

● MICRO FINE 细微钢 ●



NOGA

NIPPON KOSHUHA STEEL CO.,LTD.

[新时代高张力成形用模具钢材]

[Die steel material for new generation high-tensile molding]

解除烦恼!! 模具制造领域迈向新的舞台!!

Shut out the trouble!! With excellent characteristics of NOGA, step beyond to new stage of die making!!



Phalaenopsis | 兰花



日本高周波钢业株式会社

NIPPON KOSHUHA STEEL CO.,LTD.

URL; <http://www.koshuha.co.jp>

解除烦恼!! 模具制造领域迈向新自

Shut out the trouble !! With excellent characteristics of NOGA, step beyond to

NOGA的特征 Characteristics of NOGA

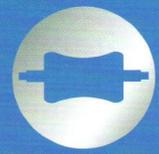
Stronger!
Improved service life of die

**更加坚固!
提高了
模具寿命**

for the Stamper

MICRO FINE

● 细微钢 ●



NOGA

NIPPON KOSHUHA STEEL CO.,LTD.



耐划痕性(表面处理) Good 良
Galling resistance (after surface treatment)

※耐划痕性是指经过 KS-G 表面处理后的表象。
KS-G 以外的镀膜或许不能充分发挥它的特性。
※Galling resistance is the image by KS-G coating treatment. Sufficient characteristics may not be obtained by coating other than the KS-G coating as the case may be.



热处理尺寸变化 Good 良
Dimensional change by heat treatment

**更加简单!
提高了模具的
制造效率**

Simpler!
Improved die manufacturing efficiency

Characteristics of NOGA

的舞台!!

new stage of die making!!

提高了耐划痕性

- 实现了最适于PVD处理的钢材组织。
- 因表面处理镀膜难以剥离，对高张力板的拉弯，拉伸成形加工提高了模具寿命。

Improves galling resistance.

- Realizes steel material structure optimal for PVD treatment.
- Enables improvement of the service life of the forming die that does high-tensile processing such as bending and drawing because the surface treatment coating is hard to peel off.

减少了崩裂的可能性

- 大幅减少了成为崩裂原因的粗大碳化物和夹杂物，提高了约**2~3倍**的耐疲劳特性和韧性。
- 减少了冲裁模刀的崩裂或成形模具的开裂等问题，提高了模具寿命。

Enables reduction of chipping.

- Reduces large size carbides and debris that cause chipping to a large extent, and improves fatigue characteristic and toughness two to three times higher.
- Reduces chipping of the trimming die tip and cracking troubles of the forming die, and enables to improve the service life of the die.

提高了焊接性

- 调整了合金元素，减轻了因焊接而引起的开裂。
- 减少了阻碍焊接作业的合金元素。因焊接金属的相容性良好，焊渣较安定，所以焊接作业性良好。

Improves weldability.

- Reduces cracking trouble of the die by welding because the alloy is designed to reduce welding cracks.
- Improves welding workability because welded metals combine well and the bead is stabilized by excellent component design.

实现了卓越的热处理尺寸变化特性

- 大幅减少了热处理尺寸变化，最大限度地抑制了方向性尺寸变化的偏差，减少了模具镶嵌组装工作量。

Realizes the best dimensional change characteristic by heat treatment.

- Reduces dimensional change by heat treatment to a large extent, suppresses directional variation to the limit, and reduces die assembling workload.

切削性达到极限

- 与以前的SKD11改良钢相比，其切削性被惊人地提高了**3~10倍**，减少了加工成本缩短了加工时间。

Realizes utmost machinability.

- Amazingly improves machinability about 3 to 10 times higher as compared with the existing SKD11 improved steel, and enables to reduce machining cost and time.

