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DURGRIP™

Galvannealed

Steel
Sheet



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DURGRIP™
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NIPPON STEEL CORPORATION

Introduction

Galvanized steel sheet was previously better known as corrugated iron, which was mainly used for roofing and siding materials, as well as sundry goods, but its uses have recently expanded across a wider range of fields.

Among other types, DURGRIP™ – which is an alloyed hot-dip galvanized steel sheet – affords superior coating and welding performance than existing hot-dip galvanized steel sheet, and is widely used in vehicles, electrical equipment, and construction materials, etc. DURGRIP™ is heat-processed after hot dipping, and electroplated with a zinc-iron alloy. This surface is comprised of minute con-

cave and convex irregularities, making this perfect as a base steel sheet for painting purposes. The characteristics, standards, and applications, etc. of DURGRIP™ are introduced in this catalogue. Please digest the details to confirm the superiority of DURGRIP™.



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Characteristics

1. Excellent corrosion-resistance properties

The degree of protection afforded by the steel sheet is every bit as good as conventional hot-dip galvanized steel sheet, but in addition, this surface has greater adhesion to paint, and after applying such coating, its corrosion resistance is further enhanced.

2. Superior painting efficacy

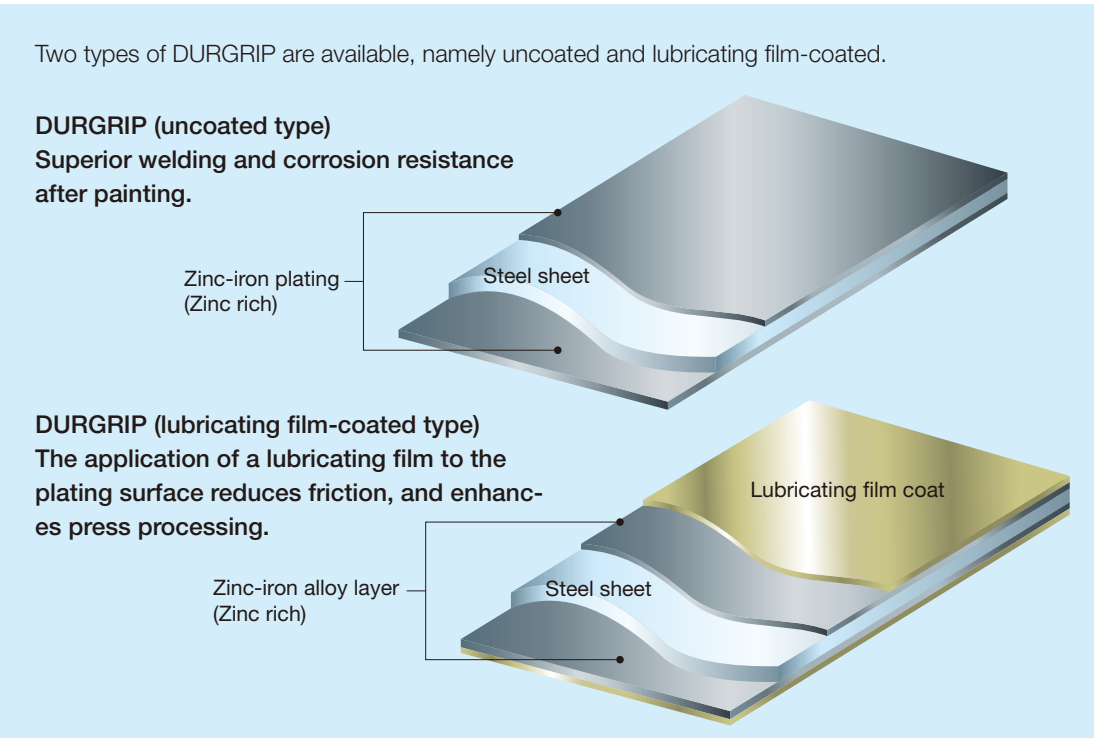
The ability of paint to adhere to this surface is markedly improved thanks to the slightly rough surface after Zn-Fe plating, making this optimal as a base steel sheet for painting.

3. Ease of welding

The Zn-Fe plating makes this product easier to weld than ordinary galvanized steel sheet.

