speed), maximum feedrate: (SG8, SG12)7,000mm/min(XYZ) (SG28) 4,000mm/min(XYZ)	

Power Facilities Capacity

Model	SG8M	SG12M		SG28M	
Power supply	GV80	GV80	GV120	GV80	GV120
Maximum machining current average [A]	60	60	100	60	100
Maximum machining current peak [A]	80	80	120	80	120
Dielectric fluid chiller unit [kW]	1.74	1.74	3.5	1.74	3.5
Total input capacity*1 [kVA]	6.5	7.0	10.0	9.0	13.0
Machine-generated heat value*2 *3 [kW]	3.9	4.2	6.0	5.4	7.8

*1 Please add 5[kVA] for total input capacity with SP power supply specifications.
*2 Reference value (heat value (kW) = Total input capacity (kVA) × 0.6)
*3 Please add 3[kW] for machine-generated heat value with SP power supply specifications.

Network connection specifications

Data, such as NC programs, machining conditions and variables can be exchanged between a personal computer and EDM.
Required options differ according to models and purpose, and can be confirmed using following table. One IP address must be prepared for each EDM within user's in-house network.

Required specifications	Image drawing	Function	Supplement
Operate on the EDM side and receive data from personal computer	Data transmission	LAN/W	Use EDM's Explorer and receive data in common HDD on the EDM side. After that, data I/O operations are required.
Operate on the EDM side and send data directly to the EDM's NC data area.	Data transmission	FTP	Data can be received only using data I/O operation.
Operate on personal computer side and send data to the EDM	Data transmission	LAN/W	Personal computer's Explorer and the EDM's common HDD are used. After that, data I/O operations are required for the EDM.
Operate on personal computer side and send data directly to the EDM's NC data area	Data transmission	DNC	Commercially available DNC software must be installed on personal computer side. Refer to DNC specifications operation for details.
Automatically send data from machining machine to FTP server	No person in both	Operating status data output (Option)	Customer should prepare FTP server.
Automatically send data from machining machine to MTConnectAgent	No person in both	MTConnect (Option)	Customer should prepare MTConnectAgent. Machine operating Status, alarm data, and machining history data are output using MTConnect communication protocol.

*4 When selected, machine installation dimensions will change.
*5 Select chuck from following types. (3R-MACRO, 3R-Combi, EROWA-ITS50) (Automatic clamp is not available at 3R-Combi)
*6 Cannot be combined with High-accuracy built-in spindle.
*7 Only ITS50 specifications is available, and centering plate 50 can be used.
*8 Centering plate 50 and Compact can be used each other.
*9 External signal output (M code with answer) is necessary for attaching external equipment that requires an answer signal.
*10 Proprietary personal computer is to be acquired separately.
*11 LAN cables should all be straight wiring with shielding connector, Category 5 (100BASETX compliant), STP (four-shielded twisted-pair). A switchable hub capable of supporting shielded LAN cables should be used.
*12 Select of either MTConnect or Operating status data output.

Options

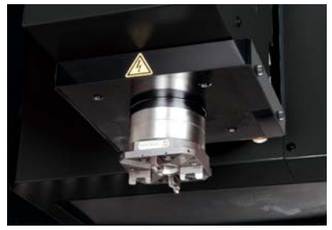
Options and retrofit specifications differ according to country and region; Please contact Mitsubishi Electric representative for details.
Main options correspondence table:
◎ Standard equipment, ○ Can be added after installation,
● Cannot be added after installation, × Not available