特性比较 Comparison of characteristics

	模具寿命 Service life of die					模具制造便宜 Ease of die manufacturing			
	表面处理性 (PVD) Surface treatment characteristic (PVD)	CVD·TD 反复处理特性 CVD, TD repetition characteristic	耐磨耗性 无表面处理 Wear resistance without surface treatment	疲劳特性 Fatigue characteristics	韧性 Toughness	切削性 Machinability	热处理 尺寸变化 Dimensional change by heat treatment	焊接性 Weldability	放电 加工性 Electric discharge machinability
NOGA	○	△	△	◎	○	◎	◎	◎	○
KD11S	△	◎	◎	○	×	○	△	×	△
SKD11	△	◎	◎	△	×	×	△	×	△
8%Cr钢 8%Cr steel	△	○	○	○	△	△	×	△	△
8%Cr钢改 8%Cr improved steel	△	○	○	○	△	○	○	×	×

优 Superior

◎

○

△

×

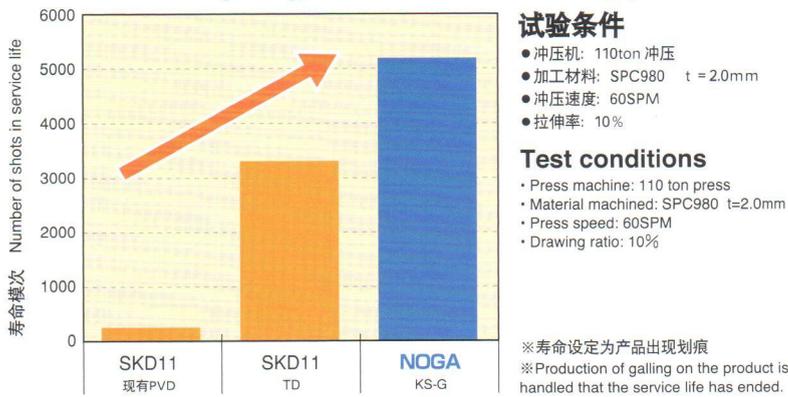
劣 Inferior

耐划痕性 Galling resistance

- 高张力成形加工时出现的划痕（摩擦热上升而引起的凝结磨耗）是由于表面处理镀膜的剥离而产生的。NOGA提高了表面处理镀膜的紧贴性，因此兼备了较强的耐划痕性。
- NOGA使用KS-G表面处理，寿命比SKD11有惊异的提高。
- Galling that occurs in high-tensile molding (adhesive wear due to rising of friction heat) is produced in a peeling position of surface coating. NOGA combines the characteristics to resist galling by improving adhesion to surface coating.
- NOGA improves service life amazingly further than SKD11 by the KS-G coating treatment.

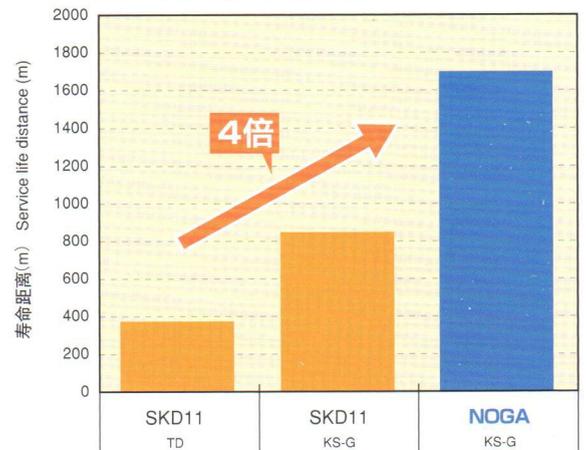
弯曲冲压寿命比较结果

Result of comparing the service life of bending press



摩擦磨耗试验

Friction abrasion test



在3,300模次时的产品表面和模具表面状态

Product material and die surface condition at the time of 3,300 shots



试验条件

- 射线径迹材: 高张力钢板 100kgf
- 试验负荷: 50kgf
- 试验旋转数: 64rpm

Test conditions

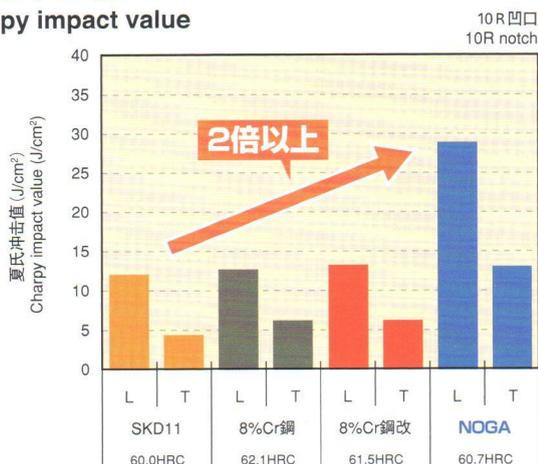
- Pin material: High-tensile steel material 100 kgf
- Test load: 50 kgf
- Test revolution: 64 rpm