4. Choice of materials available for wide range of applications

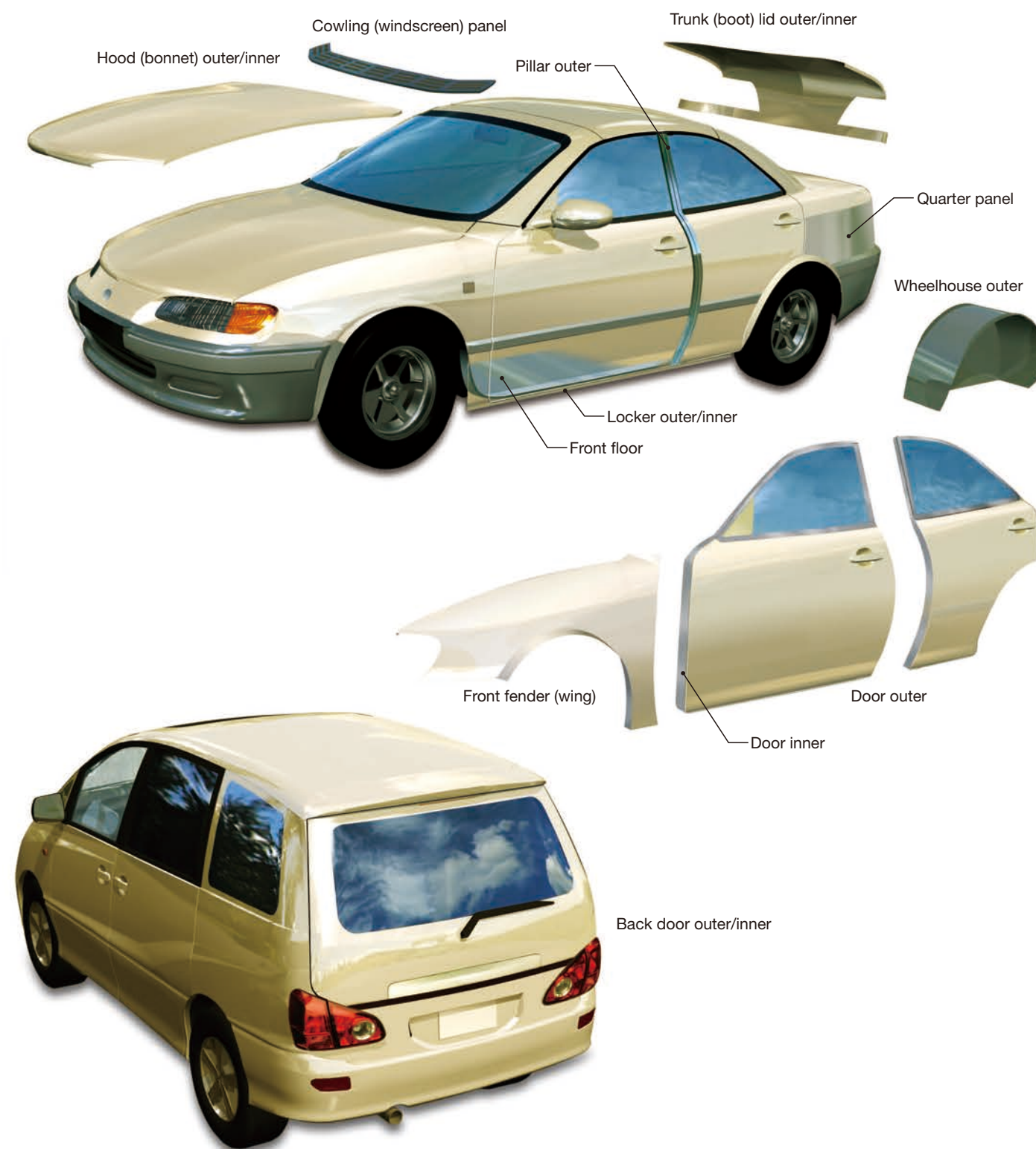
Select from a versatile range of materials designed to accommodate diverse needs, such as automotive, electrical equipment, and construction materials.



Examples of Product Uses

DURGRIP is a superior hot-dip galvanized steel sheet in terms of its corrosion-resistance after painting and weldability, making it well suited to uses requiring painted or welded components, notably for construction materials, vehicles, and electrical equipment.

■ Examples of applications for automotive components (Car exposed panels, unexposed panels, and parts)



■ Examples of applications for electrical equipment

- Washing machines
- Fridges
- Air conditioners
- Vending machines (external, side, back and bottom panels, parts)

