

# Electrical Discharge Machining Wire <EDM wire>



# Electrical Discharge Machining Wire

We satisfy customer demands by implementing integrated production from casting to processing.

- The wire is manufactured and quality-controlled in Japan.
- Many W-EDM machine manufacturers recommend the use of our wire in their machines.
- Stable discharging is enabled with our wire, as carefully selected materials are used.



## Guideline for selecting products

Positioning of each wire type .....	2
Cutting application of each wire type .....	2
Table for checking paraffin presence .....	3
Advantages of non-paraffin wire .....	3

## Introduction of products

### Standard EDM wire

BZ-U (BZ-K) wire (Standard brass: Equivalent to JIS C 2800) ....	4
BZ-MU wire (Standard brass: Equivalent to JIS C 2700) .....	4

### Special EDM wire

BZ-B wire (Special brass: Increased zinc content) .....	5
TF wire (Alloy brass: Special metallic-element added) .....	5
BZ-AT wire (Extra-soft brass: For taper cutting) .....	6
OFC wire (Oxygen free copper) .....	6

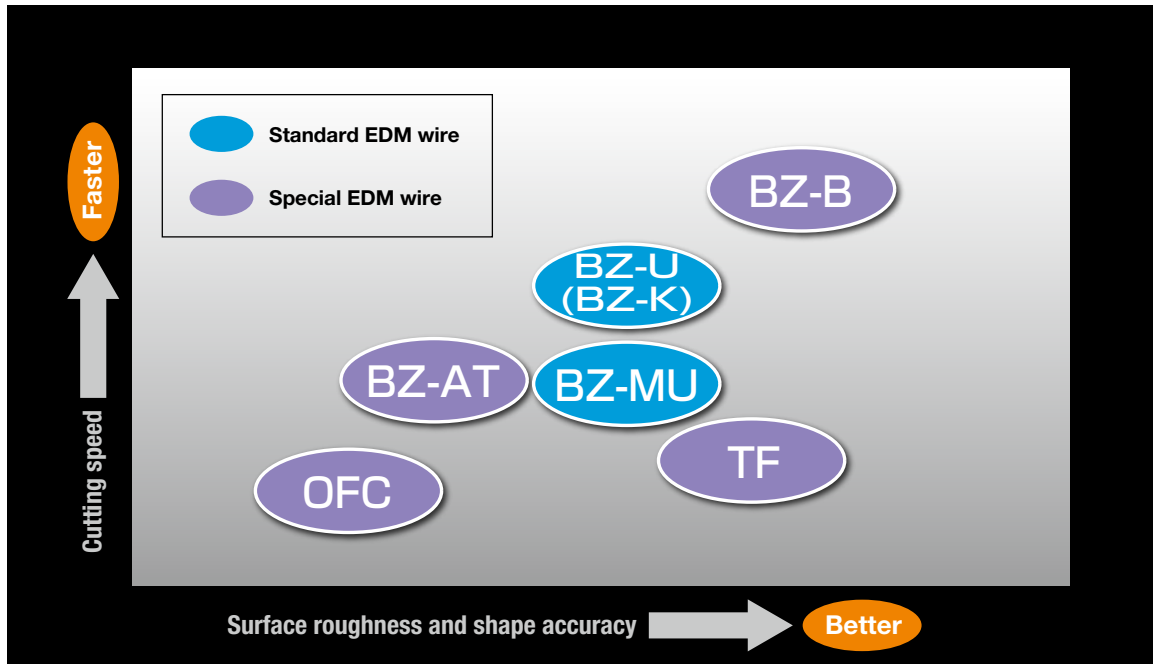
## Ordering products

Product specifications .....	7
Spool specifications .....	7
Packing specifications .....	8

## Technical data

Setting cutting conditions .....	9
Problems and troubleshooting .....	10
How to correct tangled wire .....	11
Optimization of cutting conditions .....	12

▶ Positioning of each wire type



▶ Cutting application of each wire type

Cutting target		Standard EDM wire		Special EDM wire			
		BZ-U (BZ-K)	BZ-MU	BZ-B	TF	BZ-AT	OFC*
Cutting purpose	Standard cutting	◎	◎	○	○	—	—
	Taper cutting	◎	◎	○	○	★	◎
	Rough cutting	◎	◎	◎	◎	—	—
	High accuracy shape cutting	◎	◎	○	○	—	—
	Thick material cutting	◎	◎	◎	○	—	—
	High surface roughness cutting	◎	◎	◎	○	—	—
	High-speed cutting	◎	○	★	○	—	—
	Automatic threading	★	★	◎	◎	—	—
	Poor jet flow cutting	◎	◎	◎	◎	—	—
	Copper adhesion-free cutting	◎	○	★	★	—	—
	Prevention of brass powder generation	○	★	○	○	○	—
Work-piece	Aluminium	◎	◎	○	◎	—	—
	Graphite	◎	◎	◎	◎	—	★
	Poly crystalline diamond (PCD)	◎	◎	◎	◎	—	—
	Tungsten carbide	◎	◎	○	◎	—	—
	Stainless steel	◎	◎	◎	◎	—	—
	Low conductivity materials	◎	◎	◎	◎	—	★
W-EDM machine	GF Machining Solutions (formerly Agie)	○	◎	○	○	—	—
	GF Machining Solutions (formerly Charmilles)	○	◎	○	○	★	—
	Seibu	★	○	◎	○	○	—
	Sodick	★	◎	○	★	—	—
	Fanuc	★	○	○	○	★	—
	Makino	○	◎	○	○	—	—
	Mitsubishi	◎	★	○	○	—	—

★ : Excellent ◎ : Good ○ : Applicable

\*OFC (Oxygen-Free Copper)

(The above rating is based on the internal evaluation results by Hitachi Metals, Ltd.)