Model				SG8M Automatic elevation	SG8M Fornt door	SG12M Automatic elevation	SG12M Fornt door	SG28M
Machine main unit	Lubricant	Automatic lubrication unit		◎	◎	◎	◎	◎
	Scale	Scale feedback specifications	Z-axis	●	●	◎	◎	◎
			XY-axis	●	●	●	●	●
	Thermal displacement compensation system			×	×	×	×	◎
	Thin LCD operation box			◎	◎	◎	◎	◎
Dielectric fluid system	Fluid system	Dielectric fluid emission automatic control function		○	○	○	○	○
		Dielectric fluid suction function		○	○	○	○	○
		Dielectric fluid distributor		◎	◎	◎	◎	◎
		Automatic working tank fluid level adjustment (ATA)		◎	×	◎	×	◎
Power supply	Main power supply	GV80		◎	◎	◎	◎	◎
		GV120		×	×	●	●	●
	Special power supply	NP2 circuit		×	×	×	×	●
		Narrow gap circuit		◎	◎	◎	◎	◎
		Glossy mirror-finish circuit (HGM2)		◎	◎	◎	◎	◎
		Machining circuit for difficult to machine materials (HPS)		×	×	×	×	●
		SP power supply (exclusive for tungsten carbide machining)*4		●	●	●	●	●
Head-side tooling	High-rigidity C-axis*5*6			●	●	●	●	●
	High-accuracy built-in spindle*5			×	×	×	×	●
	Automatic clamp*5			●	●	●	●	●
	Large electrode adaptor			×	×	×	×	●
ATC	LS	10T	3R MACRO	●	×	●	×	●
			3R Combi	●	×	●	×	●
			EROWA ITS 50*7	●	×	●	×	●
			EROWA ITS Combi*8	●	×	●	×	●
		20T	3R MACRO	●	×	●	×	●
			3R Combi	●	×	●	×	●
			EROWA ITS 50*7	●	×	●	×	●
			EROWA ITS Combi*8	●	×	●	×	●
	Shuttle	4T	3R MACRO	×	●	×	●	×
			3R Combi	×	×	×	×	×
			EROWA ITS 50*7	×	●	×	●	×
			EROWA ITS Combi*8	×	×	×	×	●
	MVH	20T	3R MACRO	×	×	×	×	●
			3R Combi	×	×	×	×	●
			EROWA ITS 50*7	×	×	×	×	●
		40T	3R MACRO	×	×	×	×	●
			3R Combi	×	×	×	×	●
			EROWA ITS 50*7	×	×	×	×	●
Control unit	Communication	External signal output (M code)		●	●	●	●	●
		External signal output (M code with answer) *9		●	●	●	●	●
		LAN, DNC H/W, S/W, FTP*11		◎	◎	◎	◎	◎
		MTConnect*12		○	○	○	○	○
		Operating status data output*12		○	○	○	○	○
S/W	ESPERADVANCE PRO lite*10			×	×	×	×	×
	ESPERADVANCE PRO*10			○	○	○	○	○
	3D check function			○	○	○	○	○
	e-manual (electronic instruction manual)			◎	◎	◎	◎	◎
	Built-in scheduler			◎	◎	◎	◎	◎
	Anti-virus protection			○	○	○	○	○
Display	Run timer			●	●	●	●	●
	Warning light (Tower type)			●	●	●	●	●
	Warning light (Built-in type)			●	●	●	●	●
Miscellaneous	Operation manual (paper)			○	○	○	○	○
	LED type working lamp DC24V			◎	◎	◎	◎	◎
	Tool and tool box			◎	◎	◎	◎	◎
	Workpiece clump setting fixture			◎	◎	◎	◎	◎

Head-side tooling

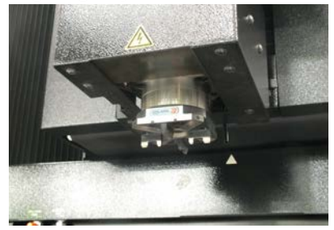
* Tooling should be selected

Automatic clamp



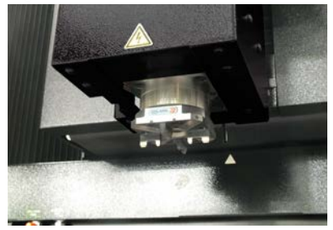
Clamp spindle side holder with air chuck
(photo shows EROWA-ITS chuck specifications)

High-rigidity C-axis



Supports parallel electrode setup and index machining
Supports fluid emission from spindle center
(photo shows EROWA ITS50 chuck specifications)

High-accuracy built-in spindle (Only SG28)



Supports high-speed rotation (1 to 1500min^{-1}) machining
Supports fluid emission from spindle center
(photo shows EROWA ITS50 chuck specifications)

ATC (Automatic Tool Changer)

