● ミクロファイン鋼 ●

NOGA

NIPPON KOSHUHA STEEL CO.,LTD.

[新世代ハイテン成形用金型鋼材]

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

金型寿命向上とつくりやすさを追求した、新世代の冷間工具鋼です。

New generation cold work die steel pursuing improvement of service life of die and ease of die making

Phalaenopsis | ファレノプシス

煩わしさをシャットアウト!! 金型作りの

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

NOGAの特徴 Characteristics of NOGA

Stronger!
Improved service life of die

より強く!
金型寿命
向上

※耐かじり性はKS-Gコーティング処理を行った時のイメージです。KS-G以外の被膜では十分な特性が得られないことがあります。
※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.

for the Stamper

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Characteristics of NOGA

for the Die Maker

より簡単に!
金型製造
効率向上

Simpler!
Improved die manufacturing
efficiency

新たなステージに!!

new stage of die making!!

耐かじり性を向上

●PVD処理に最適な鋼材組織を実現しました。
●表面処理被膜が剥離し難いため、ハイテンの加工を行う曲げや絞りなど成形型の金型寿命向上が可能です。

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.

チッピングの低減を可能に

●チッピングの原因となる粗大な炭化物や介在物を大幅に低減し、耐疲労特性や靭性を2~3倍程度向上。
●抜き型の刃先の欠けや成形型の割れトラブルを低減し、金型寿命向上が可能です。

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.

溶接性の向上

●溶接割れを軽減できる合金設計を行い、溶接による金型の割れトラブルが軽減します。
●抜群の成分設計により、溶接金属のなじみが良く、ビードが安定するため溶接作業性が向上します。

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 conform well and the bead is stabled by excellent component design.

最良の熱処理変寸特性を実現

●熱処理変寸を大幅に低減し、方向性のバラつきを極限まで抑え、金型組み付け工数を低減します。

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.

究極の被削性を実現

●従来のSKD11改良鋼に比べ被削性が3~10倍程度驚異的に向上し、加工コストの低減や加工時間の短縮が可能となります。

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.

特性比較 Comparison of characteristics

	金型寿命 Service life of die					金型のつくりやすさ Ease of die manufacturing			
	表面処理性(PVD) Surface treatment characteristic (PVD)	CVD・TD補修し特性 CVD, TD repetition characteristic	耐摩耗性 表面処理なし Wear resistance without surface treatment	疲労特性 Fatigue characteristics	靭性 Toughness	被削性 Machinability	熱処理変寸 Dimensional change by heat treatment	溶接性 Weldability	放電加工性 Electric discharge machinability
NOGA	○	△	△	◎	○	◎	◎	◎	○
KD11S	△	◎	◎	○	×	○	△	×	△
SKD11	△	◎	◎	△	×	×	△	×	△
8%Cr鋼 8%Cr steel	△	○	○	○	△	△	×	△	△
8%Cr鋼改 8%Cr improved steel	△	○	○	○	△	○	○	×	×

優 Superior ◎ ○ △ × 劣 Inferior

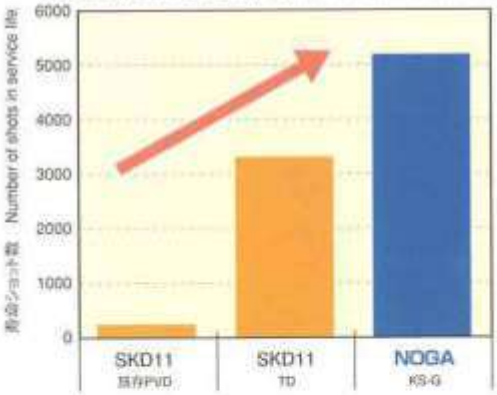
耐かじり性 Galling resistance

●ハイテン成形加工時に発生するかじり(摩擦熱上昇による凝着摩耗)は、表面処理被膜の剥離箇所より生じます。
NOGAは表面処理被膜との密着性を向上させることで、かじりに強い特性を兼ね備えました。
●NOGAはKS-Gコーティング処理をすることにより、SKD11より驚異的に寿命が向上します。

- 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.

