

Electrical Discharge Machining Wire 〈EDM wire〉

Proterial, Ltd. <https://www.proterial.com/e/>

Headquarters

Toyosu Prime Square, 5-6-36 Toyosu,
Koto-ku, Tokyo 135-0061, Japan

Ibaraki Works

4-10-1, Kawajiri-cho Hitachi-city, Ibaraki 319-1411, Japan

Proterial Asia Pacific Pte. Ltd.

Head Office

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

Proterial (India) Private Limited

Plot No 94 & 95, Sector 8, IMT Manesar, Gurugram-122050, Haryana, India
Tel. +91-124-4812300



Contact us
(through proterial web site)



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.

SIMPLY THE BEST!
MADE IN JAPAN

Electrical Discharge Machining Wire

We always try to satisfy customer demands by our accumulated technology and expertise from casting to drawing process as a Japanese cable manufacturer.

- 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

HBZ-K/HBZ-U wire (60/40 brass : Equivalent to JIS C 2800)	4
HBZ-MU wire (65/35 brass : Equivalent to JIS C 2700)	4

Special EDM wire

HBZ-B wire (57/43 brass : for Faster speed cutting)	5
ABZ wire (Soft 65/35 brass : for Taper cutting)	6
ABZ-AT wire (Soft 65/35 brass : for Wide-angle Taper cutting)	6
HBZ-SS wire (60/40 brass : for Line-mark control cutting)	7

Coated wire

HIH wire (Zinc coated for Better surface roughness cutting)	8
---	---

Ordering products

Product specifications	9
Spool specifications	9
Packing specifications	10

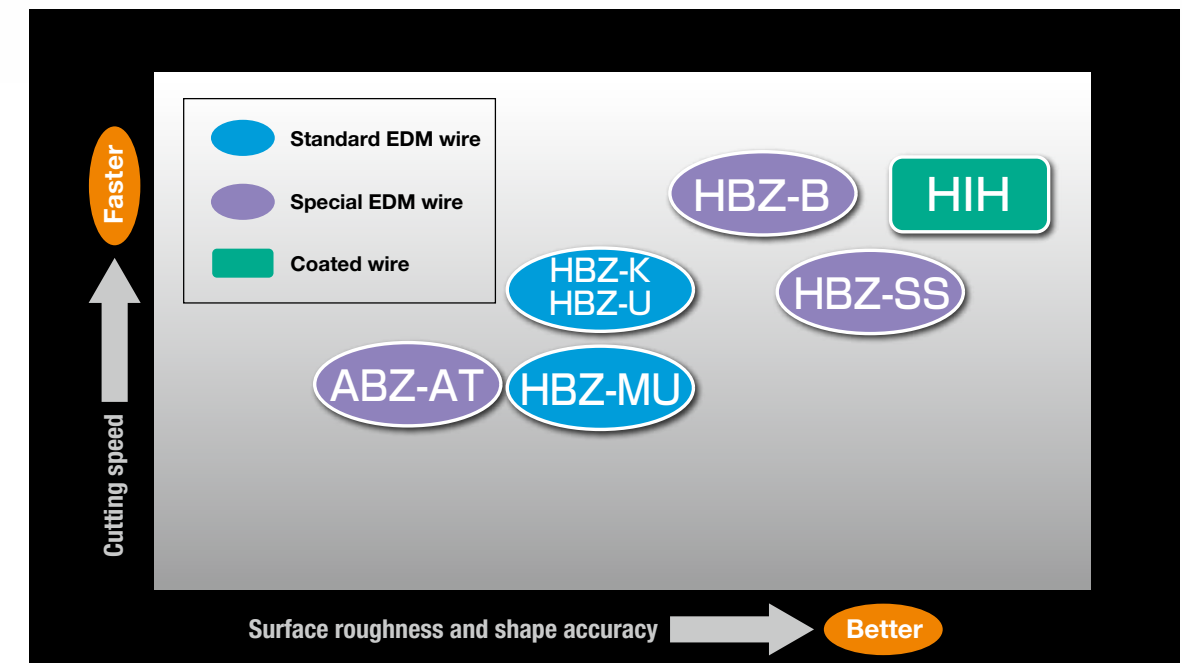
Technical data

Problems and troubleshooting	11
Precaution and corrective action against wire tangling	12,13
Optimization of cutting conditions	14