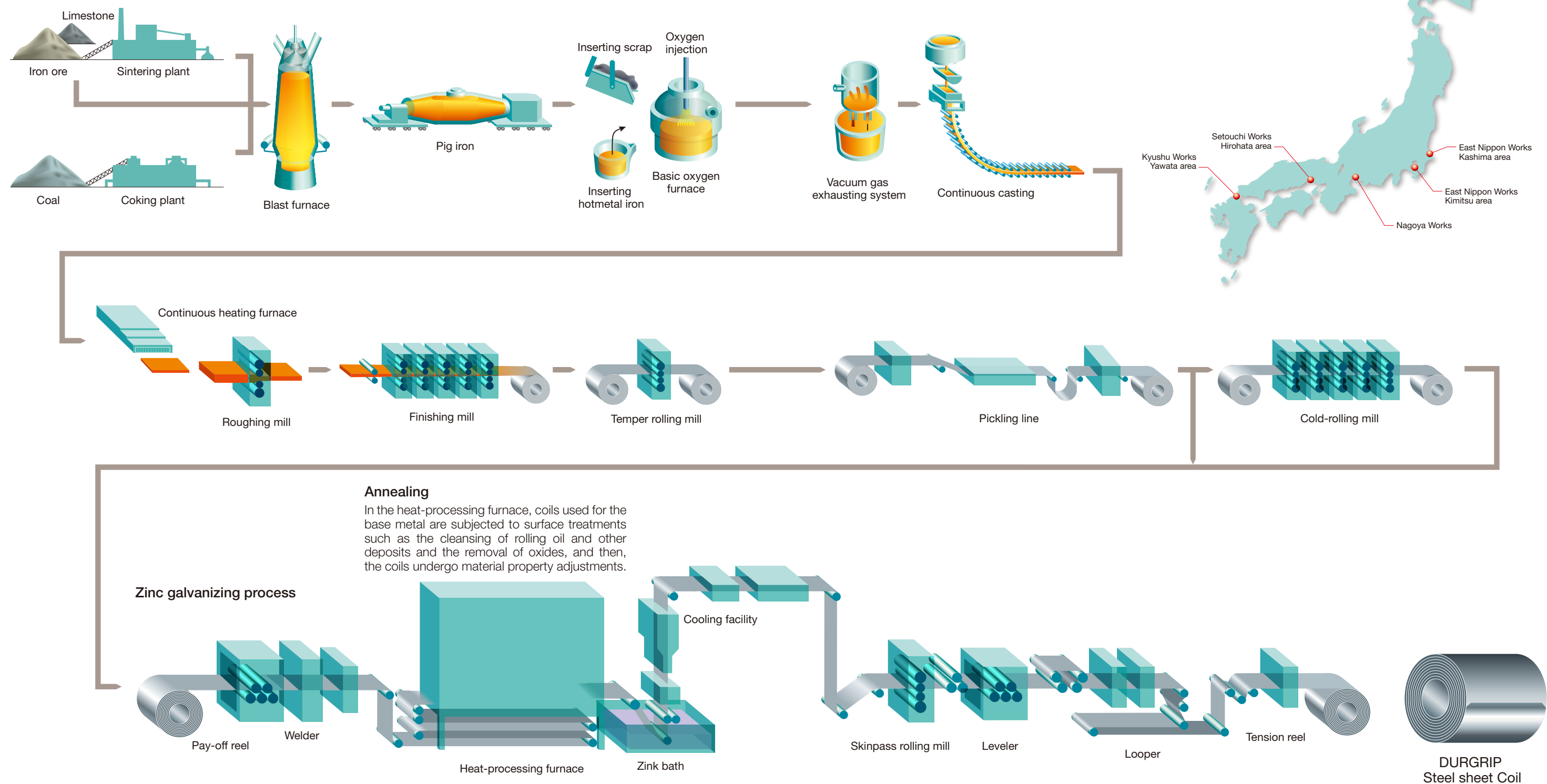


■ Examples of applications for architecture and furniture

- Signboards, doors, sashes, shutters
- Cabinets, steel furniture
- OA equipment, etc.