韧性·耐疲劳特性 Toughness and fatigue resistance characteristics

- NOGA与SKD11或SKD11改良钢相比大幅提高了韧性·耐疲劳特性。NOGA is improved in the toughness and fatigue resistance characteristics to a large extent as compared with SKD11 steel and SKD11 improved steel.

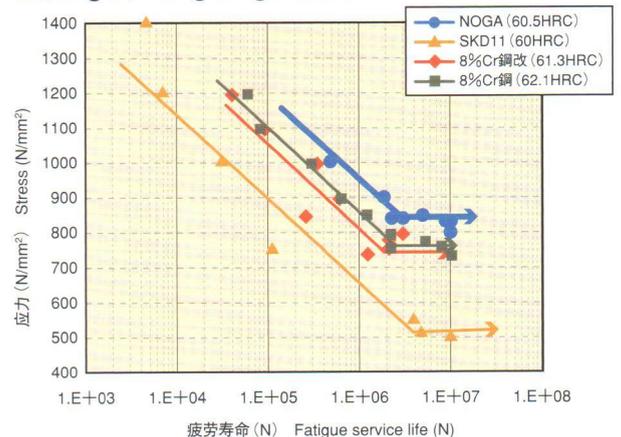
夏氏冲击值

Charpy impact value



旋转弯曲疲劳试验

Rotating bending fatigue test

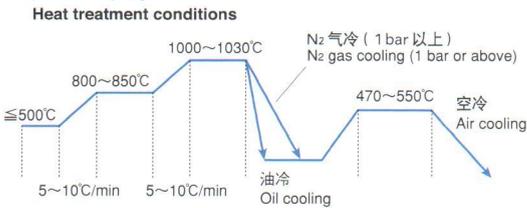




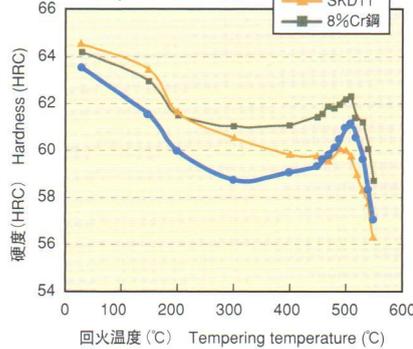
热处理硬度 Hardness by heat treatment

- NOGA的热处理可以在与SKD11同等的热处理条件下进行、在高温回火下硬度要比SKD11高出约1HRC。
NOGA enables heat treatment under the same heat treatment conditions of SKD11, and becomes harder than SKD11 by 1 HRC by high temperature tempering.

■ 热处理条件



■ 淬火回火硬度



在高温回火下硬度要比SKD11高出约0.5~1HRC
 Becomes harder than SKD11 by about 0.5 to 1 HRC by high temperature tempering.

试验条件

- 试验片尺寸: 15×25×18mm
- 淬火温度: 1030°C×1.5Hr (气冷)
- 回火: T°C×3Hr

Test conditions

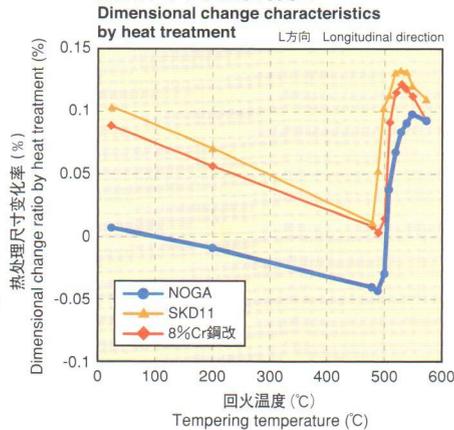
- Test piece dimension: 15×25×18mm
- Quenching temperature: 1030°C×1.5Hr(gas cooling)
- Tempering: T°C×3Hr

