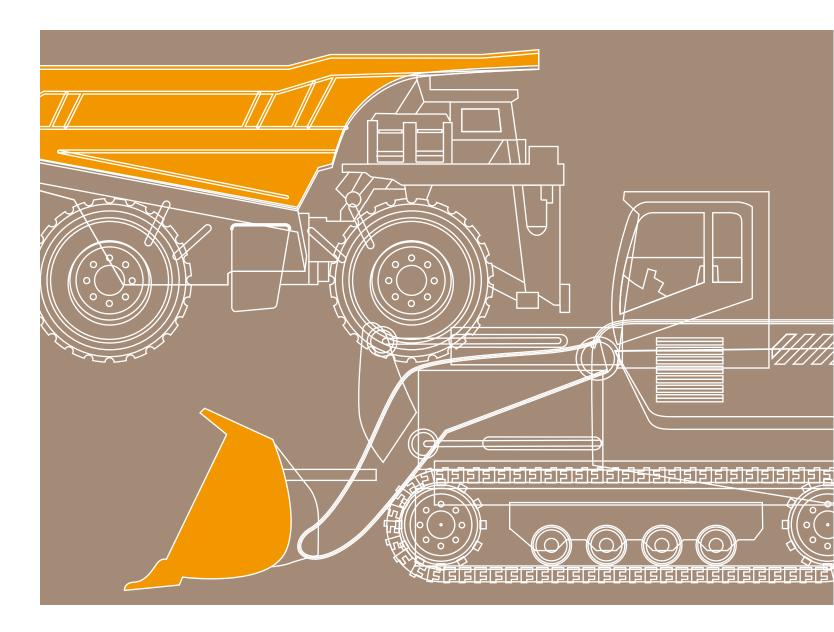
Steel Plate

ABREX[™] Abrasion resistant steel plate

NIPPON STEEL & SUMITOMO METAL

http://www.nssmc.com/





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NIPPON STEEL & SUMITOMO METAL

Foreword

The WEL-TEN AR Series and the WEL-HARD Series from the former Nippon Steel and the SUMIHARD Series from the former Sumitomo Metal are all widely used abrasion resistant steel plates which meet the needs for higher strength steel for applications in construction and other types of industrial machinery. Here NSSMC is proud to introduce the new ABREX* Series, with 4 standard options of abrasion resistant steel plate in addition to 3 extra tough options. We appreciate your support and look forward to receiving your orders for these products.

*ABREX stands for ABrasion Resistance EXcellent.

Advantages of Using ABREX[™]

The use of abrasion resistant ABREX steel plate markedly reduces the weight of structural members exposed to severe abrasive conditions. Compared with regular steel, ABREX steel plate reduces structural weight and delivers economic merits. Adoption of high performance abrasion resistant ABREX will prolong the service life of machinery and components.

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Introducing the ABREX[™] Series

The ABREX* Series features 4 standard options of abrasion resistant steel plate in addition to 3 extra tough options - a product range capable of meeting a variety of needs. All of our products are maintained at very low impurity levels, making them well suited to welding and formability.

Specifications by Type and Designation

Turne	Decignation	Plate Thickness	Brinell Hardr	iess (HBW)*1	Charpy Impact Test (L Direction)*2			
Туре	Designation	t (mm)	Aiming	Range	Test Temperature (°C)	Absorbed Energy (J)		
	ABREX 400	6(4.0) ~ 100	400	360 ~ 440	-	-		
Ohan dand Tara	ABREX 450	6(4.5) ~ 50	450	410 ~ 490	-	-		
Standard Type	ABREX 500	6(4.5) ~ 50	500	450 ~ 550	-	-		
	ABREX 600	6 ~ 25	600	550 ~ 650	-	-		
	ABREX 400LT	6 ~ 60	400	360 ~ 440	-40	27		
Extra Tough Type	ABREX 450LT	6 ~ 25	450	410 ~ 490	-40	27		
	ABREX 500LT	6 ~ 25	500	450 ~ 550	-40	21		

Please consult with us with regard to the figures in parenthesis above.

*1: The Brinell Hardness value is an average of measurements taken from three points on the steel plate surface. A section of the surface from which the decarburized layer is ground off by about 0.7mm should be used as the specimen surface. Prior consultation is recommended in the case of using thicknesses surpassing those listed above.