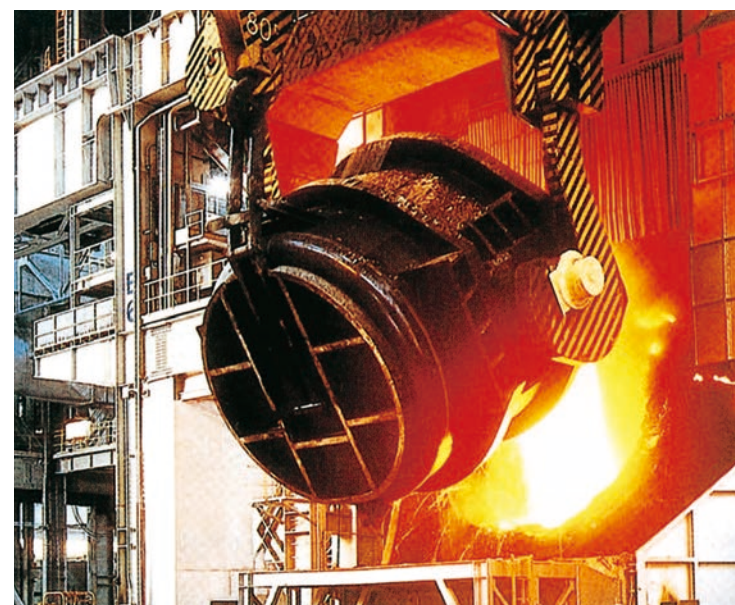
Manufacturing Processes



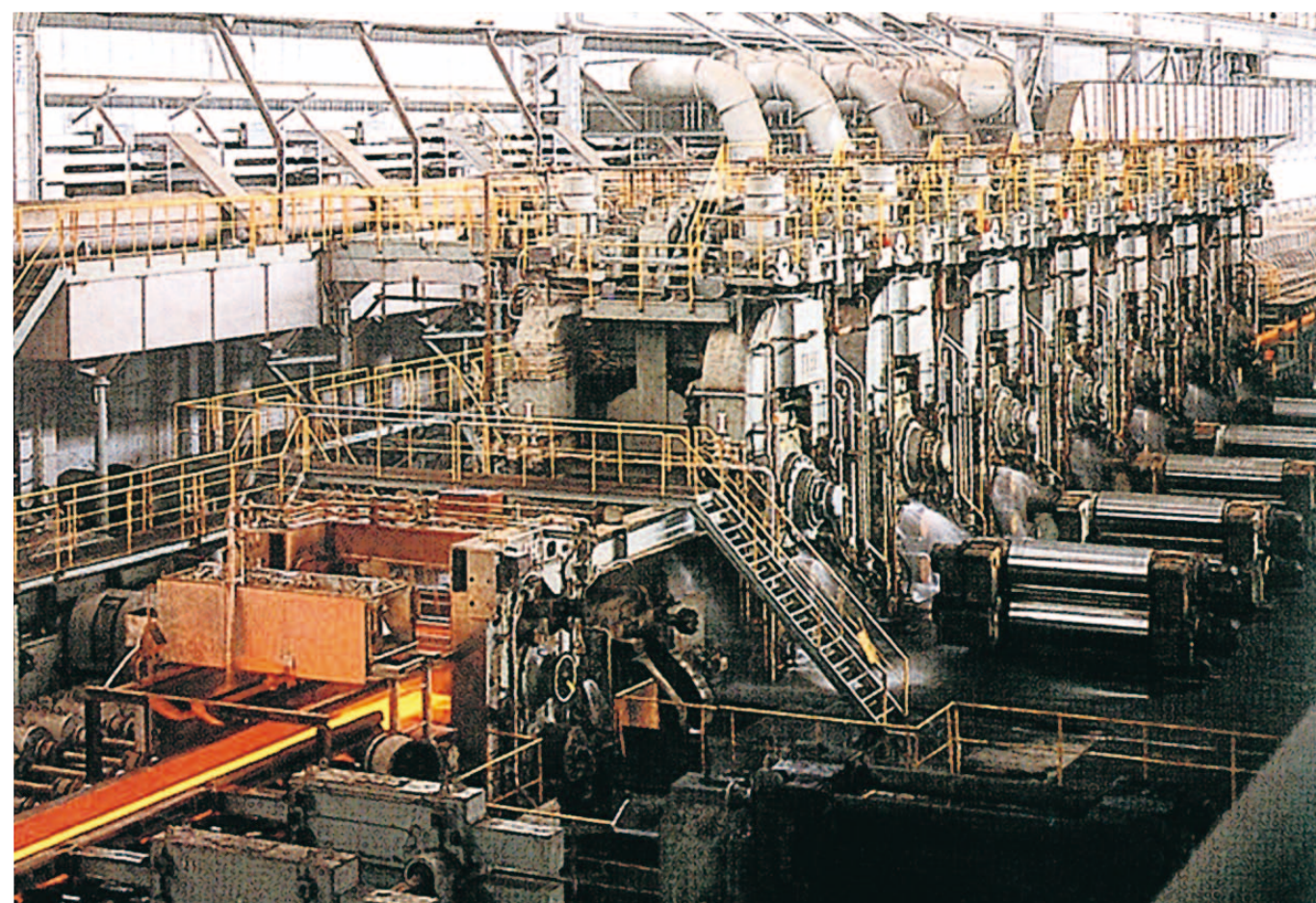
Manufacturing Equipment

Constant Casting from the Blast Furnace

Pig iron is extracted through the chemical reaction of iron ore and coke. In order to process the extracted pig iron into strong yet flexible steel to meet the quality requested by customers, surplus carbon and impurities must be removed, and the chemical constituents adjusted through four processes – namely pre-molten iron treatment, rotating furnace, secondary refining, and constant casting – to create “slabs” as the interim material.



Rotating furnace



Hot rolling

From Hot Rolling to Acid Pickling

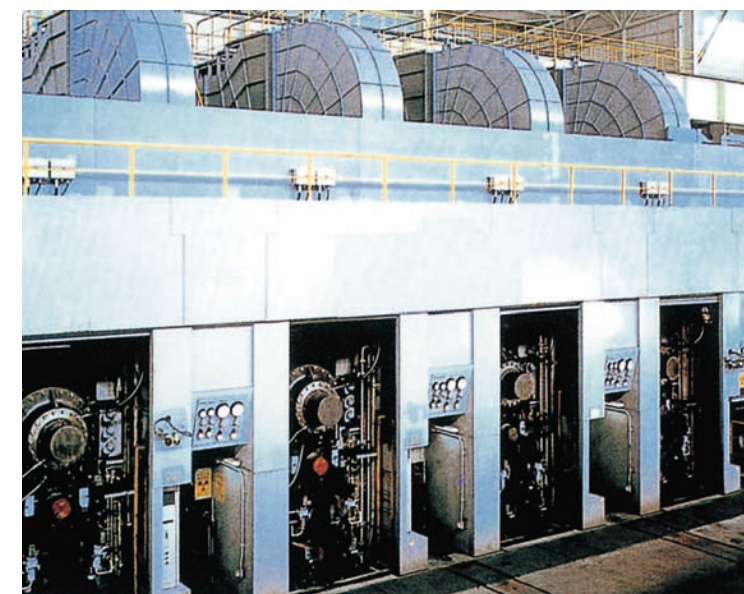
In the rolling process, base metals (hot-rolled coils) with minimal surface scratches or internal defects that are good for processing are manufactured by strictly controlling the temperature and roll surface, etc. All processes – from insertion through heating the furnace to completion of coiling – are computer controlled, with the quality of each product precisely controlled with dynamic and swift management.

Hot-rolled coils used for base metals continuously undergo acid pickling, and any scaling on the surface (iron oxide film) is removed to prepare for beautiful surfaces in the latter process.

Cold Rolling

For orders that require a cold-rolled base metal, the sheets are processed to the prescribed thickness by cold rolling after acid pickling.

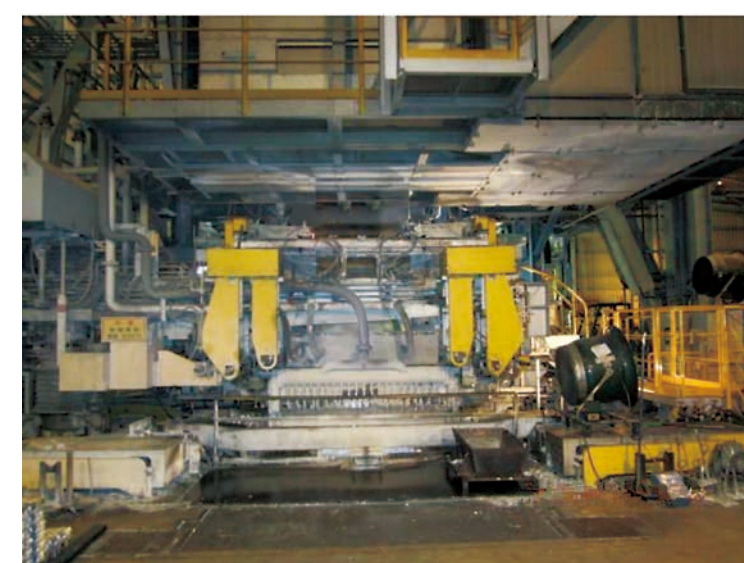
The important points for cold-rolling quality are the sheet thickness accuracy and flatness. We manufacture high quality cold-rolled coils as base metal with to a fine degree of tolerance in sheet thickness by using superior automated sheet thickness controllers and cutting-edge shape controllers.



Cold rolling



Constant hot-dip galvanizing (Annealing)



Constant hot-dip galvanizing (Plating)

Electrolytic Cleaning, Annealing, Plating, Post-processing

Any oil that becomes attached in the cold-rolling process is removed by electrolytic cleaning, which is followed by annealing and plating. Crystalline structures in cold-rolled coils are stretched in the rolling direction creating a hard but fragile material. In the annealing process, it is heated and kept in a gaseous reducing atmosphere to recrystallize, and materials suited to the standards set for the purpose and usage application are manufactured. Next, they are immersed in a molten zinc galvanizing tank for the zinc coating. The coating mass is adjusted by gas wiping immediately after the hot-dip galvanizing.