■曲げプレス寿命比較結果

Result of comparing the service life of bending press



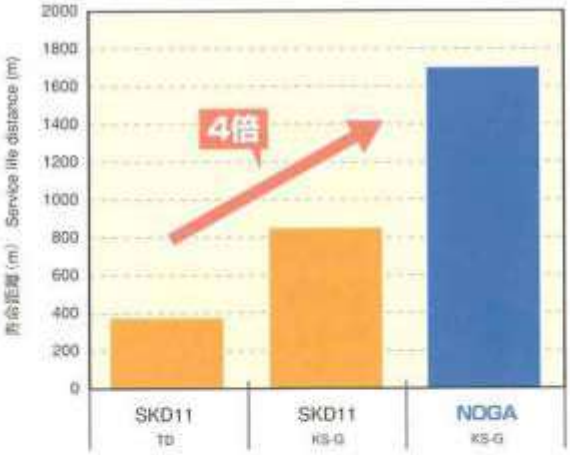
試験条件
●プレス機:110tonプレス
●被加工材:SPC980 t=2.0mm
●プレス速度:60SPM
●しごき率:10%

Test conditions
- Press machine: 110 ton press
- Material machined: SPC980 t=2.0mm
- Press speed: 60SPM
- Drawing ratio: 10%

※製品にかじり発生を寿命とした
※Production of galling on the product is handled that the service life has ended.

■摩擦摩耗試験

Friction abrasion test



試験条件
●ピン材:ハイテン鋼板100kgf
●試験荷重:50kgf
●試験回転数:64rpm

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

■3,300ショット時の製品材と金型表面状態

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

製品材表面 Product material surface

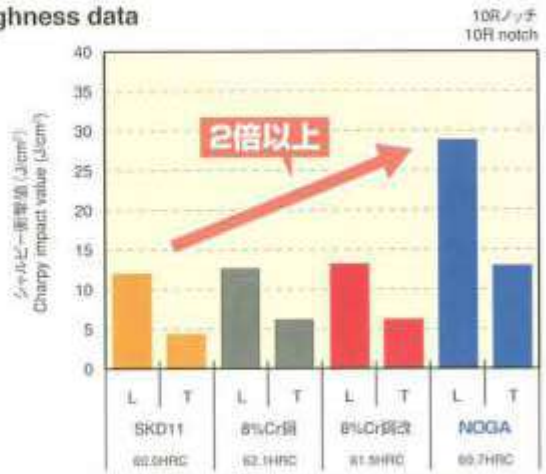
金型:曲げパンチ Die: Bending punch

靭性・耐疲労特性 Toughness and fatigue resistance characteristics

●NOGAはSKD11やSKD11改良鋼に比べ大幅に靭性・耐疲労特性が向上します。
NOGA is improved in the toughness and fatigue resistance characteristics to a large extent as compared with SKD11 steel and SKD11 improved steel.

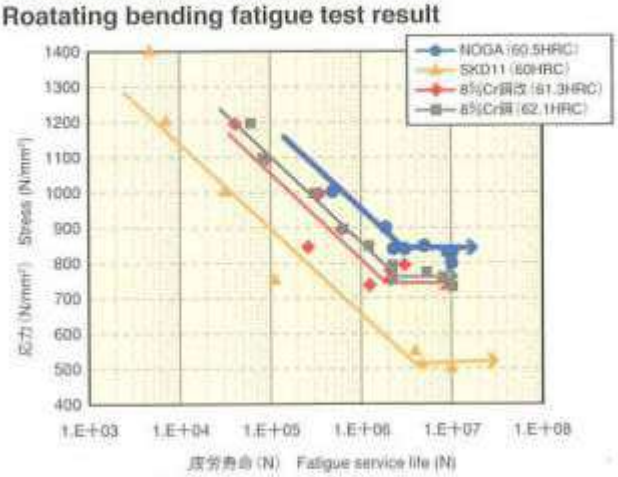
■靭性データ

Toughness data



■回転曲げ疲労試験結果

Roatating bending fatigue test result



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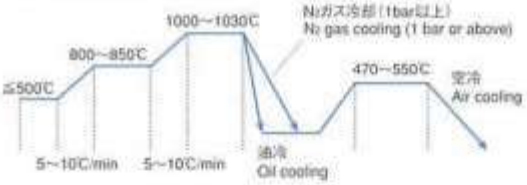
熱処理硬さ Hardness by heat treatment

●NOGAはSKD11と同じ熱処理条件で熱処理が可能で、高温戻しでSKD11より1HRC程度硬くなります。

NOGA enables heat treatment under the same heat treatment conditions of SKD11, and becomes harder than SKD11 by 1 HRC by high temperature tempering.