*2: The Charpy Impact Test shall be applied to steel plates thicker than 12mm.

	Designation	Chemical Composition (%) *1											
Туре		с	Si	Mn	Р	s	Ni	Cr	Мо	В	Рсм (t: thickness)* ²		
		Ŭ	0.		•	Ũ		0.			t 25	t > 25	
	ABREX 400	0.21	0.70	2.00	0.025	0.010	1.00	1.20	0.60	0.005	0.30	0.35	
Ctandard Tuna	ABREX 450	0.23	0.70	2.00	0.025	0.010	1.00	1.20	0.60	0.005	0.36	0.36	
Standard Type	ABREX 500	0.35	0.70	2.00	0.015	0.010	1.00	1.20	0.60	0.005	0.42	0.42	
	ABREX 600	0.45	0.70	2.00	0.015	0.010	1.00	1.20	0.60	0.005	0.54	-	
	ABREX 400LT	0.21	1.20	2.00	0.020	0.010	1.00	1.20	0.60	0.005	0.30	0.35	
Extra Tough Type	ABREX 450LT	0.28	1.20	2.00	0.020	0.010	1.00	1.20	0.60	0.005	0.36	-	
	ABREX 500LT	0.35	1.20	2.00	0.015	0.010	1.00	1.20	0.60	0.005	0.42	-	

*1: Elements other than those listed in the table can be added as necessary.

*2: $P_{CM} = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B(\%)$

Typical Properties and Characteristics

					Mechanical Properties (Reference Values)								
Turne	Decignation	Thick-	Brinell Hardness	Tensile	e Tests	Ber	iding Te	ests	Charpy Im	npact Test			
Туре	Designation	ness (mm)	(HBW)	Yield Strength (N/mm2)	Tensile Strength (N/mm2)	Bend radius (t:thickness)	Angle	Result	Temperature (°C)	Absorbed Energy (J)			
	ABREX 400	25	414, 417, 416	1075	1322	3t	180 °	No cracking	0	73			
Standard	ABREX 450	25	458, 453, 459	1192	1469	3t	180 °	No cracking	0	57			
Туре	ABREX 500	25	513, 509, 520	1373	1552	3t	180 °	No cracking	0	43			
	ABREX 600	25	611, 606, 601	1568	2058	-	-	-	0	13			
Extra	ABREX 400LT	60	390, 393, 393	1162	1207	3t	180 °	No cracking	-40	63			
Tough	ABREX 450LT	25	464, 464, 467	1237	1560	3t	180 °	No cracking	-40	38			
Туре	ABREX 500LT	25	495, 492, 495	1198	1680	3t	180 °	No cracking	-40	38			
-	Test Condition		JIS Z2243 Surface	JIS No.5 T	Direction	JIS No.	1 T Dir	ection	2mmV Notcl	h L Direction			

Precautions for Use

Increasing the thickness of the steel plate will lead to a slight decrease in the hardness of the central portion of the plate. In the event that these steel plates need to perform at high temperatures, please consult with us prior to placing your order. In the event that these steel plates need to perform at low temperatures, please select the Extra Tough steel plate options.

Size Availability

.....