热处理特性·热处理尺寸变化特性

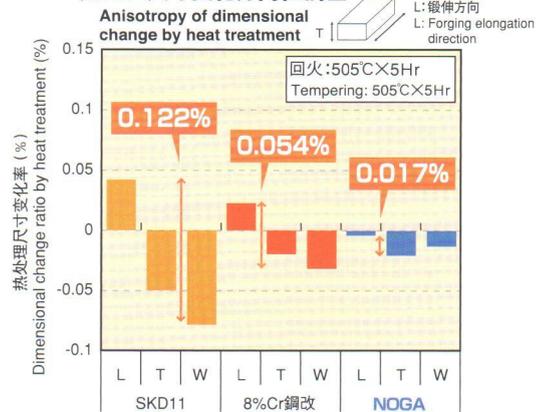
Heat treatment characteristics, dimensional change characteristics by heat treatment

- NOGA在热处理尺寸变化时的方向性偏差很小, 显示了其高精度的热处理尺寸变化的特性。
NOGA has small anisotropy (directional variation) due to dimensional change by heat treatment, and keeps highly accurate die sizes after heat treatment.

■ 热处理尺寸变化特性



■ 热处理尺寸变化方向性偏差



试验条件

- 尺寸: 50 (t)×100 (w)×200 (L)mm

热处理条件

- 淬火: 1020°C×2Hr (气冷)

Test conditions

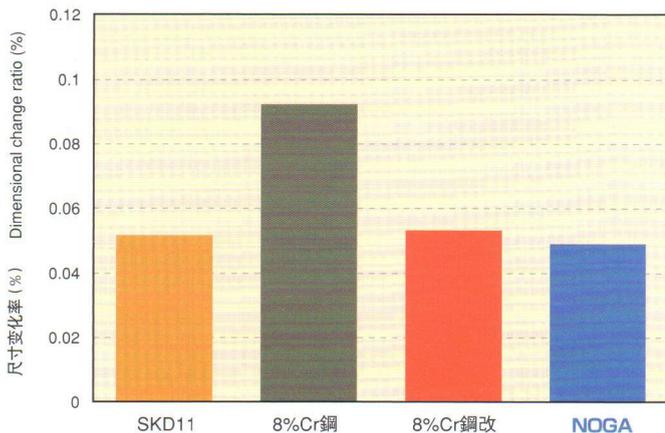
- Dimension: 50(t)×100(w)×200(L)mm

Heat treatment conditions

- Quenching: 1020°C×2Hr(gas cooling)

经年变化 Secular change

- NOGA的经年变化特性与SKD11同等。
NOGA has the secular change characteristics equivalent to those of SKD11.



试验条件

- 尺寸: 95 (t)×100 (w)×150 (L)mm
- 淬火: 1020°C×2Hr (气冷)
- 回火: 505°C×5Hr
- 回火完5天后的尺寸变化

Test conditions

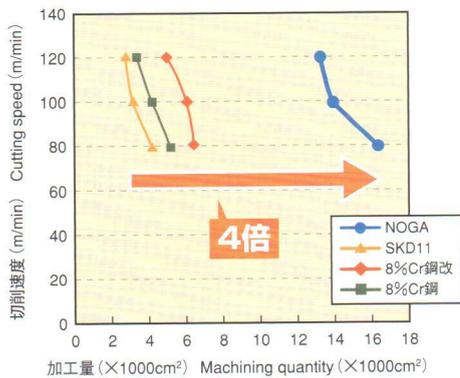
- Dimension: 95(t)×100(w)×150(L)mm
- Quenching: 1020°C×2Hr(gas cooling)
- Tempering: 505°C×5Hr
- Dimensional change in 5 days after tempering