After the addition of this coating, they are heated appropriately in the alloying equipment, the iron fuses into the coating layer to form an alloyed coating of zinc and iron, which affords superior characteristics in terms of corrosion resistance, painting, and welding. Additionally, the provision of a lubricating film coating can enhance pressing for some customers.

Manufacturing Specifications

Type (JIS Specifications) JIS G-3302-2010 (abstract)

Cold-rolled Base Metal Coils

| Type | | Designation | Nominal thickness (mm) |
|------------|------------|-------------|------------------------|
| Commercial | | SGCC | 0.25 ~ 3.2 |
| Drawing | Grade 1 | SGCD1 | 0.40 ~ 2.3 |
| | Grade 2 | SGCD2 | 0.40 ~ 2.3 |
| | Grade 3 | SGCD3 | 0.60 ~ 2.3 |
| Structural | 340N class | SGC340 | 0.25 ~ 3.2 |
| | 400N class | SGC400 | 0.25 ~ 3.2 |
| | 440N class | SGC440 | 0.25 ~ 3.2 |

- Notes:
- Nominal thicknesses other than those listed in the above table are subject to agreement between the producer and purchaser.
 - On the above type designations, F04~F12 indicates the coating mass, but F10 and F12 are not applicable to Drawing Grades 1, 2, and 3.

Type (NIPPON STEEL Standards)

Cold-rolled Base Metal Coils

| Type | | Designation | Equivalent JF Standards |
|--|-------------|-------------|-------------------------|
| Commercial | | NSACC | — |
| Drawing | Grade 1 | NSAC270C | JAC270C |
| | Grade 2 | NSAC270D | JAC270D |
| | Grade 3 | NSAC270E | JAC270E |
| | Grade 4 | NSAC270F | JAC270F |
| | Grade 5 | NSAC270G | JAC260G |
| Drawing, high strength, bake-hardened type | 340N class | NSAC340BH | JAC340H |
| Commercial, high strength | 340N class | NSAC340 | — |
| | 400N class | NSAC400 | — |
| | 440N class | NSAC440 | — |
| Drawing, high strength | 340N class | NSAC340R | JAC340W |
| | 370N class | NSAC370R | — |
| | 390N class | NSAC390R | JAC390W |
| | 440N class | NSAC440R | JAC440W |
| Automotive, high strength | 590N class | NSAC590N | JAC590R |
| | 440N class | NSAC440B | JAC440A |
| High burring, high strength | 590N class | NSAC590B | JAC590A |
| | 340N class | NSAC340E | JAC340P |
| Deep drawing, high strength | 370N class | NSAC370E | — |
| | 390N class | NSAC390E | JAC390P |
| | 440N class | NSAC440E | JAC440P |
| | 590N class | NSAC590D | JAC590Y |
| Low yield ratio, high strength | 780N class | NSAC780D | JAC780Y |
| | 980N class | NSAC980D | JAC980Y |
| | 1180N class | NSAC1180D | JAC1180Y |
| High formability, high strength | 590T class | NSAC590T | JAC590T |
| | 780T class | NSAC780T | JAC780T |
| Hot Stamping | 1500 class | NSSQA1500 | — |

- Notes:
- If NSAC270E, NSAC270F, and NSAC270G are covered by a non-aging guarantee, they are tagged with an N at the end of the designation code to create NSAC270EN, NSAC270FN, and NSAC270GN. Non-aging refers to properties that do not cause stretcher strains during press forming, and are guaranteed for six months after manufacture.
 - When the above types are selected, 030-090 is applied as the coating mass designation code for equal coatings on both sides.

Hot-rolled Base Metal Coils

| Type | | NIPPON STEEL designation | Nominal thickness (mm) |
|------------|------------|--------------------------|------------------------|
| Commercial | | SGHC | 1.6 ~ 4.5 |
| Structural | 340N class | SGH340 | 1.6 ~ 4.5 |
| | 400N class | SGH400 | 1.6 ~ 4.5 |
| | 440N class | SGH440 | 1.6 ~ 4.5 |

Note:
On the above type designations, F04~F12 indicates the coating mass.

Hot-rolled Base Metal Coils

| Type | | Designation | Equivalent JF Standards |
|--------------------------------------|------------|-------------|-------------------------|
| Commercial | | NSAHC | — |
| Commercial automotive use | | NSAH270C | JAH270C |
| Drawing | Grade 1 | NSAH270D | JAH270D |
| | Grade 2 | NSAH270E | JAH270E |
| Commercial, high strength | 340N class | NSAH340 | — |
| | 400N class | NSAH400 | — |
| | 440N class | NSAH440 | — |
| | 490N class | NSAH490 | — |
| Commercial automotive, high strength | 310N class | NSAH310N | — |
| | 370N class | NSAH370N | JAH370W |
| | 400N class | NSAH400N | JAH400W |
| | 440N class | NSAH440N | JAH440W |
| Automotive drawing, high strength, | 490N class | NSAH490R | — |
| | 590N class | NSAH590R | JAH590R |
| High burring, high strength | 440N class | NSAH440B | JAH440A |
| | 590N class | NSAH590B | JAH590A |
| | 780N class | NSAH780B | JAH780A |
| For use in steel pipes | 270N class | NSAHT270 | — |
| | 340N class | NSAHT340 | — |
| | 410N class | NSAHT410 | — |
| | 490N class | NSAHT490 | — |

- Notes:
- When the above types are selected, 030-090 is applied as the coating mass designation code for equal coatings on both sides.