History

Corporate name	Year	Events
Hitachi, Ltd.	1918	Magnet Wire manufacturing started at Hitachi Works
Hitachi Cable, Ltd.	1956	Wire and Cable business unit company was established.
	1965	Toyoura Works(in Hitachi city Ibaraki prefecture) was set up
	1980	EDM wire, HBZ manufacturing started.
	1996	ISO9001 was certified
	1997	ISO14001 was certified
Hitachi Metals, Ltd.	2013	Hitachi Cable, Ltd. and Hitachi Metals, Ltd. were combined.
Proterial, Ltd.	2023	Hitachi Metals has become a new company Proterial.

Positioning of each wire type



Cutting application of each wire type

Cutting target		Standard EDM wire		Special EDM wire		Coated wire
		HBZ-K / HBZ-U	HBZ-MU	HBZ-B	ABZ/ABZ-AT	HIH
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	★(※1)	★	○	—	○
	Fanuc	★	○	○	★	★
	Makino	○	◎	○	—	○
	Mitsubishi	★(※2)	★	○	—	◎

★ : Excellent ◎ : Good ○ : Applicable

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

※1 : For EDM cutting piece required less than 2μmRz

※2 : For EDM after FA series with automatic threading

▶ 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)	—	○	
	AGIE CUT (SF + HSS)	—	○	
	Classic/Evolution/Excellence /Progress/Vertex	—	○	
GF Machining Solutions (formerly Charmilles)	Robofil®	—	○	
Seibu	MA/MMA/Super MMA /MB/MMB/Ultra MMB	—	○	The non-paraffin type applies to all wire, regardless of size.
	MS	—	○	
	EW	—	○	
Sodick	AL/VL	—	○	The non-paraffin type applies to all wire, regardless of size.
	AG/SL/AQ	—	○	
	AP	—	○	
	EXC	—	○	
Fanuc	α	—	○	The non-paraffin type also applies to new models (i.e., α Series).
	Tape Cut	○	—	
Makino	U (H.E.A.T,j)	○	—	For wire of φ0.15 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 φ0.15 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



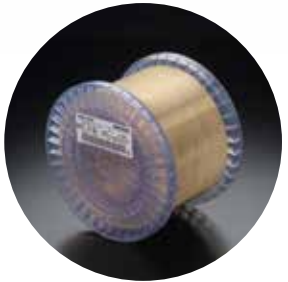
If paraffin wire is used on the W-EDM machine that is specifically calibrated for non-paraffin wire, the characteristics of electrical discharge machining may be adversely affected since the wire travel system will become unstable due to sliding, etc. Sufficient care must be taken when selecting wire,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

HBZ-K/HBZ-U wire



Capable of automatic threading

Hard wire

- ▶ Proterials' 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 HBZ-K/HBZ-U wire

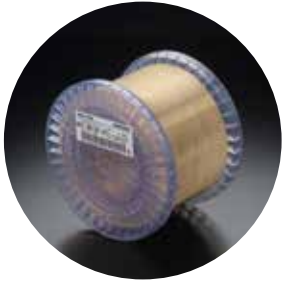
Product name	Standard size*1 (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
HBZ-K/HBZ-U	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
	0.15/0.006			
	0.20/0.008			
	0.25/0.010	-0.002~0/ -0.00008~0	Min 932	
	0.30/0.012		Min 850	
	0.40/0.016			

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

Standard
EDM wire

HBZ-MU wire



Brass powder reduction

Capable of automatic threading

Hard wire

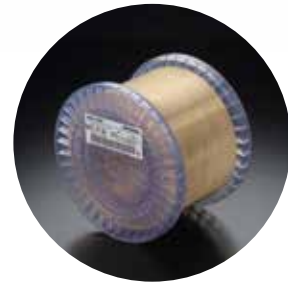
- ▶ Significant reduction of brass powder adhered to cutting surface
- ▶ Improved automatic threading capability due to excellent straightness of wire
- ▶ Applicable for use on all models of W-EDM machines of pipe, jet or anneal systems equipped with an automatic threading function.