Shuttle-4T (Front door compatible)

Change up to four electrodes
Compatible with continuous machining using multiple electrodes

LS type 10T (Automatic elevation tank compatible)

LS type can change up to 10/20 electrodes
Supports continuous machining using many electrodes

MVH type 20T (SG28 compatible)

MVH type can change up to 20/40 electrodes
Supports continuous machining using many electrodes

Display

Warning light (Built-in type)

Machine operating status

Warning light (Tower type)

Machine operating status

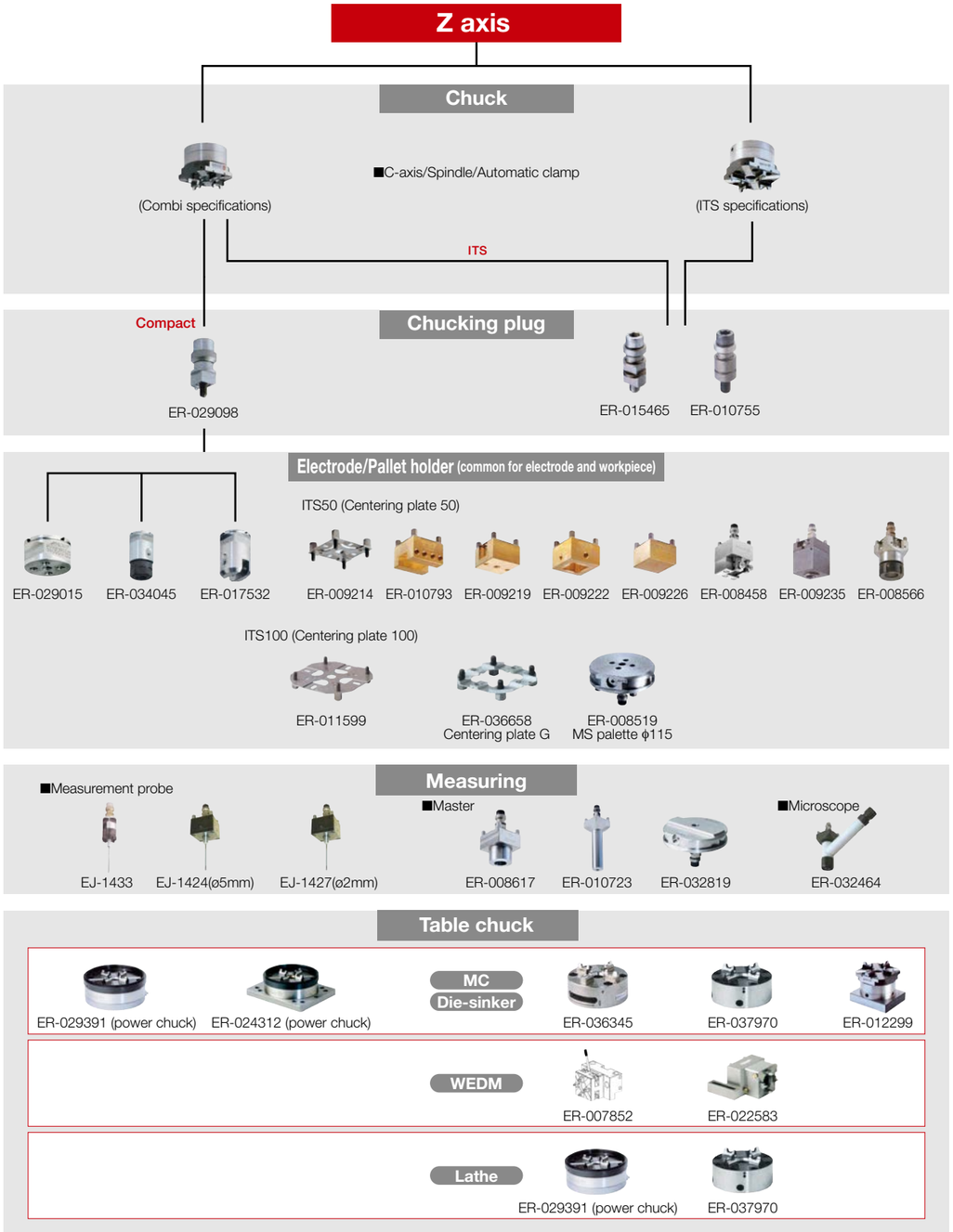
Power supply

GV120 (SG8 is not compatible)

Specifications are subject to change without notice, and appearance may be different from photo.