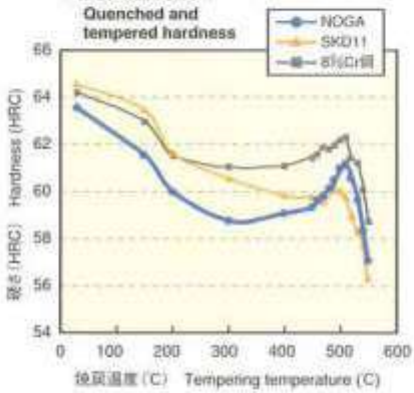
■熱処理条件

Heat treatment conditions



■焼入焼戻硬さ

Quenched and tempered hardness



高温戻しでSKD11より0.5~1HRC程度硬くなる

Becomes harder than SKD11 by about 0.5 to 1 HRC by high temperature tempering.

試験条件

●試片寸法:15×25×18mm
●焼入れ温度:1030℃×1.5Hr（ガス冷）
●焼き戻し:TC×3Hr

Test conditions

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

熱処理特性・熱処理変寸特性 Heat treatment characteristics, dimensional change characteristics by heat treatment

●NOGAは熱処理変寸時の異方性（方向によるばらつき）が小さく、高精度な熱処理変寸特性を示します。

NOGA has small anisotropy (directional variation) due to dimensional change by heat treatment, and keeps highly accurate die sizes after heat treatment.

試験条件

●寸法:50(t)×100(w)×200(L)mm

熱処理条件

●焼入れ:1020℃×2h(ガス冷)
●焼戻し:505℃×5

Test conditions

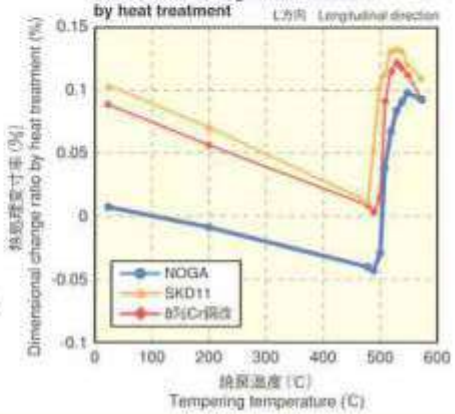
- Dimension: 50(t)×100(w)×200(L)mm

Heat treatment conditions

- Quenching: 1020℃×2h(gas cooling)
- Tempering: 505℃×5

■熱処理変寸特性

Dimensional change characteristics by heat treatment



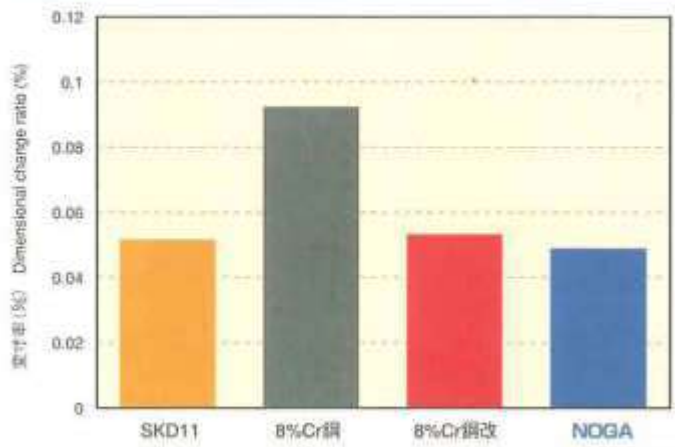
■熱処理変寸異方性

Anisotropy of dimensional change by heat treatment

経時変化 Secular change

●NOGAはSKD11と同等の経時変化特性となります。

NOGA has the secular change characteristics equivalent to those of SKD11.



試験条件

●寸　法：95(t)×100(w)×150(L)mm
●焼入れ：1020℃×2h(ガス冷)
●焼戻し：505℃×5h
●焼戻しから5日後の変寸

Test conditions

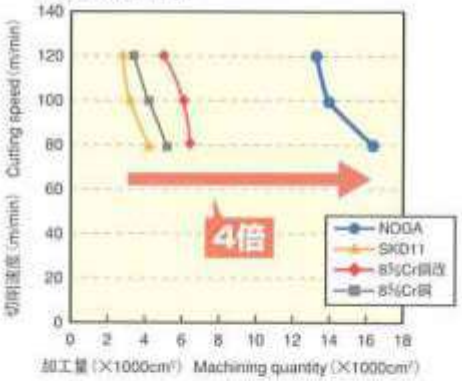
- Dimension: 95(t)×100(w)×150(L)mm
- Quenching: 1020℃×2h(gas cooling)
- Tempering: 505℃×5h
- Dimensional change in 5 days after tempering

被削性 Machinability

●NOGAは従来のSKD11やSKD11改良鋼よりも驚異的に被削性を向上させています。
NOGA is amazingly improved in machinability further than the existing SKD11 steel and SKD11 improved steel.