Coating Mass

(Unit: g/m²)

| Type of Coating | Coating mass (designa- tion) | Minimum coating mass | | | |
|--|------------------------------|---------------------------------|------------------------------|-----------------------------------|-----------------------------------|
| | | Both sides (triple spot method) | Both sides (one spot method) | Obverse side (triple spot method) | Reverse side (triple spot method) |
| Equal coating on both sides (designation on both sides) [JIS] | F04 | 40 | 34 | — | — |
| | F06 | 60 | 51 | — | — |
| | F08 | 80 | 68 | — | — |
| | F10 | 100 | 85 | — | — |
| | F12 | 120 | 102 | — | — |
| Equal coating on both sides (designation on one side) [NIPPON STEEL standards] | (F18) | 180 | 153 | — | — |
| | 030 | — | — | 20 | 20 |
| | 045 | — | — | 30 | 30 |
| | 060 | — | — | 40 | 40 |
| | 080 | — | — | 55 | 55 |
| | 090 | — | — | 60 | 60 |

- Notes:
- Please consult us in advance about any coating mass designations in parentheses.
 - In the case of differentiated coating masses, mass designation codes with the opposite obverse/reverse codes are also available.
i.e.: 030/045 ⇔ 045/030

Surface Treatments (JIS Standards)

| Type of surface treatment | Designation |
|---------------------------|-------------|
| Chromate treatment | C |
| Chromate-free treatment | NC |
| No Treatment | M |

Skin-Pass Rolling (JIS Standards and NIPPON STEEL Specifications)

| Type | Designation |
|--|-------------|
| Specification for Skin-Pass Rolling | S |
| No Specification for Skin-Pass Rolling | — |

Surface Treatments (NIPPON STEEL Specifications)

| Type of surface treatment | Designation |
|--|-------------|
| Chromate treatment | C |
| Chromate-free treatment (organic, general-purpose) | QM |
| Chromate-free treatment (inorganic, lubricant) | FN |
| Automotive lubricant treatment | L, V |
| No Treatment | M |

Oiling (NIPPON STEEL Specifications)



| Type | Designation |
|----------------|-------------|
| Heavily oiled | H |
| Normally oiled | N |
| Lightly oiled | L |
| Non-oiled | X |

Oiling (JIS Standards)

| Type | Designation |
|-----------|-------------|
| Oiled | O |
| Non-oiled | X |

Coating mass and applicable thickness

| Coating mass Thickness (mm) | F04 030 | F06 045 | F08 060 | F10 070 | F12 090 | F18 120 |
|-----------------------------|---------|---------|---------|---------|---------|---------|
| 0.35 | | | | | | |
| 0.4 | | | | | | |
| 0.5 | | | | | | |
| 0.55 | | | | | | |
| 0.6 | | | | | | |
| 0.8 | | | | | | |
| 1 | | | | | | |
| 1.4 | | | | | | |
| 1.6 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 3.2 | | | | | | |
| 4.5 | | | | | | |

-  : Can be manufactured
 : Please consult us in advance

Manufacturing Specifications

Size Tolerance

Thickness tolerances are applied to the total values of nominal plate thickness and corresponding coating thickness.

Cold-rolled Base Metal

(units: mm)

| Nominal thickness | Width | | | | |
|-------------------|-------|-------------|---------------|---------------|--------|
| | <630 | 630≤t<1,000 | 1,000≤t<1,250 | 1,250≤t<1,600 | 1,600≤ |
| <0.25 | ±0.04 | ±0.04 | ±0.04 | — | — |
| 0.25≤t<0.40 | ±0.05 | ±0.05 | ±0.05 | ±0.06 | — |
| 0.40≤t<0.60 | ±0.06 | ±0.06 | ±0.06 | ±0.07 | ±0.08 |
| 0.60≤t<0.80 | ±0.07 | ±0.07 | ±0.07 | ±0.07 | ±0.08 |
| 0.80≤t<1.00 | ±0.07 | ±0.07 | ±0.08 | ±0.09 | ±0.10 |
| 1.00≤t<1.25 | ±0.08 | ±0.08 | ±0.09 | ±0.10 | ±0.12 |
| 1.25≤t<1.60 | ±0.09 | ±0.10 | ±0.11 | ±0.12 | ±0.14 |
| 1.60≤t<2.00 | ±0.11 | ±0.12 | ±0.13 | ±0.14 | ±0.16 |
| 2.00≤t<2.50 | ±0.13 | ±0.14 | ±0.15 | ±0.16 | ±0.18 |
| 2.50≤t<3.15 | ±0.15 | ±0.16 | ±0.17 | ±0.18 | ±0.21 |
| 3.15≤ | ±0.17 | ±0.18 | ±0.20 | ±0.21 | — |

Note:Thickness shall be measured from an optimal spot at least 25 mm inside the edge.

Base Metal (Hot-Rolled Coils)
Commercial quality using hot-rolled coils

(Unit: mm)

| Nominal thickness | Width | | | |
|-------------------|--------|---------------|---------------|---------------|
| | <1,250 | 1,250≤t<1,500 | 1,500≤t<1,800 | 1,800≤t<2,300 |
| 1.60≤t<2.00 | ±0.17 | ±0.18 | ±0.19 | ±0.22(*) |
| 2.00≤t<2.50 | ±0.18 | ±0.20 | ±0.22 | ±0.26(*) |
| 2.50≤t<3.15 | ±0.20 | ±0.22 | ±0.25 | ±0.27 |
| 3.15≤t<4.00 | ±0.22 | ±0.24 | ±0.27 | ±0.28 |
| 4.00≤t<5.00 | ±0.25 | ±0.27 | — | — |
| 5.00≤t<6.00 | ±0.27 | ±0.29 | — | — |
| 6.00≤ | ±0.30 | ±0.31 | — | — |

Notes:
1. Thickness shall be measured from an optional spot 25 mm or more inside from the edge.
2. This tolerance shall be applied to widths under 2,000 mm.

Corresponding Coating Thickness

| Coating mass designation | F04 | F06 | F08 | F10 | F12 | F18 | 030 | 045 | 060 | 090 |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Corresponding coating thickness | 0.008 | 0.013 | 0.017 | 0.021 | 0.026 | 0.034 | 0.008 | 0.012 | 0.016 | 0.026 |

Note: The corresponding coating thickness is calculated using a density of 7.1 g/m² and the calculated value is rounded down to the third decimal place according to JIS Z 8401.