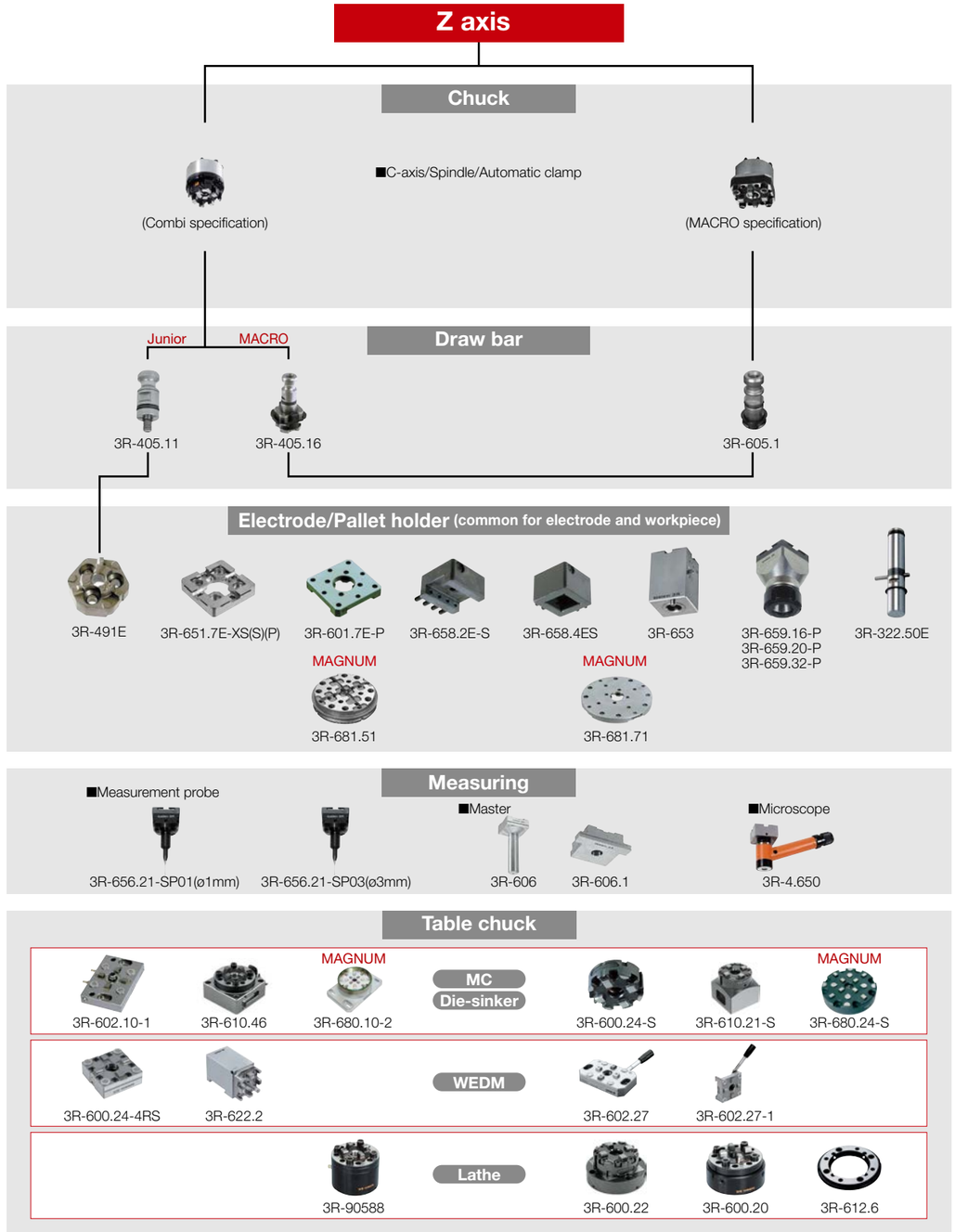
Tooling

EROWA System Chart



* Please contact EROWA Japan Co., Ltd. for detailed tooling specifications.