ABREX	400,	400	LT														(Ler	ngth: m)
Width(mm)	1000 and over ~1200	1200 over ~1400	1400 ~	1600 ~	1800 ~	2000 ~	2200 ~	2400 ~	2600 ~	2800 ~	3000 ~	3200 ~	3400 ~	3600 ~	3800 ~	4000	4200 ~	4400
Thickness(mm)	and less		1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4500
$\frac{4 \leq \leq 4.5}{4 \leq 1.5}$	unu icoo	unu icoo																
4.5 < ≤6			8															<u> </u>
6			10															
6< ≤7			10															
7 < ≤8																		
8< ≤9			18				15											
9 < ≤10																		
10 < ≤12																		
12 < ≤14																		
14 < ≤16																		
16 < ≤18																		
18 < ≤20																		
20 < ≤22																		
22 < ≤24																		
24 < ≤26																		
26 < ≤28																		
28 < ≤30																		
30 < ≤32																	22	22
32 < ≤34																22	21	20
34 < ≤36			23												22	21	20	19
36 < ≤38														22	20	19	19	18
38 < ≤40												22	22	20	19	18	18	17
40 < ≤42												20	20	19	18	17	16	16
42 < ≤44											22	20	20	18	18	17	16	16
44 < ≤46										22	21	19	19	18	17	16	15	15
46 < ≤48										21	20	18	18	17	16	15	15	14
48 < ≤50									22	20	19	17	17	16	15	15	14	14
<u>50 < ≤52</u>									21	20	19	17	17	16	14	14	13	13
<u>52 < ≤54</u>								00	21	19	18 17	16	16 15	15	14	14	13 12	13 12
<u>54 < ≤56</u>							22	22 21	20 19	18 17	17	15 15	15	14 14	13 13	13 13	12	12
56 < ≤58 58 < ≤60						22	22	20	18	16	16	15	15	14	13	13	12	
<u>58 < ≤60</u> 60 < ≤65			22			22	22	19	17	15	15	14	14	13	12	12	12	
<u>60 < ≥65</u> 65 < ≤70			22				18	17	16	15	15	13	13	ļ				
<u>70 < ≤75</u>			19				17	16	15	13								
70< ≤75 75< ≤80			18				16	15	15	13								
80 < ≤85			17				15	15										
85 < ≤90			16				10											<u> </u>
90 < ≤95			15															<u> </u>
<u>95 < ≤100</u>			14															
95 2100			14															

ABREX 450, 500, 450LT, 500LT

ADITEA	,	,		, •,														igui. III)
Width(mm)	1000 and over	1200 over	1400 ~	1600 ~	1800 ~	2000 ~	2200 ~	2400 ~	2600 ~	2800 ~	3000 ~	3200	3400	3600	3800	4000 ~	4200 ~	4400
Thickness(mm)	~1200 and less	~1400 and less	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4500
4.5≤ ≤5		8																
5< <6		10																
6≤ ≤7																		
7 < ≤8																		
8< ≤9		18																
9 < ≤10							13											
10 < ≤12																		
1 2< ≤14																		
14 < ≤16																		
<u>16< ≤18</u>																		
18< ≤20																		
20 < ≤22																		
22 < ≤24																		
24 < ≤26																		
26 < ≤28																		
28 < ≤30		23																
30 < ≤32																	22	22
32 < ≤34																22	21	20
34 < ≤36															22	21	20	19
36 < ≤38														22	20	19	19	18
38 < ≤40												22	22	20	19	18	18	17
40 < ≤42												20	20	19	18	17	16	16
<u>42 < ≤44</u>											22	20	20	18	18	17	16	16
44 < ≤46										22	21	19	19	18	17	16	15	15
46 < ≤48										21	20	18	18	17	16	15	15	14
48 < ≤50									22	20	19	17	17	16	15	15	14	14

(1) The figures quoted in the tables above represent the lengths of steel plate that can be manufactured. (2) Please consult us about the range indicated by the color pink in the tables above. (3) We will clarify issues related to flatness and rust-resistance with regard to the manufacture of one-sided short blast steel plate with a thickness of less than 15.0mm. (4) Please consult us with regard to dimensions outside of the range detailed in the above tables. (5) The minimum plate length is 3m. (6) Please ask us for details about the manufacturing range for ABREX 600.

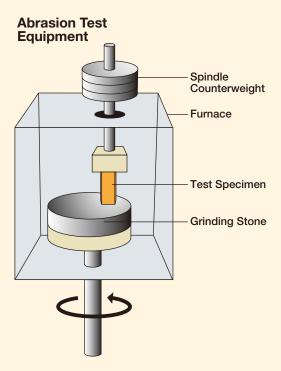
(Length: m)

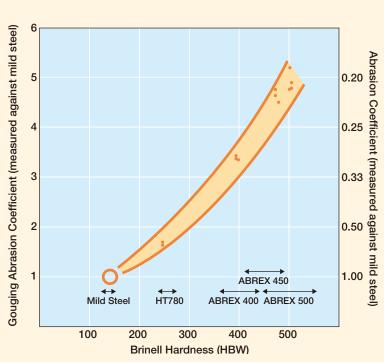
Abrasion Resistance

The loss in the mass of steel due to abrasion decreases as the surface hardness of steel increases. Accordingly, it is necessary for steel, for which abrasion resistance is required, to have higher surface hardness. NSSMC s abrasion resistant ABREX steel plate is designed by placing priority on resistance to abrasion caused by earth and sand. It offers excellent scratching abrasion resistance 2 to 5 times that specified for mild steel.