Width Tolerances

(unit: mm)

| Base Metal Classification of Width | In the case of using cold-rolled coils | In the case of using hot-rolled coils | |
|---------------------------------------|--|---|--|
| | | Classification of tolerance A (mill edge) | Classification of tolerance B (cut edge) |
| ≤1,500 | +7 0 | +25 0 | +10 0 |
| 1,500< | +10 0 | | |

Note: 1. In the case of using hot-rolled coil base metal, "B" is commonly used as the classification of tolerance. 2. Classification of Tolerance A: Mill edge B: Cut edge

Cold-rolled Base Metal with tensile limit lowered to 780 N/m²

(Unit: mm)

| Nominal thickness | Width | |
|-------------------|--------|---------------|
| | <1,250 | 1,250≤t<1,600 |
| 0.60≤t<0.80 | ±0.08 | ±0.09 |
| 0.80≤t<1.00 | ±0.09 | ±0.10 |
| 1.00≤t<1.25 | ±0.11 | ±0.12 |
| 1.25≤t<1.60 | ±0.12 | ±0.14 |
| 1.60≤t<2.00 | ±0.14 | ±0.16 |
| 2.00≤t≤2.30 | ±0.16 | ±0.18 |

Note: Thickness shall be measured from an optimal spot at least 25 mm inside the edge.

Base Metal (Hot-Rolled Coils)
Structural quality using hot-rolled coils

(Unit: mm)

| Nominal thickness | Width | |
|-------------------|--------|---------------|
| | <1,600 | 1,600≤t<2,000 |
| 1.60≤t<2.00 | ±0.20 | ±0.24 |
| 2.00≤t<2.50 | ±0.21 | ±0.26 |
| 2.50≤t<3.15 | ±0.23 | ±0.30 |
| 3.15≤t<4.00 | ±0.25 | ±0.35 |
| 4.00≤t<5.00 | ±0.46 | — |
| 5.00≤t≤6.00 | ±0.51 | — |

Note: Thickness shall be measured from an optional spot 25 mm or more inside from the edge.

Mechanical Properties (JIS Standards) JIS G 3302-2012 (abstract)

Base Metal (Cold-Rolled Coils)

| Type | | Designa- tion | Tensile Test | | | | | | | | Test piece (JIS) |
|------------|------------|------------------|--|---|------------------------|-------------|--------------|--------------|--------------|------|---|
| | | | Yield point (N/mm ²) | Tensile strength (N/mm ²) | Elongation (%) | | | | | | |
| | | | | | Nominal thickness (mm) | | | | | | |
| Commercial | | SGCC | (205≤) | (270≤) | 0.25≤t<0.40 | 0.40≤t<0.60 | 0.60≤t<1.0 | 1.0≤t<1.6 | 1.6≤t<2.5 | 2.5≤ | |
| Drawing | Grade 1 | SGCD1 | — | 270≤ | — | 34≤ | 36≤ | 37≤ | 38≤ | — | No. 5 rolling direction |
| | Grade 2 | SGCD2 | — | 270≤ | — | 36≤ | 38≤ | 39≤ | 40≤ | — | |
| | Grade 3 | SGCD3 | — | 270≤ | — | 38≤ | 41≤ (40≤) | 43≤ (41≤) | 44≤ (42≤) | — | |
| Structural | 40N class | SGC340 | 245≤ | 340≤ | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | No. 5 rolling direction or perpendicular to the rolling direction |
| | 400N class | SGC400 | 295≤ | 400≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | |
| | 440N class | SGC440 | 335≤ | 440≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | |

Notes:
1. Figures in parentheses are for reference.
2. Figures in parentheses are JIS Standards, but NIPPON STEEL guarantees the upper values.
3. If non-aging is specified for SGCD3, it is guaranteed for six months after shipping from the manufacturer.
4. Tensile tests are not generally conducted for nominal thicknesses of less than 0.25 mm.

Base Metal (Hot-Rolled Coils)

| Type | | Designa- tion | Tensile Test | | | |
|------------|------------|------------------|----------------------------------|---------------------------------------|---|---|
| | | | Yield point (N/mm ²) | Tensile strength (N/mm ²) | Elongation (%) Nominal thickness (1.6 mm≤) | Test piece (JIS) |
| Commercial | | SGHC | (205≤) | (270≤) | — | No. 5 rolling direction |
| Structural | 340N class | SGH340 | 245≤ | 340≤ | 20≤ | No. 5 rolling direction or perpendicular to the rolling direction |
| | 400N class | SGH400 | 295≤ | 400≤ | 18≤ | |
| | 440N class | SGH440 | 335≤ | 440≤ | 18≤ | |

Note: Figures in parentheses are for reference.

Manufacturing Specifications

Mechanical Properties (NIPPON STEEL Specifications)

Base Metal (Cold-rolled Coils)