▶ Table for checking paraffin presence

W-EDM Machines		Suitable Type		Remark
Maker	Model	Paraffin	Non-paraffin	
GF Machining Solutions (formerly Agie)	CUT (S,P,E,OilTech,TW)	—	○	The non-paraffin type applies to all wire, regardless of size.
	AGIE CUT (SF + HSS)	—	○	
	Classic/Evolution/Excellence /Progress/Vertex	—	○	
GF Machining Solutions (formerly Charmilles)	Robofil®	—	○	
Seibu	MA/MMA/Super MMA /MB/MMB/Ultra MMB	—	○	
	MS	—	○	
	EW	—	○	
Sodick	AL/VL	○	—	For wire of $\phi 0.15$ mm or less, the non-paraffin type improves positioning accuracy.
	AG/SL/AQ	○	—	
	AP	○	—	
	EXC	○	—	
Fanuc	$\alpha$	—	○	The non-paraffin type also applies to new models (i.e., $\alpha$ Series).
	Tape Cut	—	○	
Makino	U (H.E.A.T.,j)	○	—	For wire of $\phi 0.15$ mm or less, the non-paraffin type improves positioning accuracy.
	W-FB	○	—	
	EE	○	—	
	EQH	○	—	
	EC	○	—	
Mitsubishi	MV (S,R)/PA/MP/MX/NA (P) /BA/PA (M) /FA (V,PS,M,VSM,PSM,VM,PM) /RA (MAT,M,AT)	—	○	The non-paraffin type applies to all wire, regardless of size.
	QA/FX (K)/CX,SX/DWC®	○	—	For wire of $\phi 0.15$ mm or less, the non-paraffin type improves positioning accuracy.

▶ Advantages of non-paraffin wire

**If wire has excessive paraffin or contamination**

- Wire may easily slip on rollers, etc.
- Extraneous matter may remain on rollers, etc.



**1. Extraneous matter or oil remains, thereby causing:**

- Unstable travel of the wire and degraded surface accuracy
- Trouble in automatic threading and stoppage of the W-EDM machine triggered by guide dies being blocked

Deteriorated surface accuracy



Normal surface accuracy



If paraffin wire is used on the W-EDM machine that is specifically calibrated for non-paraffin wire, the characteristics of electrical discharge machining may be adversely affected since the wire travel system will become unstable due to sliding, etc. Sufficient care must be taken when selecting wire, as cutting seams (called wire marks) are frequently formed, particularly on the cutting surface.

**2. Insulating material remains on the wire surface, thereby causing:**

- Degraded contact detection accuracy and positioning
- Generation of unstable discharge with respect to weak discharge and a shorter service life of power feed dies

Standard  
EDM wire**BZ-U (BZ-K) wire**

Standard brass

〔JIS C 2800〕  
equivalent

Capable of automatic threading

Hard wire

- ▶ Hitachi Metals' standard brass wire
- ▶ High cutting speed due to zinc-rich constitution
- ▶ Improved automatic threading capability due to excellent straightness of wire
- ▶ Applicable for use on W-EDM machines of respective companies equipped with an automatic threading function.

## General characteristics of BZ-U wire

Type	Product name	Standard size* <sup>1</sup> (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
H (Hard)	BZ-U (BZ-K)	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0	Min 932	
		0.25/0.010			
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

▶ BZ-K is the product name in North America.

Standard  
EDM wire**BZ-MU wire**

Standard brass

〔JIS C 2700〕  
equivalent

Brass powder reduction

Capable of automatic threading

Hard wire

Soft wire

- ▶ Significant reduction of brass powder adhered to cutting surface
- ▶ Improved automatic threading capability due to excellent straightness of wire
- ▶ Applicable for use on all models of W-EDM machines of pipe, jet or anneal systems equipped with an automatic threading function.