Properties and Characteristics

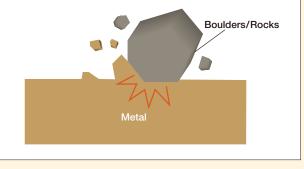






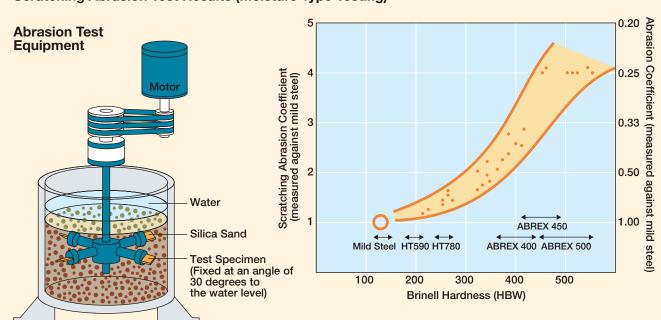
Gouging Abrasion

Boulders and rocks cause abrasion when they gouge and scrape a metallic surface. Due to repeated heavy loads and impacts, relatively large portions of the metallic surface can suffer damage, leading to the formation of grooves and dents. This can occur to shovels, etc. when tasked with excavating a rock face.



Properties and Characteristics

Scratching Abrasion Test Results (Moisture Type Testing)



Test Conditions Silica sand is suspended

Silica sand is suspended in water and the test specimen spun through this water. The resulting abrasion is measured.

Container	: 580mm in diameter
Sand	: The silica sand is in suspension in
	the water to a maximum level some
	150mm above the test specimen.
Water	: Water is added until it reaches a
	level some 10mm above the level
	of the sand.
Test specime	n:50mm x 50mm; 5mm thick
Rotating spee	d: 3.7m/s

Precautions for Use

The amount of abrasion will change depending on the usage environment.

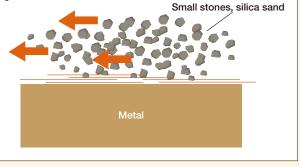
Test Conditions

The test specimen is pressed against the grinding stone and the grinding stone is rotated. The resulting abrasion is measured.

Rotating speed	: 30rpm
Test duration	: 20min
Load	: 29.4kg/cm ²
Ambient temperatur	e : 200°C
Grinding Stone	: Special grindstone for
	use at high temperatures

Scratching Abrasion

Comparatively small stones and silica sand caused abrasion when they come into contact with a metallic surface. As the load and force of impact is slight, any bumps and scrapes are relatively small. This can occur to the steel used in the load-bearing bay of a dump truck, etc. when filled with earth and gravel.



Weldability

Abrasion resistant steel is extremely strong and as a result it has a high sensitivity to cracking at low temperatures. What this means in terms of welding is that it underlines the importance of selecting the most appropriate welding materials as well as managing the pre-heating process correctly. Moreover, the constraints on couplers as well as other weld criteria such as welding heat input and weld bead length, etc. in addition to weld time, environmental conditions and the management of weld materials all require special attention.

A Guide to Pre-Heating Temperatures

	Steel Material	Plate Thickness (mm)								
	Steel Material	4.5 ~ 7	~ 11	~ 25	~ 36	~ 50	~ 100			
	Fillet Welding (Small Constraints)	*(0°C)	*(25°C)	*(25°C)	50°C	75°C	100°C			
ABREX 400	Butt-Joint Welding (Medium Constraints)	*(0°C)	50°C	75°C	100°C	125°C	150°C			
ABREX 450	Fillet Welding (Small Constraints)	*(25°C)	*(25°C)	50°C	100°C	100°C				
ADREX 400	Butt-Joint Welding (Medium Constraints)	50°C	50°C	75°C	125°C	150°C				
ABREX 500	Fillet Welding (Small Constraints)	50°C	50°C	75°C	100°C	125°C				
ABREX 500	Butt-Joint Welding (Medium Constraints)	100°C	100°C	125°C	150°C	175°C				

*: Room Temperature

: No cracking

In order to avoid low temperature cracking, the steel plate needs to undergo the required preheating. This can be approximated depending on various factors such as the carbon equivalent, the hydrogen content of the weld metal, the yield strength of the weld metal, the heat input and plate thickness to name but a few*1. The preheating temperatures shown in the table are calculations for temperatures used in gas-shield welding of soft joints, with a heat input of 1.7kJ/mm and assuming a weld metal hydrogen content dispersal of 3ml/100g*1.