(焼きなまし材 Annealed material)

■高送りラジアスカッタでの被削性
Machinability by rapid feed radius cutter



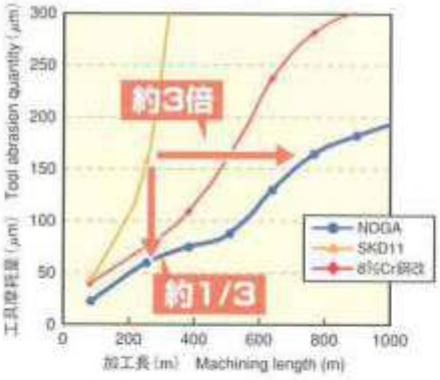
試験条件

●機　械：MC(BT50,7.5kw)
●工　具：三菱　AJX14R503SA42S φ50
●チップ：JDMW140520ZDSR-FT VP15TF
●送り量：1.0mm/刃
●切込み：Ad1mm、Rd35mm
●突出長：80mm
●切削油：エアーブロー
●寿命判定：工具摩耗、チッピング

Test conditions

- Machine: MC(BT50,7.5kw)
- Tool: Mitsubishi AJX14R503SA42S φ50
- 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

■ボールエンドミル加工
Ball end milling



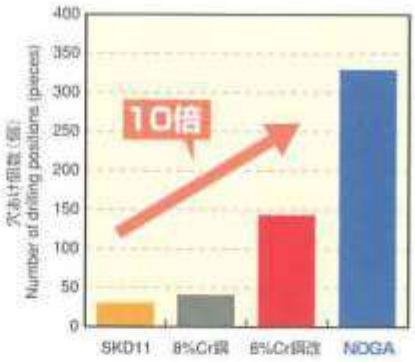
試験条件

●機　械：MORI(BT40、5.5kw)
●工　具：三菱 SRFH30S32M
●チップ：三菱 SRFT30 VP15MF
●回転数：2650min-1
●送り速度：1660mm/min　刃
●切込み：Ad0.3mm、Rd0.7mm
●突出長：118mm
●切削油：エアーブロー
●切削方向：ダウンカット

Test conditions

- Machine: MORI(BT40、5.5kw)
- Tool: Mitsubishi SRFH30S32M
- Tip: Mitsubishi SRFT30 VP15MF
- Revolution: 2650min-1
- Feed: 1660 mm/min. per blade
- Depth of cut: Ad0.3mm, Rd0.7mm
- Protrusion length: 118mm
- Cutting fluid: Air blow
- Cutting direction: Down cutting

■ドリルによる穴あけ試験
Drilling test



試験条件

●機　械：MORI MV-40M(BT40、5.5kw)
●工　具：三菱 K-TD　14.1mm
●切削速度：22m/min
●送り量：0.15mm/rev
●穴深さ：98.7mm（7D）
●ステップ：3mm
●切削油：エマルジョン
●寿　命：キー音、折損

Test conditions

- Machine: MORI MV-40M(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

●焼入れ後の加工性も大幅に向上しており、焼入れ後の修正加工にも対応できます。
Workability after quenching and tempering is also improved to a large extent, coping with correction machining after quenching and tempering.

(焼入材 Quenched & tempered material)

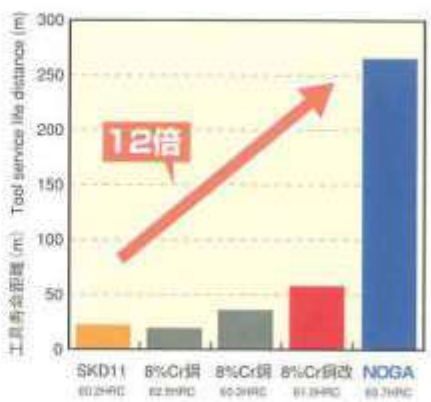
■エンドミル加工 End milling

試験条件

●機　械：MORI(BT40、5.5kw)
●工　具：三菱　VC-MD 10mm
●切削速度：150m/min(4800rpm)
●送り量：0.1mm/刃(2,900mm/min)
●切り込み：Ad10mm　Rd0.5mm
●切削方向：ダウンカット
●突出長さ：25mm
●切削油：エアーブロー

Test conditions

- Machine: MORI(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



■ボールエンドミル加工 Ball end milling

試験条件

●機　械：MORI(BT40、5.5kw)
●工　具：三菱 SRFH30S32M
●チップ：三菱 SRFT30 VP10MF
●回転数：2650min-1
●送り速度：1660mm/min　刃
●切込み：Ad0.3mm、Rd0.7mm
●突出長：118mm
●切削油：エアーブロー
●切削方向：ダウンカット
●加工長さ：50m