切削性 Machinability

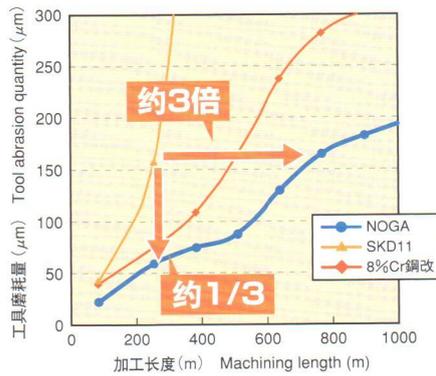
● NOGA的切削性与SKD11或SKD11改良钢相比有惊异的提高。
NOGA is amazingly improved in machinability further than the existing SKD11 steel and SKD11 improved steel.

(退火材料 Annealed material)

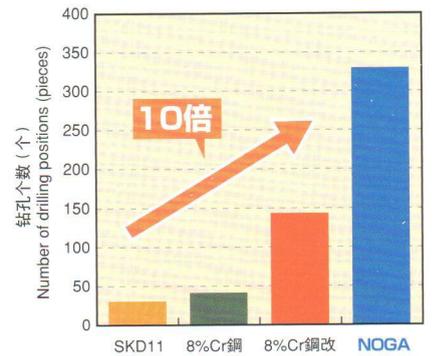
■ 高速半径铣刀 Rapid feed radius cutter



■ 球头立铣刀 Ball end mill



■ 钻头 Drill



试验条件

- 机械: MC(BT50,7.5kw)
- 工具: 三菱 AJX14R503SA42S φ50
- 刀片: JDMW140520ZDSR-FT VP15TF
- 进刀量: 1.0mm/刀
- 切削深度: Ad1mm, Rd35mm
- 露出长度: 80mm
- 切削油: 空气喷射
- 判断寿命: 工具磨损, 裂痕

Test conditions

- Machine: MC(BT50,7.5kw)
- Tool: Mitsubishi AJX14R503SA42Sφ50
- Tip: JDMW140520ZDSR-FT VP15TF
- Feed: 1.0 mm/blade
- Depth of cut: Ad1mm, Rd35mm
- Protrusion length: 80mm
- Cutting fluid: Air blow
- Judgment of service life: Tool abrasion, chipping

试验条件

- 机械: MC(BT40,5.5kw)
- 工具: 三菱 SRFH30S32M
- 刀片: 三菱 SRF30 VP15MF
- 旋转数: 2650min⁻¹
- 进刀量: 1660mm/min
- 切削深度: Ad0.3mm, Rd0.7mm
- 露出长度: 118mm
- 切削油: 空气喷射
- 切削方向: 纵向切削

Test conditions

- Machine: MC(BT40,5.5kw)
- Tool: Mitsubishi SRFH30S32M
- Tip: Mitsubishi SRF30 VP15MF
- Revolution: 2650min⁻¹
- Feed: 1660 mm/min
- Depth of cut: Ad0.3mm, Rd0.7mm
- Protrusion length: 118mm
- Cutting fluid: Air blow
- Cutting direction: Down cutting

试验条件

- 机械: MC(BT40,5.5kw)
- 工具: 三菱 K-TD 14.1mm
- 切削速度: 22m/min
- 进刀量: 0.15mm/rev
- 孔深: 98.7mm(7D)
- STEP: 3mm
- 切削油: 乳化切削油
- 寿命: 声音异常, 折损

Test conditions

- Machine: MC(BT40,5.5kw)
- Tool: Mitsubishi K-TD 14.1mm
- Cutting speed: 22m/min
- Feed: 0.15mm/rev
- Hole depth: 98.7mm(7D)
- Step: 3mm
- Cutting fluid: Emulsion
- Service life: Creaking noise, folding

● 大幅提高了热处理后的加工性, 适应了热处理后的修正加工。

Workability after quenching and tempering is also improved to a large extent, coping with correction machining after quenching and tempering.