However, appropriate preheating temperatures are also affected by external factors such as outdoor temperature, path numbers, groove form as well as the preheating method, etc. so please use these figures as a guide.

*1: pp347-357 No. 3 Volume 13, Collection of Papers from the Japan Welding Society (1995); N.Yurioka and T.Kasuya Also: P163 Steel Materials and Welding, Welding Digest 10 (1999), Sanpo Publishing Inc.

Properties and Characteristics

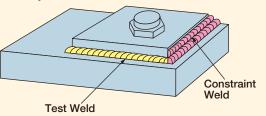
CTS Cracking Test Results (JIS Z3154: Lap Joint Weld Cracking Test)

Designation	Plate Thickness (mm)	Cracki	ng: Y/N
Designation	Flate Thickness (IIIII)	SMAW	GMAW
ABREX 400	25		
ABREX 450	25		
ABREX 500	25		

Test Method

Item	SMAW	GMAW
Temperature	Room Temperature	Room Temperature
Heat Input kJ/mm	1.73	0.85
Weld Material	LF52	SCH60
Hydrogen Content cc/100g	3.48	1.62

Test Specimen



Precautions for Use

Take care when preheating – heating a steel plate over the recommended preheating temperature will cause the plate to lose its hardness. Please ensure that the steel plate is not heated over 200 degrees Celsius.

Welding Materials

Recommended Welding Materials

1) In the event that welds are not required to have abrasion resistance (Common for all grades of steel)

Weld Method	Brand	Specification	Criteria (Plate thickness of 20mm)	Notes
Arc Welding with Covered Electrode	⊠-16LH	JIS Z3211 E4916 AWSA5.1 E7016	Heat input equal to or less than 3.0kJ/mm	For all positions Low hydrogen type
Gas Shielded Arc	⊠YM-26	JIS Z3312 YGW11 AWSA5.18 ER70S-G	Heat input equal to or less than 2.0kJ/mm	For CO ₂ gas use
Welding	⊠YM-28S	JIS Z3312 YGW15 AWSA5.18 ER70S-G	Heat input equal to or less than 3.0kJ/mm	For Ar-CO ₂ gas use

2) In the event that welds are required to have abrasion resistance (Common for all grades of steel)

Weld Method	Brand	Specification	Example of Weld Metal Hardness Hv (98N)	Criteria (Plate thickness of 20mm)	Notes
Arc Welding	⊠L-80	JIS Z3211 E7816-N5CM3U AWSA5.5 E11016-G	250	Heat input equal to or less than 3.0kJ/mm Preheated to at least 100°C	For all positions Low hydrogen type
with Covered Electrode	⊠L-100EL	WES 4101 DK9016	320	Heat input equal to or less than 3.0kJ/mm Preheated to at least 100°C	For all positions Low hydrogen type
Gas Shielded	⊠ҮМ-80С	JIS Z3312 G78JA2UCN5M3T AWSA5.28 ER110S-G	260	Heat input equal to or less than 2.0kJ/mm Preheated to at least 50°C	For CO ₂ - gas use
Arc Welding	⊠YM-80A	JIS Z3312 G78A4UMN5C1M3T AWSA5.28 ER110S-G	270	Heat input equal to or less than 3.0kJ/mm Preheated to at least 50°C	For Ar-CO₂ gas use

*The weld material will have a required preheating temperature, as will the steel plate. The higher temperature should be applied in these cases.

When the steel plate cannot be preheated, or when the preheating process needs to be shortened, there is a method that involves the use of austenite type weld materials such as SUS309, etc. Moreover, compared with conventional solid wire, etc. the hydrogen content has really been reduced and this means that the preheating process can be shortened with the use of flux wire, etc. Please ask us for more details.