General characteristics of HBZ-MU wire

Product name	Standard size*1 (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
HBZ-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			

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**HBZ-B wire**

High-speed cutting

Brass adhesion prevention

Improvement in surface accuracy

Hard wire

- ▶ Higher zinc material
- ▶ Faster cutting speed with better quality surface roughness
- ▶ Save wire cutting hours

General characteristics of HBZ-B wire

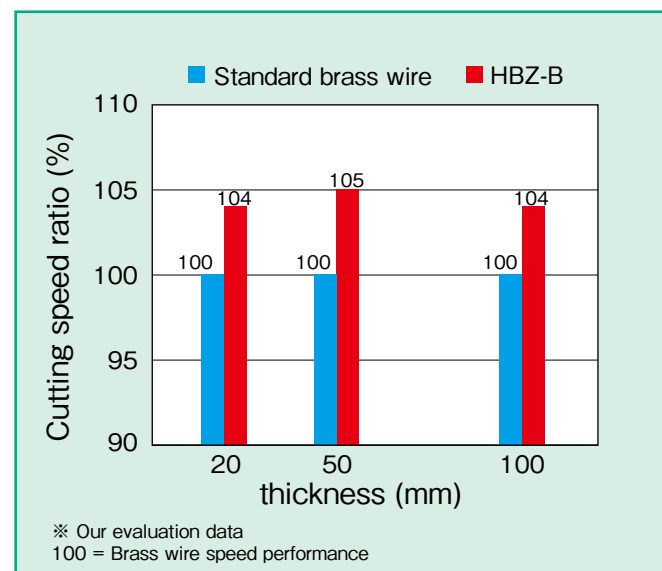
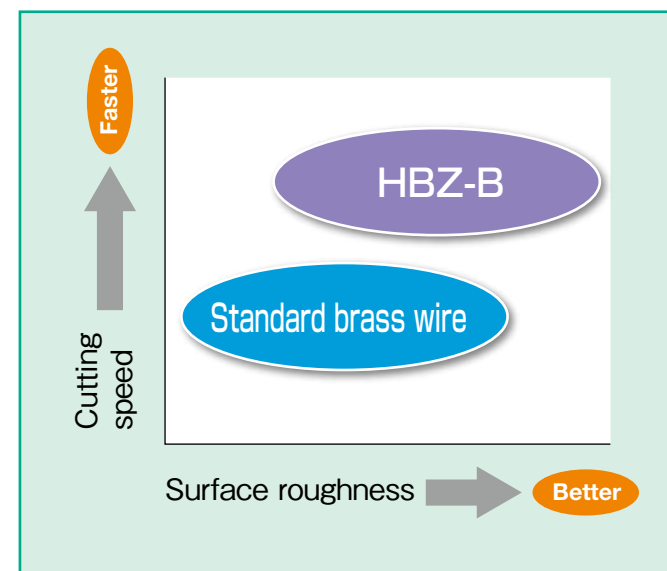
Product name	Standard size※ ¹ (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
HBZ-B	0.20/0.008	-0.002~0/ -0.00008~0	Min 883	Min 0.4
	0.25/0.010		Min 784	
	0.30/0.012			

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

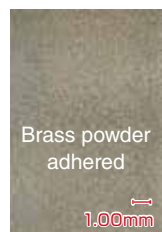
▶ The paraffin or non-paraffin type is specifiable. Please see "Table for checking paraffin presence" on page 3 for applicable W-EDM machines.

▶ Faster cutting speed

High-Zinc brass enables to have faster cutting speed performance with good surface roughness.
More suitable for thick piece cutting than general coated wire



▶ Brass powder adhered to cutting surface

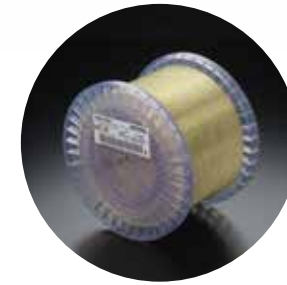


■ What is "Brass powder adhered" ?