System 3R System Chart



* Please contact System 3R Co., Ltd. for detailed tooling specifications.

Preparation for Machine Installation/ Cautions

Preparation for Machine Installation

Machine installation checklist

Determining machining details

Check each item, and make sure that no item or order is overlooked.

1) Determine workpiece	
2) Determine machining site	
3) Determine pre-processing site	
4) Determine post-processing site	

Preparation of installation fixtures

1) Plan installation fixtures	
2) Prepare or manufacture fixtures	

Preparation of tooling and electrode

It normally takes one to two months for tooling delivery, so please place orders as early as possible

1) Determination of tooling and electrode	
2) Order, preparation or manufacture	

Training of programmers and operators

1) Select programmers and operators	
2) Apply for training seminars	

Confirmation of foundation and power-supply work

If there is any possibility of radio disturbance, investigate it prior to starting work.

1) Confirmation of floor area	
2) Confirmation of environment (constant-temperature dust-proof room, measure for radio disturbance, prevention of external noise)	
3) Confirmation of foundation floor	
4) Foundation work	
5) Primary wiring for power lead-in	
6) Grounding work	
7) Air piping work	

Confirmation of delivery path

Check path inside and outside factory to avoid any trouble during delivery.

1) Traffic restrictions to factory		
Road width		
Entry road		
2) Factory entrance and width of gate in factory	(m)	
Factory building entrance dimensions (height × width)	(m)	
3) Constant-temperature dust-proof room entrance dimensions (height × width)	(m)	

Cautions
Standard delivery entrance dimensions for standard shipment delivery are given on product line-up page.
If entrance is smaller than standard delivery entrance, a machine with different dimensions can be shipped.
* Please contact a Mitsubishi Electric representative for details (a separate estimate will be issued). Note that delivery may not be possible in some cases depending on dimensions.

File applications to fire department (Installation in Japan)

Applications must be filed before the EDM is installed.

1) Confirm dielectric fluid amount	
2) File applications to fire department (EDMs already installed must also be filed.)	
•Application for “Facility using fire” (fluid amount less than 400L)	
•Application for “Low volume hazardous material storage and handling site” (fluid amount more than 400L and less than 2,000L)	
•Application for “General handling site” (fluid amount 2,000L or more)	

Required applications differ according to country and region; please contact your nearest fire department for details.

Oil for EDMs

Always use dielectric fluid which has a flash point of 70°C or more.
Prepare following dielectric fluid when operating the EDMs.

■ **Delectric fluid example**
- Paraol 250 (Shell Lubricants Japan)
- Metal Work EDF-K2 (ENEOS Corporation)

* Delectric fluid properties might be changed without notice by manufacturer. Please contact manufacturer for Material Safety Data Sheet (SDS/MSDS).

Installation conditions

1. Installation site

❶ Constant-temperature dust-proof room
– Recommended room temperature 20±1°C
– Usable temperature range 5 to 35°C
Temperature fluctuation will directly affect machine accuracy. To maintain performance accuracy, select a place with minimal temperature fluctuation.
Note that an environment where temperature fluctuates by 3°C or more within 24 hours, or 1°C or more within one hour can adversely affect machining accuracy. Make sure that machine body is not subject to direct wind from air-conditioners or to direct sunlight.
– Dust-free location is recommended.
Install EDM in environment with no corrosive gases, such as acid or salt, or mist, and with low levels of dust.
Grinding dust can adversely affect machine's linear scales and ball screws.
Pay special attention to installation location to avoid this hazard (separate from grinding machine, or install in separate room, etc.).
– Humidity Within 30 to 75%RH (with no dew condensation).
– Temperature range during transportation and storage -25 to 55°C (when power is not connected).