(淬火材料 Quenched & tempered material)

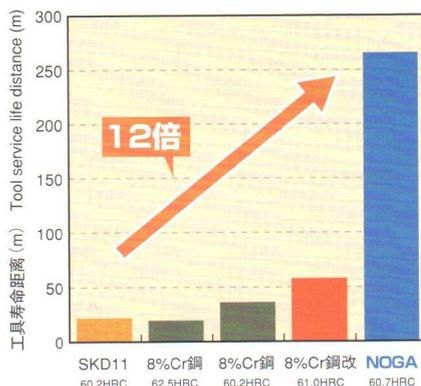
■ 立铣刀 End mill

试验条件

- 机械: MC(BT40,5.5kw)
- 工具: 三菱 VC-MD 10mm
- 切削速度: 150m/min (4800rpm)
- 送刀量: 0.1mm/刀 (2900mm/min)
- 切削深度: Ad10mm Rd0.5mm
- 切削方向: 纵向切削
- 露出长度: 25mm
- 切削油: 空气喷射

Test conditions

- Machine: MC(BT40,5.5kw)
- Tool: Mitsubishi VC-MD 10mm
- Cutting speed: 150m/min(4800rpm)
- Feed: 0.1 mm/blade(2,900mm/min)
- Depth of cut: Ad10mm Rd0.5mm
- Cutting direction: Down cutting
- Protrusion length: 25mm
- Cutting fluid: Air blow



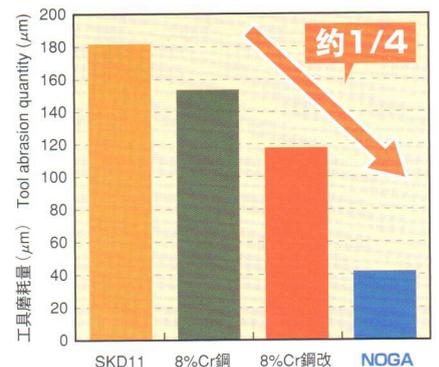
■ 球头立铣刀 Ball end mill

试验条件

- 机械: MC(BT40,5.5kw)
- 工具: 三菱 SRFH30S32M
- 刀片: 三菱 SRF30 VP10MF
- 回转速: 2650min⁻¹
- 切削速度: 1660mm/min
- 切削深度: Ad0.3mm, Rd0.7mm
- 露出长度: 118mm
- 切削油: 空气喷射
- 切削方向: 纵向切削
- 加工长度:

Test conditions

- Machine: MC(BT40,5.5kw)
- Tool: Mitsubishi SRFH30S32M
- Tip: Mitsubishi SRF30 VP10MF
- Revolution: 2650min⁻¹
- Feed: 1660 mm/min
- Depth of cut: Ad0.3mm, Rd0.7mm
- Protrusion length: 118mm
- Cutting fluid: Air blow
- Cutting direction: Down cutting
- Machining length: 50m





焊接性 Weldability

- NOGA与SKD11或SKD11改良钢相比不易引起焊接裂缝、具有良好的焊接操作性。
NOGA is lower in welding crack sensitivity than the existing SKD11 steel and SKD11 improved steel, indicating good welding workability.

■ 焊接工作性 Welding workability

钢种 Steel	焊珠安定性 Bead stability	咬边 Undercut	焊接气孔 Blowhole
NOGA	○	○	◎
SKD11	○	○	◎
8%Cr钢 8%Cr steel	○	○	◎
8%Cr钢改 8%Cr improved steel	×	×	×

试验条件

- 焊接棒: SKD61系 φ4.0
- 焊接范围: 50×150mm
- 焊接: 160A
- 三层焊接
- 没有撞击

Welding conditions

- Welding rod: SKD61 series φ4.0
- Welding range: 50×150mm
- Welding current: 160A
- Number of layers: 3 layers
- Peening: None

■ 焊接裂缝 Welding crack

钢种 Steel	预热温度 Preheating temperature				
	室温 Room temperature	100℃	200℃	300℃	350℃
NOGA	×	○	○	○	○
SKD11	×	×	×	×	△
8%Cr钢 8%Cr steel	×	×	×	×	△
8%Cr钢改 8%Cr improved steel	×	×	×	×	△

○: 无裂缝
△: 有细小裂缝
×: 有裂缝

○: No crack
△: Minute crack is produced.
×: Large crack is produced.