## General characteristics of BZ-MU wire

Type	Product name	Standard size* <sup>1</sup> (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
H (Hard)	BZ-MU	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0	Min 932	
		0.25/0.010			
		0.30/0.012			
A (Soft)	BZ	0.10/0.004	±0.001/±0.00004	Min 441	Min 15
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0		
		0.25/0.010			
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

Special  
EDM wire**BZ-B wire**

Special brass

Zinc content  
increased

High-speed cutting

Brass adhesion prevention

Improvement in surface accuracy

Hard wire

Soft wire

- ▶ Enhanced surface accuracy and processing speed due to the increased zinc-rich characteristic more than BZ-U
- ▶ Significantly reduced amount of brass adhesion on the cutting surface by increasing the amount of zinc

## General characteristics of BZ-B wire

Type	Product name	Standard size* <sup>1</sup> (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
H (Hard)	BZ-B	0.10/0.004	±0.001/±0.00004	Min 883	Min 0.4
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0	Min 784	
		0.25/0.010			
		0.30/0.012			
A (Soft)		0.10/0.004	±0.001/±0.00004	Min 441	Min 12
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0		
		0.25/0.010			
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

Special  
EDM wire**TF wire**

Alloy brass

Special  
metallic-element added

Breaking prevention

Brass adhesion prevention

Hard wire

Soft wire

- ▶ Superior high-temperature strength achieved by adding special metallic elements to prevent breakage
- ▶ Particularly effective for cutting thick objects (100 mm or more in thickness)
- ▶ Significantly reduced amount of brass adhesion on the cutting surface by adding special metallic elements

## General characteristics of TF wire

Type	Product name	Standard size* <sup>1</sup> (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
H (Hard)	TF	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0	Min 932	
		0.25/0.010			
		0.30/0.012			
A (Soft)		0.10/0.004	±0.001/±0.00004	Min 441	Min 10
		0.15/0.006			
		0.20/0.008	-0.002~0/ -0.00008~0		
		0.25/0.010			
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

Special  
EDM wire

## BZ-AT wire

Ultra-soft brass

Wide-angle taper cutting

Ultra-soft wire

- ▶ Particularly effective for taper cutting thanks to extreme softness achieved by special heat processing
- ▶ Shows the effect especially in wide-angle (20 to 45°) taper cutting.

### General characteristics of BZ-AT wire

Type	Product name	Standard size* <sup>1</sup> (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
A (Soft)	BZ-AT	0.20/0.008	-0.002~0/ -0.00008~0	Max 490	Min 25
		0.25/0.010		Max 450	
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

Special  
EDM wire

## OFC\*<sup>2</sup> wire

Oxygen free  
copper

[99.9% or more]

Copper wire

Hard wire

Soft wire

- ▶ Wire for the old model W-EDM machines (for which copper wire is recommended)
- ▶ Effective for sintered material such as graphite and for vacuum

### General characteristics of OFC wire

Type	Product name	Standard size* <sup>1</sup> (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
H (Hard)	1OFC-ED	0.20/0.008	-0.002~0/ -0.00008~0	Min 441	Min 0.3
		0.25/0.010			
		0.30/0.012			
A (Soft)		0.20/0.008	-0.002~0/ -0.00008~0	Max 274	Min 15
		0.25/0.010			
		0.30/0.012			

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

\*2 OFC: Oxygen-Free Copper

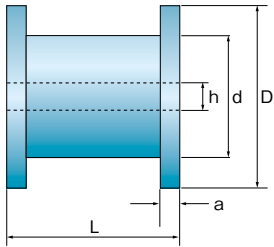
▶ The paraffin or non-paraffin type is specifiable.

▶ Product specifications

Product category	Type	Product name	Standard size <sup>*1</sup> (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
Standard EDM wire	H (hard)	BZ-U (BZ-K) BZ-MU	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
			0.15/0.006			
			0.20/0.008	-0.002~0/-0.00008~0	Min 932	
			0.25/0.010			
	A (soft)	BZ	0.10/0.004	±0.001/±0.00004	Min 441	Min 15
			0.15/0.006			
			0.20/0.008	-0.002~0/-0.00008~0		
			0.25/0.010			
Special EDM Wire	H (hard)	BZ-B	0.10/0.004	±0.001/±0.00004	Min 883	Min 0.4
			0.15/0.006			
			0.20/0.008	-0.002~0/-0.00008~0	Min 784	
			0.25/0.010			
A (soft)	BZ-B	0.10/0.004	±0.001/±0.00004	Min 441	Min 12	
		0.15/0.006				
		0.20/0.008	-0.002~0/-0.00008~0			
		0.25/0.010				
H (hard)	TF	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4	
		0.15/0.006				
		0.20/0.008	-0.002~0/-0.00008~0	Min 932		
		0.25/0.010				
A (soft)	TF	0.10/0.004	±0.001/±0.00004	Min 441	Min 10	
		0.15/0.006				
		0.20/0.008	-0.002~0/-0.00008~0			
		0.25/0.010				
A (ultra-soft)	BZ-AT	0.20/0.008	-0.002~0/-0.00008~0	Max 490	Min 25	
		0.25/0.010		Max 450		
		0.30/0.012				
H (hard)	1OFC-ED	0.20/0.008	-0.002~0/-0.00008~0	Min 441	Min 0.3	
		0.25/0.010				
		0.30/0.012				
A (soft)	1OFC-ED	0.20/0.008	-0.002~0/-0.00008~0	Max 274	Min 15	
		0.25/0.010				
		0.30/0.012				

Note: \*1 Please contact us for the availability of custom sizes, other than standard sizes.