Brass powder from wire can adhere to a workpiece surface during EDM process. It is because thermal compound would be formed from wire material copper and work piece material through EDM process. Enhancing Zinc percentage of brass wire enables to reduce brass powder

■ Brass powder reduction effect

HBZ-U, HBZ-MU < HBZ-B
(Standard brass) (High Zinc Brass)

Special
EDM wire**ABZ wire**

Taper cutting

Soft wire

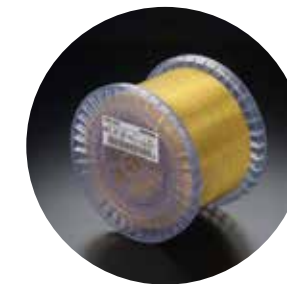
- ▶ Effective for taper cutting
- ▶ For less than 20° taper cutting.

General characteristics of ABZ wire

Product name	Standard size*1 (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
ABZ	0.20/0.008	-0.002~0/ -0.00008~0	Min 441	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.

▶ 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**ABZ-AT wire**

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 ABZ-AT wire

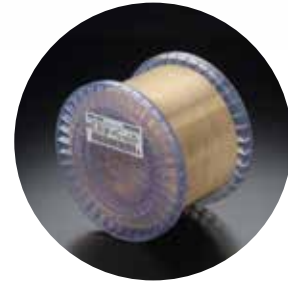
Product name	Standard size※ ¹ (φ mm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
ABZ-AT	0.20/0.008	-0.002~0/ -0.00008~0	Max 490	Min 25
	0.25/0.010		Max 450	
	0.30/0.012			

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

HBZ-SS wire



High precision process

Line-mark reduction

Hard wire

- ▶ Line-mark reduction and control, resulting in better quality surface roughness
- ▶ Specially stricter tolerance controlled lengthwise
- ▶ Save post-process working hours such as lapping process

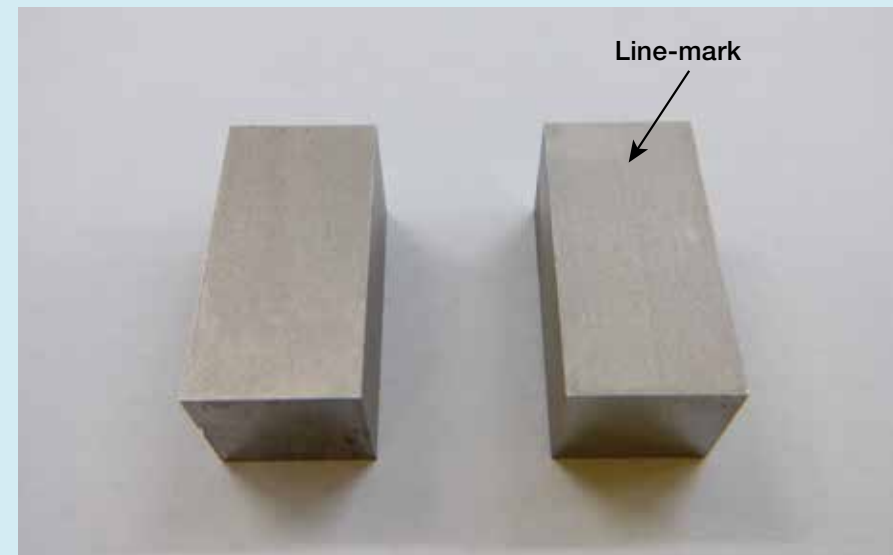
General characteristics of HBZ-SS wire

Product name	Standard size※1 (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
HBZ-SS	0.10/0.004	-0.001~0/ -0.00004~0	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			

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

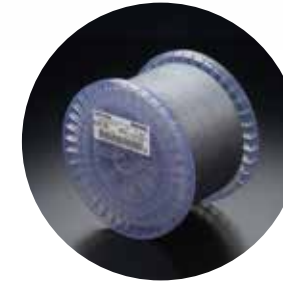
▶ Only non-paraffin type available

▶ Example of Line-mark on workpiece surface



Coated wire

HIH wire



Improvement in surface accuracy

Zinc powder reduction

Brass adhesion prevention

Hard wire

- ▶ Effective for better surface roughness and form accuracy
- ▶ Stable and constant discharge performance by uniform Zinc coating
- ▶ Reducing thermal stress to workpiece during EDM process, and contributing to longer life of press mold