※以没有形雕的四方材料为评价对象得出的评价结果。
素材的大小, 形状等因素导致评价结果不同。

※Evaluation result is that on a square block without profile cutting.
The result differs by the material size, shape, etc.

推荐SKD61系焊接棒。

- 电弧焊接棒: JIS:DF2B-B, DF3B-B, DF3C-B 等
- TIG 焊接棒: 由于厂家模式不同请详细咨询

A welding rod of SKD61 material or equivalent is recommended.

- Arc welding rod: JIS: DF2B-B, DF3B-B, DF3C-B, etc.
- TIG welding rod: Please ask us about it because models differ by the manufacturer.

优 Superior ◎ ○ △ × 劣 Inferior

表面处理特性 Surface treatment characteristics

- NOGA具有最适合于PVD处理的钢材组织。
推荐使用(株)KAMS的新PVD表面处理「KS-G」。
- 可以使用TD (VC) 或CVD (TiC) 表面处理、
获取的表面膜厚与SKD11同等。

· NOGA realized steel material structure optimal for PVD treatment.
Use of the new PVD surface treatment "Machaon coat KS-G" of Koshuha All Metal Service Co., Ltd. is recommended.

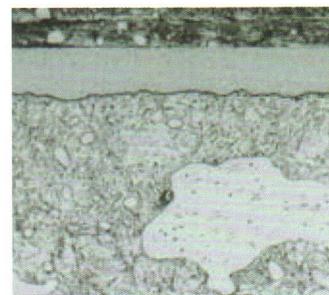
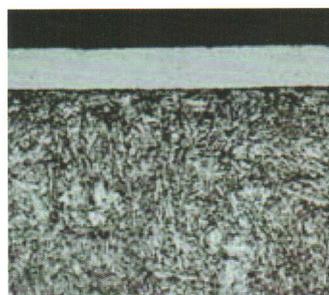
· The surface treatment of TD (VC) and CVD (TiC) is also enabled, and the obtained film thickness is equivalent to that of SKD11.

TD

TiC

NOGA

SKD11





日本高周波鋼業株式会社

NIPPON KOSHUHA STEEL CO.,LTD.

URL; <http://www.koshuha.co.jp>

本社	〒101-0032	東京都千代田区岩本町1丁目10番5号 (TMMビル8F)	TEL.03 (5687) 6023 (代)	FAX.03 (5687) 6047
大阪支店	〒530-0022	大阪府大阪市北区浪花町12番24号 (赤坂天六ビル7F)	TEL.06 (4802) 1480 (代)	FAX.06 (4802) 1481
名古屋支店	〒460-0003	愛知県名古屋市中区錦1丁目20番25号 (広小路YMDビル8F)	TEL.052 (232) 3410	FAX.052 (232) 3413
北関東営業所	〒373-0014	群馬県太田市植木野町328	TEL.0276 (20) 5071	FAX.0276 (20) 5072
Bangkok Liaison Office	39/3 Rama 3Rd.,	Chongnonsee, Yannawa, Bangkok 10120, Thailand	TEL.66-2294-9258	FAX.66-2294-9260
上海事務所	上海市徐匯区肇嘉浜路777号	青松城大酒店7階707号	TEL.86-21-6443-5402/5404	FAX.86-21-6443-5407

Head Office Address TMM Bldg. 8th Floor, 1-10-5, Iwamotocho, Chiyoda-ku, Tokyo 101-0032 Telephone 03-5687-6023 Fax 03-5687-6047

Osaka Branch Address Akasakatenroku Bldg 7th Floor, 12-24, Naniwacho, Kita-ku, Osaka, 530-0022 Telephone 06-4802-1480 Fax 06-4802-1481

Nagoya Branch Address Hirokoji YMD Bldg. 8th Floor, 1-20-25, Nishiki, Naka-ku, Nagoya, Aichi Pref. 460-0003 Telephone 052-232-3410 Fax 052-232-3413