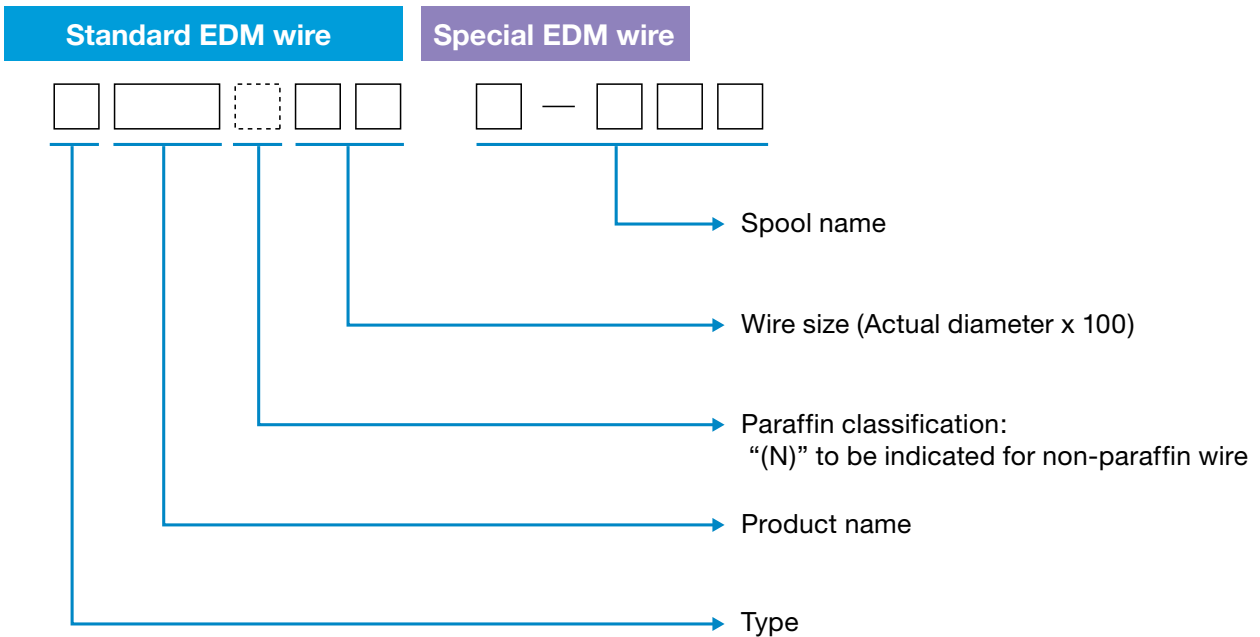
▶ Spool names and dimensions

Spool name	Flange diameter D(mm/inch)	Barrel diameter d(mm/inch)	Outer width L(mm/inch)	Flange thickness a(mm/inch)	Arbor hole diameter h(mm/inch)	Winding weight (kg/pound)	Spool dimensions
P-5RTS	130/5.1	80/3.1	110/4.3	10/0.4	20/0.8	3.0/6.6	
P-5RT	160/6.3	90/3.5	114/4.5	12/0.5	20/0.8	5.0/11.0	
P-5RTX	160/6.3	90/3.5	114/4.5	12/0.5	20/0.8	6.0/13.2	
P-10	200/7.9	110/4.3	134/5.3	12/0.5	25/1.0	10.0/22.0	
P-15L	250/9.8	125/4.9	140/5.5	15/0.6	34/1.3	20.0/44.0	
P-30	280/11.0	200/7.9	220/8.7	20/0.8	73/2.9	30.0/66.0	
K-125	125/4.9	80/3.1	125/4.9	12.5/0.4	16/0.6	3.0/6.6	
K-160	160/6.3	100/3.9	160/6.3	16/0.6	22/0.9	6.0/13.2	
K-160L	160/6.3	100/3.9	160/6.3	16/0.6	22/0.9	7.0/15.4	
K-160X	160/6.3	100/3.9	160/6.3	16/0.6	22/0.9	7.95/17.5	
K-200	200/7.9	125/4.9	200/7.9	20/0.8	22/0.9	15.0/33.0	
K-200X	200/7.9	125/4.9	200/7.9	20/0.8	22/0.9	15.91/35.0	
K-250	250/9.8	160/6.3	200/7.9	20/0.8	22/0.9	25.0/55.0	



## ▶ Packing Specifications

■ Please place an order according to the following format:



Typical model name: For non-paraffin wire

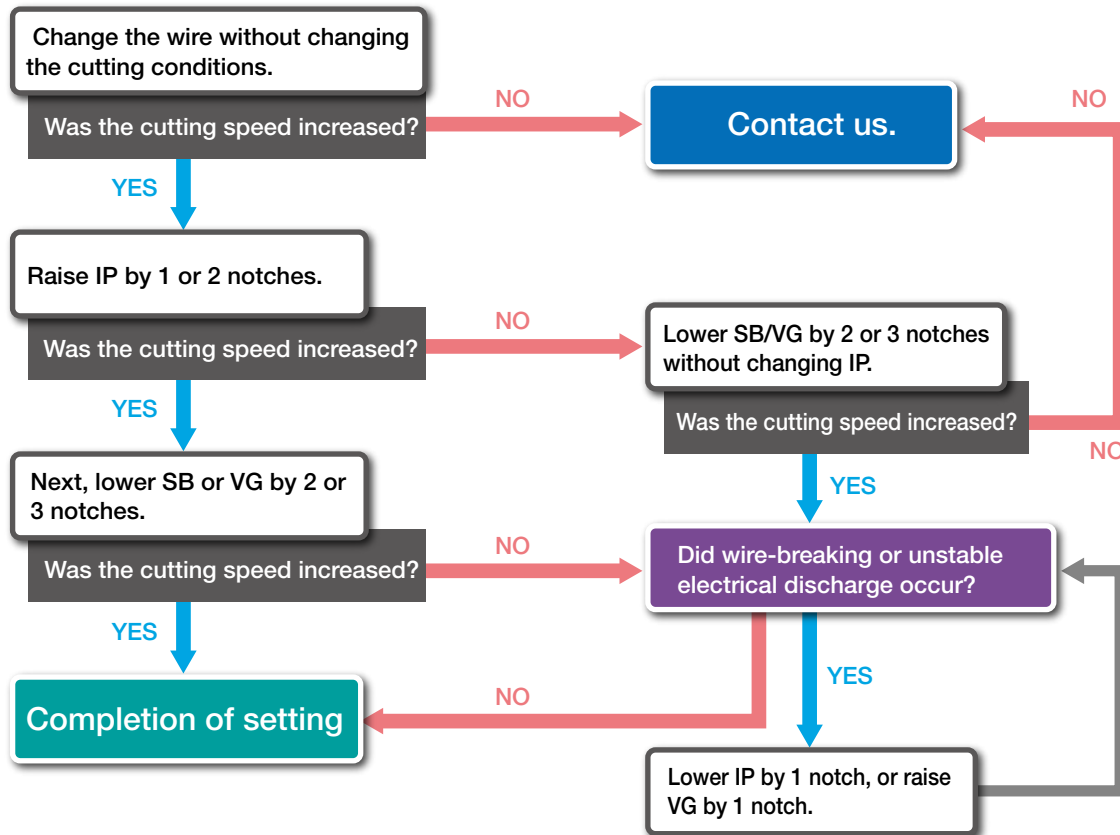
[H] [BZ-U] [(N)] [2] [0] [P] - [5] [R] [T] (Unit in mm) ...For BZ-U non-paraffin wire

Spool name	Winding weight (kg/pound)	Quantity packed in a carton box (pcs/box)	Carton box size L×W×H(mm/inch)	Color	Carton box dimensions
P-5RTS	3.0/6.6	4	370×290×200/14.6×11.4×7.9	Red	
P-5RT	5.0/11.0	4			
P-5RTX	6.0/13.2	4			
P-10	10.0/22.0	2	303×209×275/11.9×8.2×10.8	Green	
P-15L	20.0/44.0	1	300×210×290/11.8×8.3×11.4	Green	
P-30	30.0/66.0		307×285×322/12.1×11.2×12.7	Red	
K-125	3.0/6.6	4	370×290×200/14.6×11.4×7.9	Blue	
K-160	6.0/13.2				
K-160L	7.0/15.4				
K-160X	7.95/17.5	2	370×290×200/14.6×11.4×7.9	Blue	
K-200	15.0/33.0				
K-200X	15.91/35.0	1	300×210×290/11.8×8.3×11.4	Blue	
K-250	25.0/55.0		286×257×280/11.3×10.1×11.0		



▶ Setting cutting conditions (to increase cutting speed)

(Example) Tuning of Mitsubishi W-EDM machine



● Parameters for W-EDM machines of respective manufacturers

W-EDM machine makers	Discharge energy setting	Off-time setting
GF Machining Solutions (formerly Agie)	P, T	TD
GF Machining Solutions (formerly Charmilles)	A, IAL	B, Aj
Seibu	I	OFF
Sodick	IP, ON	MA, OFF
Fanuc	VM, ON	OFF
Makino	Peak current, ON	OFF
Mitsubishi	IP	SB, OFF


- Reference: How much the electrical discharge energy can be raised depends on the material thickness. Superior cutting conditions may be achieved by changing the settings according to the material thickness described below.

Material thickness	Setting point
20mm or less	<ul style="list-style-type: none"> <li>- Basically, lesser electrical discharge power is required for thinner workpiece.</li> <li>- A significant increase in speed is not allowed with thinner plates, for which acceleration is limited to being low.</li> <li>- The amount of discharging energy allowed to increase for material with a thickness of 10 mm or less is also small.</li> </ul>
20-60 mm	<ul style="list-style-type: none"> <li>- If the condition of a high-pressure jet stream is good, the machining efficiency will be improved.</li> <li>- For cutting a flat plate, place the nozzle as closely to the plate as possible.</li> <li>- A further increase in discharge energy is possible, given the better discharge of cutting sludge.</li> </ul>
60mm or more	<ul style="list-style-type: none"> <li>- Generally, more wire is consumed and susceptible to breaking more with a thicker plate.</li> <li>- The cutting speed may be increased by raising the wire speed.</li> <li>- Significant changes in conditions are possible, as the EDM wire shows a significant difference from brass wire in this range of thickness.</li> </ul>