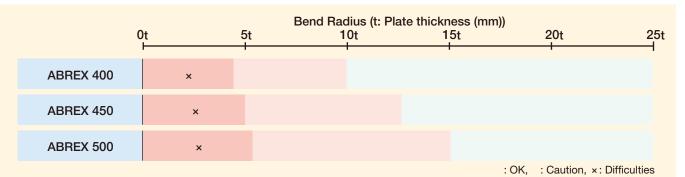
With regard to welds involving ABREX 600, please use austenite type weld materials such as SUS309, etc.

Please direct any inquires to:
Nippon Steel & Sumikin Welding Co., Ltd.
Shingu Bldg., 2-4-2 Toyo, Koto-ku, Tokyo 135-0016 JAPAN
Tel: +81-3-6388-9065
Fax: +81-3-6388-9088

Bending Formability

Compared to regular steel, abrasion resistant steel has a lower elongation value and as a result, it is important to take steps to prevent fabrication cracks. Please consider the bend radius, quality of gas cut surface and the bend direction when undertaking fabrication.

Guidelines for Maximum Bend Radii



The values shown above are a guideline for bending an edge piece in the longitudinal direction (rolling direction of plates) referred to as L. In the event of bending in the transverse direction (width direction of plates) referred to as T, please add in one more t value. Bend conditions (atmospheric temperature and moisture, facilities, edge processing, etc.) can lead to fluctuations in the maximum bend radius. These values are a guideline.

In the event that the steel plate is undergoing bending for a specific purpose, please contact NSSMC immediately after placing your order. We do not recommend subjecting ABREX 600 to bending.

Properties and Characteristics

Wide Bend Test Results

	Plate	Test	Bend	Bend	Cracking: Y/N					
Designation	Thickness t (mm)	Specimen Width (mm)	Direction	Angle	1t	2t	3t	5t		
ABREX 400	25	120	L	180 °	×	×				
ABREX 450	25	120	L	180 °	×	×				
ABREX 500	25	120	L	180 °	×	×				

: No cracking, : Some small, localized cracking, x: Cracking **Test Method** Bend Radi Bend Direction: L

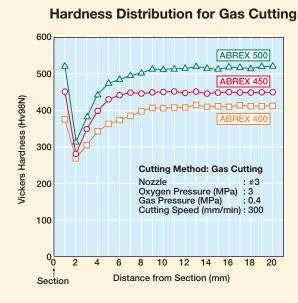
Precautions for Use

Because production of abrasion-resistant steel plate involves special heat treatment, the avoidance of hot working is recommended. Any notches or burrs on the sheared edge can lead to deterioration in the hardness of gas-cut sections, so it is recommended that any gas-cut sections be smoothed with a grinder, etc. In the event of bending abrasion-resistant steel to an extremely shallow bending radius, the corners should be beveled and care should be taken to ensure that the bend circumference be implemented in the L rolling direction. Please note that with abrasion-resistant steel plate, spring-back is greater than with conventional steel. In the event where the room temperature is less than 0 degrees Celsius, please avoid undertaking any bending procedures.

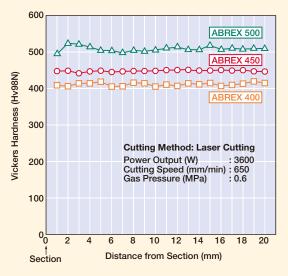
Thermal Cutting Performance

ABREX can be cut with gas, plasma and laser cutters, but the heat generated by these cutting techniques also affects the steel. Please select the best cutting solution to meet your needs once you have studied the affect of the cutting procedure and method.

Properties and Characteristics



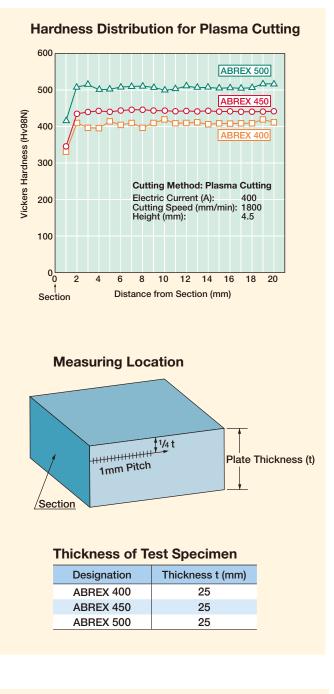
Hardness Distribution for Laser Cutting



Precautions for Use

In the event that room temperature is 5 degree Celsius or below, some preheating will be required. Please avoid the use of cold water during cutting.