General characteristics of HIH wire

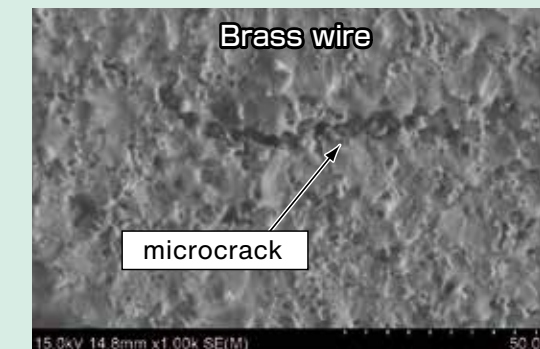
Product name	Standard size*1 (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
HIH	0.10/0.004	±0.001/±0.00004	Min 980	Min 0.4
	0.15/0.006			
	0.20/0.008	-0.002~0/ -0.00008~0	Min 932	
	0.25/0.010			
	0.30/0.012			

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.

▶ Tungsten carbide (Wc-Co) surface photos after EDM process with wire

Cutting surface

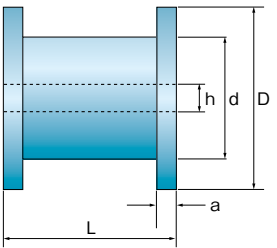


▶ Product specifications

Product category	Product name	Standard size *1 (φmm/inch)	Wire tolerance (mm/inch)	Tensile strength (MPa)	Elongation (%)
Standard EDM wire	HBZ-K/HBZ-U	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		Min 850	
	0.40/0.016	HBZ-MU	±0.001/±0.00004	Min 980	Min 0.4
	0.10/0.004				
	0.15/0.006		-0.002~0/-0.00008~0	Min 932	
	0.20/0.008				
	0.25/0.010				
0.30/0.012					
Special EDM wire	HBZ-B	0.20/0.008	-0.002~0/-0.00008~0	Min 883	Min 0.4
		0.25/0.010		Min 784	
		0.30/0.012			
	ABZ	0.20/0.008	-0.002~0/-0.00008~0	Min 441	Min 15
		0.25/0.010			
		0.30/0.012			
	ABZ-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			
	HBZ-SS	0.10/0.004	-0.001~0/-0.00004~0	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			
Coated Wire	HIH	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			

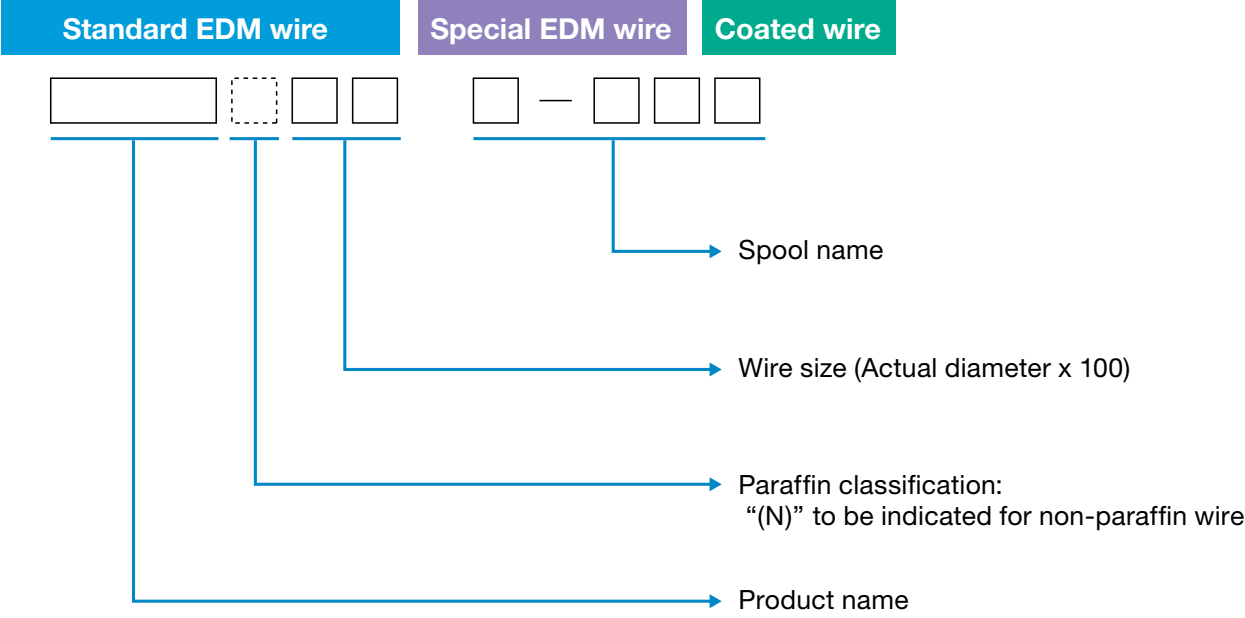
Note: *1 Please contact us for the availability of custom sizes, other than standard sizes.