❷ Tolerable vibration of floor
EA28V ADVANCE, EA40 ADVANCE specifications, SG8, SG12, SG28
– Select a floor where vibration or impact will not be conveyed.
– As a reference, vibration level should have a max. amplitude of 5μm or less at a 10 to 20Hz frequency.
SV8P, SV12P
– Select a floor where vibration or impact will not be conveyed.
– As a reference, vibration level should have a max. amplitude of 2μm or less at a 10 to 20Hz frequency.
* Consult with contractor or vibration measuring instrument manufacturer for details on measuring method.

❸ Foundation
– The floor should be concrete with a thickness of 400mm or more so it can sufficiently withstand system's weight.

❹ Room construction
– The room where the EDM is to be installed must be a non-flammable or fire-proof structure. Please contact your local fire department for details.

❺ Ventilation of combustible vapors
– Install a ventilator to effectively remove combustible vapors and fine powders.

2. Machine heating value

Use equipment capacity to calculate the EDM's heating value required for designing a constant-temperature room.

Heating value (kW)
= Equipment capacity (kVA) x 0.6
Example: For SG12 + GV80, 7.0kVA x 0.6 = 4.2kW

Above value is a guideline. Consult with constant-temperature room manufacturer for details.

3. Power-supply equipment

• Primary wiring
Normal machining : 3-phase AC200/220V±10% 60Hz, 3-phase AC200V±10% 50Hz
High-accuracy machining : 3-phase AC200/220V±4% 60Hz, 3-phase AC200V±4% 50Hz
An automatic voltage regulator (AVR) should be used if voltage fluctuations exceed that value above.
Do not power on in instantaneous power failure occurrence that exceeds 20msec.
A single-phase AC night power source for automatic fire extinguisher : AC100V±10%(50/60Hz)
Current capacity 1[A]

• Power capacity
Facility capacity [kVA] = Total power input (Machine input + power supply input + dielectric fluid chiller unit input) [kVA]
Refer to page 25 for details on machine, power supply and dielectric fluid chiller unit.

• No-fuse breaker and earth-leakage breaker
When selecting a no-fuse breaker or earth-leakage breaker for primary side of the EDM, calculate total facility capacity, and select breaker using following table as a reference.

Total facility capacity [kVA]	No-fuse breaker	Earth-leakage breaker
11.9 or less	NF50-CV(50A)	NV50-CV(50A)
12 to 21.9	NF100-CV(100A)	NV100-CV(100A)
22 to 33	NF225-CV(150A)	NV225-CV(150A)

Breakers in table allow for rush current of transformer in power supply panel.

• Selecting power input cable size
Following table is a guide for calculating appropriate power cable size to use based on total capacity. Cable size should be sufficient to allow some leeway.

Total facility capacity [kVA]	Cable size [mm²]	Total facility capacity [kVA]	Cable size [mm²]
8.9 or less	5.5	15 to 20.9	22.0
9 to 11.9	8.0	21 to 28	30.0
12 to 14.9	14.0		

4. Grounding work

The EDMs must always be grounded to prevent external noise, radio disturbance and earth leakage.
Install a EDM in an environment with no corrosive gases, such as acid or salt, or mist, and with low levels of dust.
– Common grounding can be used if noise from other devices will not enter through common grounding; grounding cable must be connected independently to grounding location (Fig. 2).
– Use a 14mm² grounding wire.

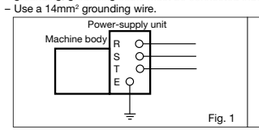


Fig. 1

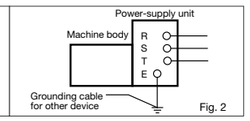


Fig. 2

5. Primary air equipment

Standard SG specifications do not require an air source, but an air supply must be prepared when using optional high-accuracy built-in C-axis etc.
– Hose diameter : 1/4 hose (hose sleeve outer diameter: ø9.0)
– Pressure : 0.5 to 0.7MPa (72.5 to 101.5psi)
(0.6MPa or more when using EROWA tooling specifications)
– Flow rate : 27L/min or more
* Install an air filter equipped with an air dryer or drainage discharge mechanism in air source (primary source) piping to prevent moisture and impurities from entering air pressure device.