Please take special care when cutting small pieces or thin widths, as the hardness of the steel can deteriorate. Notches that result after cutting should be smoothed away with a grinder. As ABREX 600 steel plate can crack easily, we recommend preheating to 50 degrees Celsius and then cutting with an acetylene gas cutter.



Drilling Workability



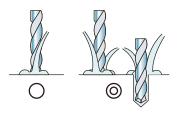
As ABREX steel plate is extremely hard and this can make it difficult to form and process, we recommend any drilling take place in a machining center using an ultra-hard metal alloy drill. However, for smaller jobs and working with components, it is often the case that boor-bank drilling machines and high-speed steel drills are used, so here we will introduce our recommended approach to drilling ABREX steel plate using a high-speed steel drill.

(1) Points to Note when Drilling

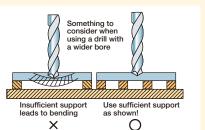


When attaching the drill, please ensure that the external vibration of the tip of the drill does not exceed 0.03mm.

(2) Recommended Conditions for Drilling



We recommend an aqueous drill lubricant with a high degree of transparency. Please ensure you have sufficient lubricant for the drilling process.



Ensure that the steel plate is secured to prevent vibrations, movement and any bending or warping during drilling.

These are the recommended conditions for using a radial boor bank drilling machine with ABREX steel plate.

Turne	Turno	Drilling		5		10		15	:	20	:	25		30
Type of Steel	Type of Drill		Rotation Speed (min ⁻¹)	Feed Rate (mm/rev)										
ABREX 500	Powder High Speed Steel	5 ~ 8	320 - 510	0.05 0.10	160 ~ 250	0.10 ~ 0.20	110 ~ 170	0.15 ~ 0.30	80 ~ 130	0.15 0.30	65 ~ 100	0.15 	55 ~ 85	0.15 0.30
ABREX 400	Powder High Speed Steel	6 ~ 10	380 ~ 640	0.05 ~ 0.10	190 ~ 320	0.10 ~ 0.20	130 ~ 210	0.15 ~ 0.30	95 ~ 160	0.15 ~ 0.30	75 ~ 130	0.15 ~ 0.30	65 ~ 110	0.15 0.30
	Cobalt High Speed Steel	5 ~ 8	320 ~ 510	0.05 ~ 0.10	160 ~ 250	0.10 ~ 0.20	110 ~ 170	0.15 ~ 0.30	80 ~ 130	0.15 ~ 0.30	65 ~ 100	0.15 ~ 0.30	55 ~ 85	0.15 0.30

These values are a guide. Depending on how the steel plate is secured and the hardness of the machining tool, sometimes the appropriate settings will fall outside of this range, so before performing the actual drilling required, we recommend test drilling under the same conditions.

We do not recommend using a Cobalt High Speed Steel for drilling ABREX 500 steel plate.

Generally speaking, in terms of performance we recommend high settings for both the drilling speed (rotation speed) and the feed rate. However, this will have an impact on the working life of the drill. Conversely, if you wish to prioritize the working lifespan on the drill as well as the precision of the work, we recommend low settings for both the drilling speed (rotation speed) and the feed rate.

During drilling, the turnings from the drilling process can sometimes become very long and yet still be attached to the steel plate. When this occurs, trimming these turnings will reduce the burden on the drill.

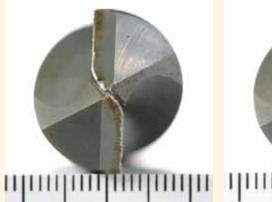
These recommendations are made with the proviso that an aqueous drill lubricant is being used. We recommend a good quality aqueous drill lubricant used at less than 20x dilution.

When using a non-aqueous drill lubricant or when an emulsion lubricant has been diluted over 20 times, please reduce the drilling speed by 20%.