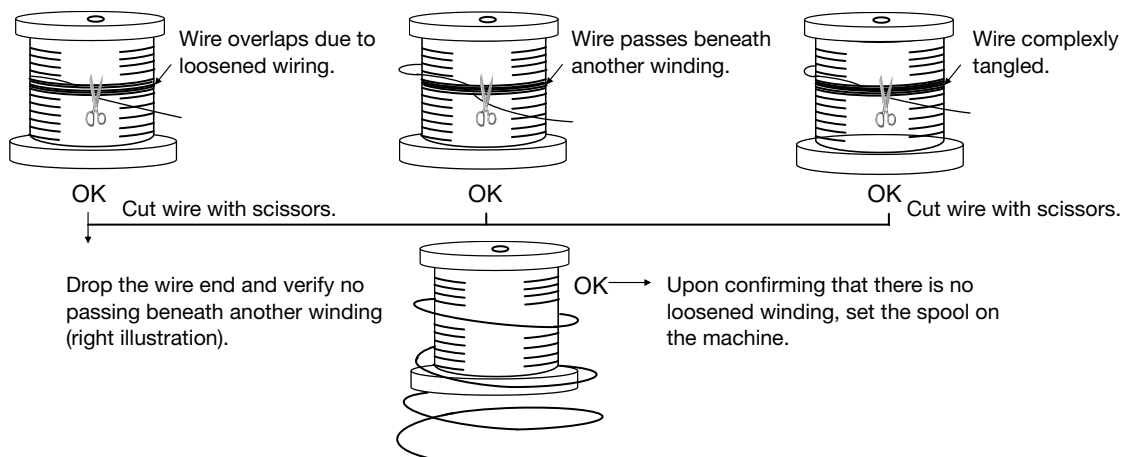
Note: As an optimal setting point varies depending on actual cutting conditions and other factors, please review the above-mentioned items so as to match the settings regarding your specific situation. Please contact us if you have any questions.

## ▶ Problems and troubleshooting

Trouble	Phenomenon	Cause	Check item/Solution
1. Wire breaking	① Breaking near feed plate	- Feed plate in friction	Check the feed plate and replace it periodically.
		- No striking of water from the feed plate nozzle	Clean the feed plate nozzle and check water pressure.
	② Breaking near wire guide	- Dirty wire guide	Perform periodic maintenance.
		- Excessively strong holding force of the wire guide	Make adjustment for optimal holding force.
		- Misaligned wire guide	Reset positioning accuracy.
	③ Breaking when idling	- Poor wire hooking	Check wire hooking position.
		- Wire winding crossed (tangled, passing beneath another)	Replace or wind off wire.
	④ Breaking immediately after the start of cutting or within 5 mm	- Air mixed in the cutting liquid (breaking in air)	Degrease and wash the object subject to cutting, as cutting conditions are very strict.
		- Tilted object subject to cutting	Check water pressure of machining liquid.
			Start cutting after plumbing.
⑤ Breaking after cutting 5 mm or more	- Low pressure of cutting liquid	Check for positioning error of cutting liquid nozzle and wear.	
	- Mismatched cutting conditions	Check for dirt of suction opening of cutting liquid supply tank.	
	- Existence of foreign material or pinhole within the object	Check the cutting liquid evacuation route when cutting an object in a complex shape.	
	- Defective wire	Replace wire.	
	- Poor travel of wire	Check for friction, cracks, and dirt of urethane rubber roller.	
		Correct setting error of wire tension.	
2. Error of cutting accuracy	① Shaping defect	- Insufficient pressing force of wire guide and positioning error	Adjust pressing force of wire guide and position.
		- Insufficient wire tension	Properly set wire tension.
		- Large fluctuation in ambient temperature	Remove material distortion (stress).
		- Non-uniform cutting materials	Erroneous plumbing of wire.
		- Improper offset	Clean and maintain guide dies and associated components.
3. Error of surface accuracy	① Rough surface	- Mismatched cutting conditions (non-uniform electric discharge)	Increase wire transfer speed.
	② Wire mark on cutting surface	- Insufficient wire tension	Increase cutting speed.
	③ Unstable cutting speed	- Excessively slow cutting speed	Replace ion-exchange resin and stabilize water specific resistance.
		- Degraded ion-exchange resin	Clean and maintain the wire travel system (i.e., guiding system).
		- Traveling fault of wire	Clean, maintain, and check consumption of the power feeder.
		- Friction, crack or dirt of urethane roller	
	- Improper wire tension		
4. Faulty cutting speed	① Increase of cutting speed disabled	- Mismatched cutting conditions (improper material, workpiece thickness, or size)	Match cutting conditions with those listed in the instruction manual.
			Check positions and wear of upper and lower nozzles.
5. Curl failure	① Irregular storage of wire within the scrap box (wire running wild to form permanent waves)	- Uneven remnant stress of wire	Increase applied current by 1 TAP (higher cutting speed).
		- Uneven wear of conveyor roller belt	Replace wire when uneven wear occurs or wear exceeds 1/3 of wire diameter.
		- Positioning error of conveyor roller belt	Consult with maintenance contractor of W-EDM machine.
		- Improper pressing force of conveyor roller belt	Run wire with pressing force suitable for wire used.
		- Large irregularity in wire shape	Replace the wire with one from a lot having proper straightness.