Kita Kanto Sales Office Address 328, Uekinocho, Oota, Gunma Pref. 373-0014 Telephone 0276-20-5071 Fax 0276-20-5072

Bangkok Liaison Office Address 39/3 Rama 3Rd., Chongnonsee, Yannawa, Bangkok 10120, Thailand Telephone 66-2294-9258 Fax 66-2294-9260

Shanghai Representative Office Address No.707, Pine City Hotel, 777-Zhaojiabang Road Shanghai, 200032 China Telephone 86-21-6443-5402/5404 Fax 86-21-6443-5407



株式会社カムス

KOSHUHA ALL METAL SERVICE CO.,LTD.

URL; <http://www.koshuha.co.jp/kams/>

本社	〒373-0014	群馬県太田市植木野町328	TEL.0276 (40) 5005	FAX.0276 (40) 5008
大阪テクノセンター	〒662-0934	兵庫県西宮市西宮浜2-4-2	TEL.0798 (26) 5785	FAX.0798 (26) 5819
北陸テクノセンター	〒930-0106	富山県富山市高木西115	TEL.076 (436) 0101	FAX.076 (436) 1223
横浜営業所	〒236-0002	神奈川県横浜市金沢区鳥浜町16-8	TEL.045 (776) 1170	FAX.045 (776) 0304
市川営業所	〒272-0003	千葉県市川市東浜1-1 (高周波精密株式会社内)	TEL.047 (328) 1831	FAX.047 (328) 3292
北関東テクノセンター (熱処理)	〒373-0014	群馬県太田市植木野町328	TEL.0276 (20) 5120	FAX.0276 (37) 7115
中部テクノセンター (熱処理・表面処理)	〒489-0071	愛知県瀬戸市暁町9番地	TEL.0561 (97) 8431	FAX.0561 (97) 8433
南関東テクノセンター (熱処理)	〒243-0033	神奈川県厚木市温水208	TEL.046 (247) 2231	FAX.046 (247) 9962

Head Office Address 328 Uekinocho, Oota, Gunma Pref. 373-0014 Telephone 0276-40-5005 Fax 0276-40-5008

Osaka Techno Center Address 2-4-2 Nishinomiyahama, Nishinomiya, Hyogo Pref. 662-0934 Telephone 0798-26-5785 Fax 0798-26-5819

Hokuriku Techno Center Address 115 Takaginishi, Toyama, Toyama Pref. 930-0106 Telephone 076-436-0101 Fax 076-436-1223

Yokohama Sales Office Address 16-8 Torihamacho, Kanazawa-ku, Yokohama, Kanagawa Pref. 236-0002 Telephone 045-776-1170 Fax 045-776-0304

Ichikawa Sales Office Address c/o Koshuha Precision Co., Ltd. 1-1 Higashihama, Ichikawa, Chiba Pref. 272-0003 Telephone 047-328-1831 Fax 047-328-3292

Kita Kanto Techno Center (Heat treatment) Address 328 Uekinocho, Oota, Gunma Pref. 373-0014 Telephone 0276-20-5120 Fax 0276-37-7115

Chubu Techno Center (Heat treatment / Surface treatment) Address 9 Akatukimachi, Seto, Aichi Pref. 489-0071 Telephone 0561-97-8431 Fax 0561-97-8433

Minami Kanto Techno Center (Heat treatment) Address 208 Nukumizu, Atugi, Kanagawa Pref. 243-0033 *Former Mildori Heat Treatment Co., Ltd. Telephone 046-247-2231 Fax 046-247-9962

取扱店 Dealer

■注意点和要求

这个商品目录上记载的数据是代表性的例子。实际商品所得到的数据有不同的时候。此外本资料所记载的信息，以后有变更时，没有被通知预告的情况下，请到营业窗口咨询最新信息

Caution and request

The respective data given on this catalog are typical examples and may be different in some cases from the data obtained from the actual product. In addition, the informations contained in this document are subject to change without notice. For the last information, please contact any of our sales offices indicated above.