Test conditions

- Machine: MORI(BT40、5.5kw)
- Tool: Mitsubishi SRFH30S32M
- Tip: Mitsubishi SRFT30 VP10MF
- Revolution: 2650min-1
- Feed: 1660 mm/min. per blade
- Depth of cut: Ad0.3mm、Rd0.7mm
- Protrusion length: 118mm
- Cutting fluid: Air blow
- Cutting direction: Down cutting
- Machining length: 50m

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溶接性 Weldability

●NOGAは従来のSKD11やSKD11改良鋼に比べ溶接割れ感受性が低く、良好な溶接作業性を示します。
NOGA is lower in welding crack sensitivity than the existing SKD11 steel and SKD11 improved steel, indicating good welding workability.

■溶接作業性
Welding workability

鋼種 Steel	ビード安定性 Bead stability	アンダーカット Undercut	ブローホール Blowhole
NOGA	○	○	◎
SKD11	○	○	◎
8%Cr鋼 8%Cr steel	○	○	◎
8%Cr鋼改 8%Cr improved steel	×	×	×

溶接条件
●溶接棒：SKD61系　φ4.0
●溶接範囲：50×150mm
●溶接電流：160A
●積層数：3層
●ピーニング：なし

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

■溶接割れ
Welding crack

○：割れなし　○：No crack
△：微小な割れ発生　△：Minute crack is produced.
×：大割れ発生　×：Large crack is produced.

鋼種 Steel	予熱温度 Preheating temperature				
	室温 Room temperature	100℃	200℃	300℃	350℃
NOGA	×	○	○	○	○
SKD11	×	×	×	×	△
8%Cr鋼 8%Cr steel	×	×	×	×	△
8%Cr鋼改 8%Cr improved steel	×	×	×	×	△

※評価は形状彫りのない四角いブロックでの評価結果です。
素材の大きさ、形状等によって結果が異なります。

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

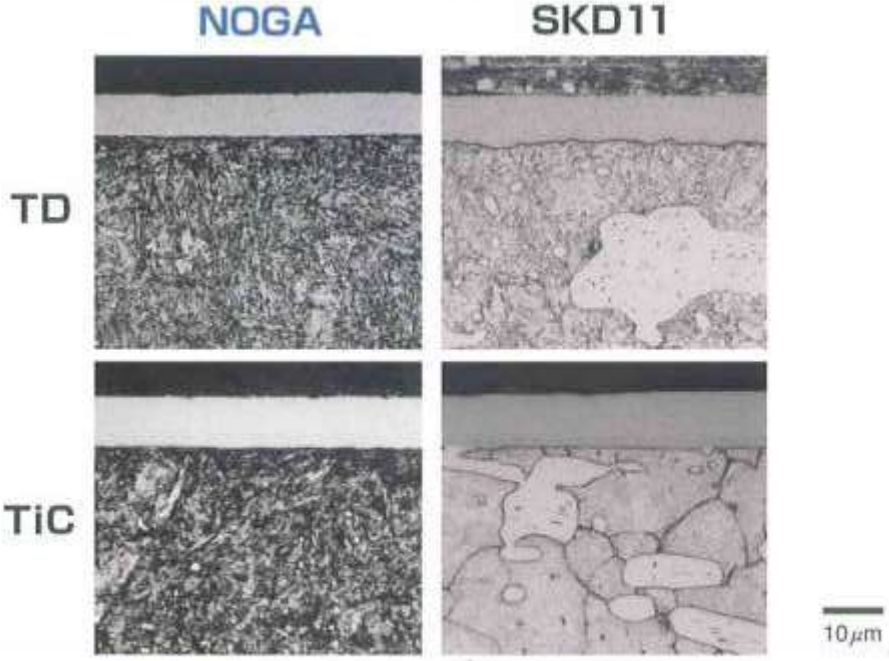
SKD61相当材の溶接棒をご推奨致します。
●アーク溶接棒：JIS:DF2B-B、DF3B-B、DF3C-Bなど
●ＴＩＧ溶接棒：メーカーにより型式が異なりますのでお問い合わせ下さい。

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.

表面処理特性 Surface treatment characteristics

●NOGAはPVD処理に最も適した鋼材組織を実現しました。
㈱カムスの新PVD 表面処理「マカオンコート KS-G」のご使用を推奨いたします。
●TD（VC）やCVD（TiC）の
表面処理も可能であり、得られる
膜厚はSKD11同等です。

- 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.



OUR PRESENCE

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WEB:
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