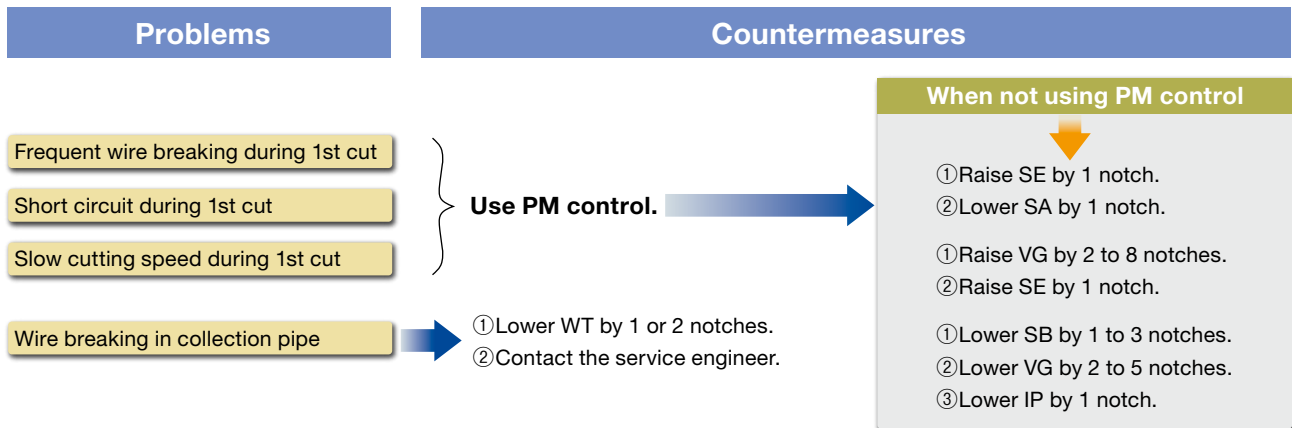
Trouble	Phenomenon	Cause	Check item/Solution
6. Failure of automatic threading (insertion failure)	① Disabled automatic insertion into guidance and pilot hole	- Contamination and clogging existing in guidance	Perform periodical maintenance.
		- Improper (too small) diameter of pilot hole (on working side)	Check minimum lower hole diameter of W-EDM machine.
		- Insufficient jet water pressure and amount of water	Adjust water pressure valve manually.
		- Misaligned upper head and pilot hole	Perform program checking and centering.
		- Large irregularity in wire shape	Replace the wire with one from a lot having proper straightness.
7. Failure of automatic threading (cutting failure)	In case of cutter cutting	- Uneven wear and insufficient cutting force of cutter	Replace wire if a wire mark exists, and check pressing pressure of cutting.
	① Poor cutting result	- Blurred cutting end of wire	Replace the cutting cutter with a new one.
	② Not inserted into lower hole	- Large irregularity in wire shape	Replace the wire with one from a lot having proper straightness.
	In case of annealer cutting	- Erroneous entry of wire diameter	Match the wire material and characteristics recommended by the W-EDM maker.
	① Poor cutting result	- Improper wire material	Enter the diameter of the wire being used.
	② Varied cutting positions	- Wrong wire type	
8. Faulty winding (wire passing beneath another)	① Wire end passing beneath another	- Released wire end (human error)	Thoroughly check the wire for passing beneath another after rewinding.
	② Wire passing beneath another occurs in the middle of a spool stroke, even though there is no problem when running		The customer needs to properly handle the wire end (when setting spool to W-EDM machine).
9. Winding failure (loose winding)	① Loose winding and "playing" wire	- Erroneous adjustment of winding tension (unstable dancer)	Set winding tension for individual wire diameters.
		- Play due to vibration of rewinding machine	Securely install the machine.
		- Misaligned center of the spool on the rewinding machine	Verify the shape and setting state of the spool on the machine.
10. Faulty winding (uneven winding)	① Uneven (i.e., convex and concave) winding in sections close to spool flanges	- Erroneous adjustment of rewinding machine traverser	Adjust traverser and perform periodical checking when rewinding.
		- Deformed spool	Change return control motor. Bring traverse pulley as close to winding body diameter as possible. Check spool shape.

▶ How to correct tangled wire



▶ Optimization of cutting conditions (Example) In case of an W-EDM machine manufactured by Mitsubishi

● Case of rough cutting (1st cut)



● How to change cutting conditions In case of cutting AISI D2, 60 t with  $\phi 0.2$  wire \*For a reference only. [AE: 21 notches, SE: 1 notch used]