▶ Spool specifications

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	160/6.3	90/3.5	114/4.5	12/0.5	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	90/3.5	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	

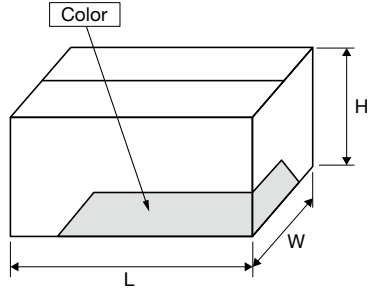
▶ Packing Specifications

■ Please place an order according to the following format:



Typical model name: For non-paraffin wire

HBZ-U (N) 2 0 P — 5 R T (Unit in mm) ...For HBZ-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	Red	
P-30	30.0/66.0		307×285×322/12.1×11.2×12.7		
K-125	3.0/6.6	4	370×290×200/14.6×11.4×7.9	Blue	
K-160	6.0/13.2	2			
K-160L	7.0/15.4				
K-160X	7.95/17.5				
K-200	15.0/33.0	1	300×210×290/11.8×8.3×11.4		
K-200X	15.91/35.0		286×257×280/11.3×10.1×11.0		
K-250	25.0/55.0				



► Problems and troubleshooting

Trouble	Phenomenon	Cause	Check item/Solution
1. Wire breaking	①Breaking 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.
	②Breaking 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.
	③Breaking when idling	- Poor wire hooking	Check wire hooking position.
		- Wire winding crossed (tangled, passing beneath another)	Replace or wind off wire.
	④Breaking 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	①Shaping 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	①Rough surface	- Mismatched cutting conditions (non-uniform electric discharge)	Increase wire transfer speed.
	②Wire mark on cutting surface	- Insufficient wire tension	Increase cutting speed.
	③Unstable 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	①Increase 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	①Irregular 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.

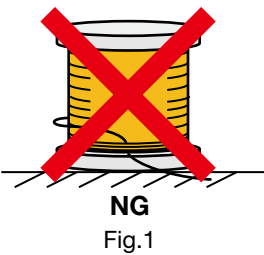
Trouble	Phenomenon	Cause	Check item/Solution
6. Failure of automatic threading (insertion failure)	① Disabled automatic insertion into guidance and pilot hole	- Contamination and clogging existing in guidance	Perform periodical maintenance.
		- Improper (too small) diameter of pilot hole (on working 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.
8. Faulty winding (wire passing beneath another)	① Poor cutting result	- Improper wire material	Enter the diameter of the wire being used.
	② Varied cutting positions	- Wrong wire type	
	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.

► Precaution and corrective action against wire tangling

When handling wire. “Please do not release wire-end and loosen wire winding.”

When storing wire. “Please do not put spool as shown in Fig.1.”

- * If you release wire-end, it will be a cause of wire tangling.
- * If you put spool as shown in Fig.1, it will be a cause of loosen wire winding.
- * If tangling happens to wire, it will be cause of AWF error and wire breakage.



▶ Precaution and corrective action against wire tangling

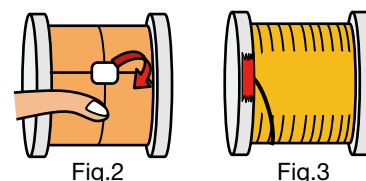
<Precautions when handling EDM wire>

(1)When setting spool and wire in the machine

- ① Please do not detach wire-end label and anti-rust paper when setting spool in the machine.
- ② Please hold wire (near wire-end label) by your finger when detaching wire-end label.(Fig.2)
- ③ Please do not release wire-end when setting wire in the machine.