6. Shield room

Install a shield room if the EDM affects televisions or other communication facilities in area.
Observe following points when installing the EDM in shield room.
1. Ground the EDM in shield room (Fig. 3).
2. If the EDM cannot be grounded in shield room, connect the EDM's grounding cable to shield room's grounding terminal (through bolt) as shown in Fig. 4.
3. Consult with a Mitsubishi Electric representative for details on installing a shield room.

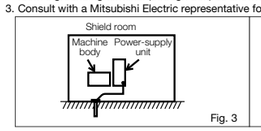


Fig. 3

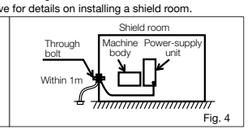


Fig. 4

Precautions for selecting earth-leakage breaker

To prevent malfunctions caused by external noise from control units, etc., a filter is installed for power-supply input. By grounding one end of this filter, an earth-leakage current of approx. 30 to 40mA passes through filter. A highly sensitive earth-leakage breaker (sensitivity current 30mA) could malfunction. Thus, a medium-sensitivity earth-leakage breaker (sensitivity current 100 to 200mA) is recommended for the EDM. Class C grounding (grounding resistance of 10Ω or less) is recommended for the EDM. Even if sensitivity current is 200mA, contact voltage will be 2V or less, and no problems will occur in preventing electric shock (application of tolerable contact current Class 2, 25V or less).

Refrigerant for dielectric fluid chiller

Dielectric fluid chiller unit includes a fluorinated greenhouse gas R407C or R410A (for booster power). Please use only specified refrigerant (R407C or R410A), when servicing dielectric fluid chiller unit. Use of any refrigerant other than that specified will cause mechanical failure, system malfunction or unit breakdown. In worst case, this could lead to a serious impediment to securing product safety.

Disposal

Dielectric fluid, dielectric fluid filter, etc. are industrial waste. These must be disposed of following national and local laws and ordinances.

Harmonic distortion

If there is harmonic distortion in power supply, machine operation could be affected even if voltage does not fluctuate. In addition, harmonic current could flow from the EDM to power system and adversely affect peripheral devices. If effect of harmonic distortion causes problems, install a harmonic suppression filter or take other measures.

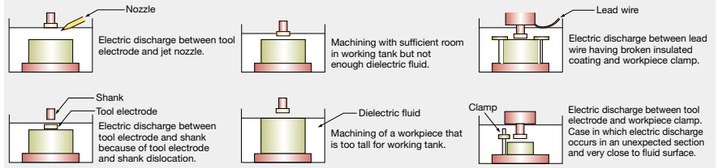
Recommended sliding surface lubricants

Use sliding surface lubricant oil G68*1 as lubricant oil.
(Industrial lubricant oil ISO viscosity grade ISO VG68*2)
*1 JIS B 6016-1 *2 Refer to JIS K 2001

Cautions

Preventing fires and accidents with EDMs

Never attempt following operation methods. These are extremely hazardous.



- Ensure that upper part of workpiece is submerged by 50mm or more GV80P or 100mm or more GV120P from surface of dielectric fluid
- Never conduct spray machining as there is a risk of fire
- Do not use equipment that produces heat or sparks such as heating systems, welding machines, or grinding machinery near the EDM
- Always keep area clean and tidy, and do not store flammable materials near the EDM
- Install an extra fire extinguisher in addition to automatic fire extinguisher enclosed with the EDM
- Ensure that area is sufficiently ventilated
- Monitoring automatic operation : For safety purposes, make sure an operator is always present during operation, even if various safety devices are equipped, so that appropriate actions can be taken

Safety measures

A dielectric fluid temperature detector, fluid level detector, abnormal machining detector and automatic fire extinguisher (Installation in Japan), standard equipment, and a flame-resistant metal hose is used. A tank which has passed type test of electrical-discharge machine of Hazardous Materials Safety Techniques Association is used (for tank capacities less than 2,000L, tanks which have passed a voluntary water leakage test). Note that safety devices must be periodically inspected. Refer to instruction manual (safety manual) when using the EDM.

Automatic fire extinguisher (Installation in Japan)

When heat is detected, a light-water solution is automatically sprayed to extinguish fire. Machining also stops automatically at this time.
A separate AC100V power supply is required for automatic fire extinguisher.