1. In case of each workpiece

Types of material		Standard value	Adjustment value						
		<b>AISI D2 DIN 1.2363</b>	AISI P25 DIN 1.2330	AISI 1045 DIN C45	Stainless steel	Aluminum	Copper	Tungsten carbide copper tungsten	Graphite
Voltage switching	Vo (Notch)	12	0	0	0	0	0	0	+4
Cutting setting	IP (Notch)	9	0	-1	0	0	-1	-1	-2
Off-time	OFF (Notch)	1	0	0	0	0	0	0	0
Stabilizer A	SA (Notch)	3	0	0	0	0	0	0	-2
Stabilizer B	SB (Notch)	10	+2	+2	+2	+3	0	0	+4
Wire tension	WT (Notch)	8	0	0	0	0	0	0	-1
Average cutting voltage	VG (V)	39	0	0	+2	0	+8	+5	+15
Actual cutting speed	FA (%)	100	90	85	85	200	85	50	+40






2. In case of each cutting purpose

Types of material		Standard value	Correction value						
		<b>AISI D2 DIN 1.2363</b>	Either nozzle separated	Both nozzle separated	Stepped workpiece	Taper 3 degrees	Taper 5 degrees	Taper 10 degrees	Taper 15 degrees
Voltage switching	Vo (Notch)	12	0	0	0	0	0	0	0
Cutting setting	IP (Notch)	9	-1	-1	-2	0	0	-2	-2
Off-time	OFF (Notch)	1	0	0	0	0	0	0	0
Stabilizer A	SA (Notch)	3	0	0	0	0	0	0	-1
Stabilizer B	SB (Notch)	10	+2	+2	-1	+2	+2	+3	+3
Wire tension	WT (Notch)	8	0	0	0	-1	-1	-2	-3
Average cutting voltage	VG (V)	39	0	+4	+4	0	+5	+5	+10
Actual cutting speed	FA (%)	100	80	60	60	90	85	70	50

\*Wire breaking can be reduced by raising the SE notch from 1→2→3→4→5.

▶ Optimization of cutting conditions (Example) In case of an W-EDM machine manufactured by Mitsubishi

● Improvement of cutting precision (For punch shape)

● Concaved center		→ ① Raise 2nd cutting speed.	(Lower 2nd SB by 1 to 4 notches.) (Lower 2nd Vo by 1 to 2 notches.) (Lower 2nd VG by 2 to 5 notches.)
● Concaved center and variance existing in upper/lower dimensions		→ ① Raise 2nd cutting speed. ② Raise wire feeding speed.	(Same as above.) (Raise WS by 2 to 4 notches.)
● Variance existing in upper/lower dimensions		→ ① Raise wire feeding speed. ② Increase the amount of approach from 1st to 2nd.	(Raise WS by 2 to 4 notches.) (Increase the amount by 2 to 7 μm.)
● Bullet-shaped and variance existing in upper/lower dimensions		→ ① Decrease the amount of approach from 1st to 2nd.	(Increase the amount by 2 to 10 μm.)
● Barrel-shaped		→ ① Lower 2nd cutting speed.	(Lower 2nd VG by 2 to 5 notches.) (Lower 2nd SB by 1 to 3 notches.)

● When seams are formed on cutting surface

[When short circuit occurs]	→	① Decrease approach amount between IP:4 and IP:3 by 1 to 5 μm. ② Raise VG of IP:4 by 1 to 5 notches. ③ Raise Vo of IP:3 by 2 to 4 notches. ④ Perform the "Plus-One" cutting (see the following item).
[When FC=0 occurs]	→	① Lower, by 3 to 8 notches, the VG of cutting conditions under which "FC = 0" occurs. ② Decrease the amount of approach from 1st to 2nd by 5 to 10 μm.

\* For the case of cutting a thicker plate (60 mm or more), where the upper and lower nozzles are significantly spaced apart, ensure a working fluid flow rate of 1.5 to 2.0 L from the 2nd cutting and thereafter (for the purpose of preventing a short circuit and dropped speed at IP:3 or less).

● Tips on finish cutting (points to be checked during cutting)

Cutting speed falls compared with [1st] standard cutting.	→	When slow → •Raise IP by 1 notch. •Raise SB by 1 to 2 notches.
Optimal [2nd] cutting speed is 1.5 to 2.3 times of FA.	→	When slow → •Raise Vo by 1 to 2 notches. •Lower SB by 1 to 4 notches.
Optimal [3rd] cutting speed is 2.0 to 2.5 times of FA. IP:3 (Stable when cutting voltage V is VG +3 to +15 V)	→	When slow → •Raise Vo by 2 to 4 notches. •Lower VG by 2 to 5 notches.
Optimal [4th] cutting speed is 2.0 to 2.5 times of FA. IP:2 (Stable when cutting voltage V is VG +5 to +15 V)	→	When slow → •Raise Vo by 2 to 4 notches. •Lower VG by 2 to 5 notches.

\* When cutting speed is too high, take measures opposite to the above.

 **Hitachi Metals, Ltd.** <http://www.hitachi-metals.co.jp/e/>

**Cable Materials Company**

Shinagawa Season Terrace, 2-70, Konan 1-chome, Minato-ku, Tokyo 108-8224, Japan  
Tel : +81-3-6774-3636

 **Hitachi Metals Singapore Pte. Ltd.**

**Head Office**

12 Gul Avenue, Singapore 629656  
Tel : +65-6861-7711



Robofil is a registered trademark of Charmilles Technologies S.A.  
DWC is a registered trademark of Mitsubishi Electric Corporation.  
※Specifications subject to change without notice.