(2)When detaching spool from machine.

- ① Please do not loosen wire winding.
- ② Please hold wire-end on spool flange by tape.(Fig.3)



(3)When storing wire

- ① Please rewind anti-rust paper on the spool, because it is necessary for preventing discoloration of wire.
- ② Please put spool into Proterial EDM wire carton box.
- ③ If you store wire for a long time, wire straightness become big, therefore we recommend you to use wire as soon as possible.
 - * If discoloration and rust happens to wire, it will be a cause of wire breakage.
 - * If wire straightness becomes big, it will be a cause of AWF error.

(4)When changing spool and using wire feeding machine(Autoloader)

- ① Please pay attention to wire tension setting.

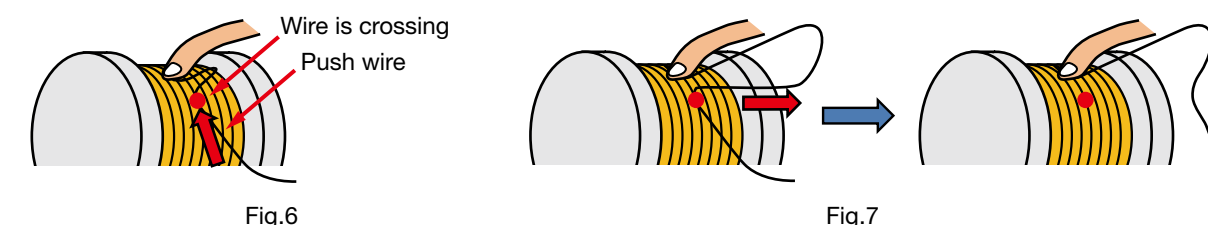
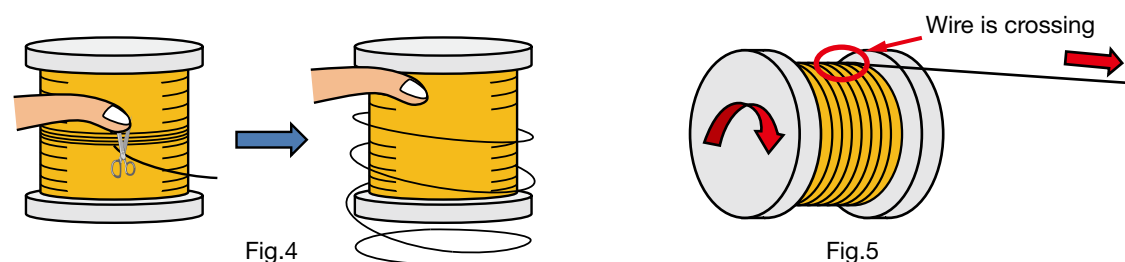
<Wire tangling check method>

If you find loose wire winding or released wire-end, please check the wire winding status and make a corrective action.

- ① When wire winding become loose or complicated tangling, please hold the wire with your finger and cut tangling area.(Fig.4)
- ② Unwind wire until wire-end will be single.
- ③ Turn spool and unwind wire slowly as shown in Fig.5.
- ④ In case wire is tangled, you can find a point where wire is crossing.

<Wire tangling corrective action>

- ① When you find a point where wire is crossing, please hold it with your finger and push the wire-end to make slack of wire.
- ② Hold slack of wire with your finger and withdraw wire-end from where wire is crossing.(Fig.6)
(In case wire-end is far from a point where wire is crossing, please cut slack of wire.)
- ③ Please confirm that wire tangling is resolved.
- ④ If tangling is not resolved, please continue the corrective action again.



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

●Improvement of cutting precision (For punch shape)

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

●When Line-marks are formed on cutting surface

- [When short circuit occurs] → ①Decrease approach amount between IP:4 and IP:3 by 1 to 5 μm.
②Raise VG of IP:4 by 1 to 5 notches.
③Raise Vo of IP:3 by 2 to 4 notches.
④Perform the“Plus-One”cutting (see the following item).

- [When FC=0 occurs] → ①Lower, by 3 to 8 notches, the VG of cutting conditions under which “FC = 0” occurs.
②Decrease 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.