Dielectric fluid temperature and fluid level detector

Machining is automatically stopped when dielectric fluid temperature reaches approx.

60˚C, or when fluid level drops during machining.

Terms of warranty

1. Terms of warranty

This will differ according to country and region of sale; please contact a Mitsubishi Electric representative for details.

2. Coverage

(1)Terms of repairment free of charge
Parts labor and travel are included free of charge when failure occurs during normal use for stated Terms of warranty (based on proper usage and maintenance as described in operations manual and sales agreement).
Coverage exceptions:
❶ When a failure occurs that was caused by a machine modification that directly affects machine's functioning or accuracy.
❷ When a failure occurs caused by use of non-standard parts, consumables or lubricants.
❸ When a failure occurs caused by a natural disaster such as lighting, earthquake or storms and flooding.
❹ When use of non-recommended consumables or aftermarket parts are used such as filters or flushing nozzles.

(2)Exclusion of loss in opportunity and secondary loss from warranty liability
Regardless of gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:
❶ Damages caused by any cause found not to be responsibility of Mitsubishi Electric.
❷ Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.
❸ Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.
❹ Replacement by user, maintenance of on-site equipment, start-up test run and other tasks.
(3)Information regarding what should be revised or improved acquired during product support may be used to improve product quality or services.

3. Post Warranty / Expected Service Life

After warranty period expires, all standard service rates and travel expenses will apply. Normal service life expectancy is 11 years after installation, but there may be some cases where discontinued electrical parts such as semiconductors and motors will reduce this period.

FA Machinery and Automation Products Global Production Bases

①Nagoya / Industrial Mechatronics Systems Works
Programmable controllers, display panels (HMI), AC servos, inverters, industrial robots, CNCs for power distribution transformers, EDMs, laser processing machines

②Kani Factory
Electromagnetic switchgear

③Shinshiro Factory
3-phase motors, IPM motors

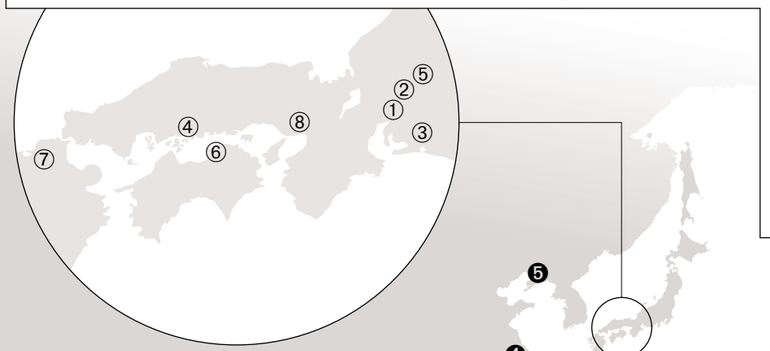
④Fukuyama Works
Power management meters, energy-saving UPS support devices, low-voltage circuit breakers

⑤Nagatsugawa Works
Pressurized ventilators

⑥Power Distribution Systems Center
High-voltage circuit breakers, high-voltage electromagnetic contactors

⑦Mitsubishi Electric Factory Industrial Products Corporation
Geared motors

⑧Tada Electric Co., Ltd.
Electron-beam processing machines



❺China (Dalian)

Mitsubishi Electric Dalian Industrial Products Co., Ltd.
Inverters, low-voltage circuit breakers, electromagnetic switchgear EDMs, laser processing machines

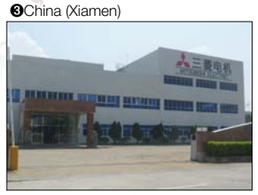
❶India (Pune)

Mitsubishi Electric India Pvt. Ltd.
Inverters

❷Thailand (Bangkok)

Mitsubishi Electric Automation (Thailand) Co., Ltd.
3-phase motors

❸China (Xiamen)



Mitsubishi Electric Low Voltage Equipment (Xiamen) Co., Ltd.
Low-voltage circuit breakers

❹China (Changshu)

Mitsubishi Electric Automation Manufacturing (ChangShu) Co., Ltd.
Programmable controllers, display panels (HMI), AC servo CNCs

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