(3) Examples of Drill Process Data (for reference purposes)

Type of Steel	Type of Drill	Drilling Depth (mm)	Machine Tool	Drill Lubricant	Drill Diameter (mm)	Drill Speed (min-1)	Rotation Speed (min-1)	Feed Rate (mm/rev)	Plated Through Hole	Length of Cut (mm)
	Davidari		Standing	aqueous	10	5.2	165	0.15	31	775
ABREX 500	Powder High Speed Steel	25	radial boor bank drilling	drill lubricant at 15x	20	4.7	75	0.25	53	1325
	Sleer		machine	dilution	30	4.7	50	0.25	20	500
	Powder High Speed Steel	n Speed 25	25 Standing radial boor bank drilling machine	aqueous drill lubricant at 15x dilution	10	6.3	200	0.15	78	1950
					20	6.9	110	0.25	136	3400
ABREX 400	Steel				30	7.1	75	0.25	42	1050
ABREX 400			Standing radial boor bank drilling machine	aqueous drill lubricant at 15x dilution	10	5.2	165	0.15	123	3075
	Cobalt High Speed Steel				20	4.7	75	0.25	52	1300
					30	4.7	50	0.25	34	850

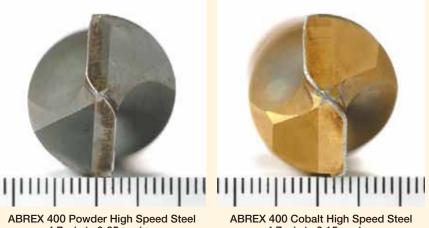
Close-up Photos of Drill Bits (All 3 have a diameter of 20mm)



ABREX 500 Powder High Speed Steel 4.7m/min 0.25mm/rev Plated Through Hole: 53

ABREX 400 Powder High Speed Steel 4.7m/min 0.25mm/rev Plated Through Hole: 136

This table shows reference data for drilling using a radial boor bank drilling machine.



4.7m/min 0.15mm/rev Plated Through Hole: 52

Examples of the Product in Use



Bulldozer



Dump Truck







Excavator

Reference

NSSMC Specifications; Comparison with Former Specifications

NOSMO Specifications, comparison with ronner spe									
Former NSC Product Name	Former Sumitomo Metals Product Name	New NSSMC Name							
	SUMIHARD-K340								
WEL-HARD400 WEL-TEN AR360E	SUMIHARD-K400	ABREX 400							
WEL-TEN AR400E	SUMIHARD-K450	ABREX 450							
WEL-HARD500 WEL-TEN AR500E	SUMIHARD-K500	ABREX 500	* Wit or v						
		ABREX 600	car						
		ABREX 400LT	any						
		ABREX 450LT	* Wit						
		ABREX 500LT	the						

Hardness Table

Vieleere	Brinell Hardness 10mm sphere; 29400N Load	Rockwell	Hardness	Charr	Tensile Strength	
Vickers Hardness	Tungsten Carbide Sphere	B Scale 980N Load Sphere 1/16in Diameter	C Scale 1470N Load Sphere 1/16in Diameter Brale Indenter	Shore Hardness	(N/mm²) (approximate values)	
600 590 580 570 560	564 554 545 535 525		55.2 54.7 54.1 53.6 53.0	74 72 71	2055 2020 1985 1950	
550 540 530 520 510	517 507 497 488 479		52.3 51.7 51.1 50.5 49.8	69 67	1905 1860 1825 1795 1750	
500 490 480 470 460	471 460 452 442 433		49.1 48.4 47.7 46.9 46.1	66 64 62	1705 1660 1620 1570 1530	
450 440 430 420 410	425 415 405 397 388		45.3 44.5 43.6 42.7 41.8	59 57	1495 1460 1410 1370 1330	
400 390 380 370 360	379 369 360 350 341	(110.0) (109.0)	40.8 39.8 38.8 37.7 36.5	55 52 50	1290 1240 1205 1170 1130	
350 340 330 320 310	331 322 312 303 294	(108.0) (107.0)	35.5 34.4 33.3 32.2 31.0	47 45	1095 1070 1035 1005 980	
300 290 280 270 260	284 275 266 256 248	(105.5) (104.5) (103.5) (102.0) (101.0)	29.8 28.5 27.1 25.6 24.0	42 41 40 38 37	950 915 890 855 825	

ith regard to products that have been discontinued where the product name no longer exists, NSSMC an continue to manufacture said products in line with ny existing agreement and specifications.

ith regard to special specification products not cluded in the above table, please contact us about ese specific products.