| Type | | Designation | Tensile Test | | | | | | | | | | | | | Test piece / Test direction |
|---|------------|------------------------|--|---|---|-------------------------------|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|------|---|--------------------------------|
| | | | Yield Point or Yield Resistance (N/mm ²) | Tensile Strength (N/mm ²) | Bake-hard- ening value (N/mm ²) | Hole expansion rate (%) | Elongation (%) | | | | | | | | | |
| | | | | | | | Nominal Thickness (mm) | | | | | | | | | |
| | | | | | | 0.25≤t<0.40 | 0.40≤t<0.60 | 0.6≤t<0.8 | 0.8≤t<1.0 | 1.0≤t<1.2 | 1.2≤t<1.6 | 1.6≤t<2.0 | 2.0≤t<2.5 | 2.5≤ | | |
| Commercial | | NSACC | (205≤) | (270≤) | | — | — | — | — | — | — | — | — | — | JIS No. 5 rolling direction | |
| Drawing | Grade 1 | NSAC270C | — | 270≤ | | — | 34≤ | 36≤ | 36≤ | 37≤ | 37≤ | 38≤ | 38≤ | 39≤ | | |
| | Grade 2 | NSAC270D | — | 270≤ | | — | 36≤ | 38≤ | 38≤ | 39≤ | 39≤ | 40≤ | 40≤ | 41≤ | | |
| | Grade 3 | NSAC270E ^{a)} | — | 270≤ | | — | 38≤ | 41≤ | 41≤ | 43≤ | 43≤ | 44≤ | 44≤ | 44≤ | | |
| | Grade 4 | NSAC270F ^{a)} | — | 270≤ | | — | 40≤ | 43≤ | 43≤ | 45≤ | 45≤ | 46≤ | 46≤ | 46≤ | | |
| | Grade 5 | NSAC270G ^{a)} | — | 270≤ | | — | 43≤ | 46≤ | 46≤ | 48≤ | 48≤ | 49≤ | 49≤ | 49≤ | | |
| Commercial, high strength | 340N class | NSAC340 | 245≤ | 340≤ | | (20≤) | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | 20≤ | JIS No. 5 perpendicular to rolling direction | |
| | 400N class | NSAC400 | 295≤ | 400≤ | | (18≤) | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | | |
| | 440N class | NSAC440 | 335≤ | 440≤ | | (18≤) | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | 18≤ | | |
| Drawing, high strength, bake-hardened type | 340N class | NSAC340BH | (195≤) | 340≤ | 30≤ | — | 32≤ | 34≤ | 35≤ | 36≤ | 37≤ | 38≤ | 39≤ | 39≤ | | |
| Drawing, high strength | 340N class | NSAC340R | 185≤ | 340≤ | | — | 32≤ | 34≤ | 35≤ | 36≤ | 37≤ | 38≤ | 39≤ | 39≤ | | |
| | 370N class | NSAC370R | 205≤ | 370≤ | | — | 31≤ | 33≤ | 34≤ | 35≤ | 36≤ | 37≤ | 38≤ | 38≤ | | |
| | 390N class | NSAC390R | 225≤ | 390≤ | | — | 29≤ | 31≤ | 32≤ | 33≤ | 34≤ | 35≤ | 36≤ | 36≤ | | |
| | 440N class | NSAC440R | 265≤ | 440≤ | | — | 27≤ | 29≤ | 30≤ | 30≤ | 31≤ | 31≤ | 32≤ | 32≤ | | |
| Automotive manufac- turing, high strength | 590N class | NSAC590N | 390≤ | 590≤ | | — | — | 17≤ | 17≤ | 18≤ | 18≤ | 18≤ | 19≤ | 19≤ | | |
| High burring, high strength | 440N class | NSAC440B | 265≤ | 440≤ | | (60≤) | — | 27≤ | 29≤ | 30≤ | 30≤ | 31≤ | 31≤ | 32≤ | | 32≤ |
| | 590N class | NSAC590B | as per table on the right | 590≤ | | (45≤) | — | — | 14~29 | 15~30 | 16~31 | 17~32 | 17≤ | 17≤ | 17≤ | |
| Deep drawing, high strength | 340N class | NSAC340E | 165≤ | 340≤ | — | — | — | 32≤ | 34≤ | 35≤ | 36≤ | 37≤ | — | — | — | |
| | 370N class | NSAC370E | 205≤ | 370≤ | — | — | — | 31≤ | 33≤ | 34≤ | 35≤ | 36≤ | — | — | — | |
| | 390N class | NSAC390E | 225≤ | 390≤ | — | — | — | 29≤ | 31≤ | 32≤ | 33≤ | 34≤ | — | — | — | |
| | 440N class | NSAC440E | 265≤ | 440≤ | — | — | — | 27≤ | 29≤ | 30≤ | 30≤ | 31≤ | — | — | — | |
| Low yield ratio, high strength | 590N class | NSAC590D | as per table on the right | 590≤ | — | — | — | — | 17~32 | 18~33 | 19~34 | 20~35 | 21≤ | 21≤ | 21≤ | |
| | 780N class | NSAC780D | as per table on the right | 780≤ | — | — | — | — | 12~25 | 13~26 | 14~27 | 15~28 | 16≤ | 16≤ | — | |
| | 980N class | NSAC980D | as per table on the right | 980≤ | — | — | — | — | — | 9~20 | 10~21 | 11~22 | 12≤ | 12≤ | — | |

| Designation | Yield point or yield resistance (N/mm ²) | | |
|-------------|--|-------------|------------|
| | Nominal thickness (mm) | | |
| | 0.60≤t<0.80 | 0.80≤t<1.00 | 1.00≤t<2.3 |
| NSAC590B | 370~590 | 360~580 | 350~570 |
| NSAC590D | 325~470 | 315~460 | 305~450 |
| NSAC780D | 420~645 | 410~635 | 400~625 |
| NSAC980D | — | 590~930 | 580~920 |

- Notes:
- For the paint bake-hardening value (BH amount), the yield point increase amount is shown after a 2% pre-strain and heating at 170°C for about twenty minutes.
 - Data for hole expansion is for reference. Details may be agreed upon between the producer and purchaser
The hole expansion rate is as per on JFS T 1001 (hole expansion test method).
 - Figures in parentheses are for reference.
 - Figures in parentheses may be agreed upon between the producer and purchaser.
 - If non-aging is specified for NSAC270E, NSAC270F, and NSAC270G, they are guaranteed for six months after manufacture. Non-aging refers to properties that do not cause stretcher strains during press forming.

Base Metal (Hot-rolled coils)

| Type | | Designation | Tensile Test | | | | | | | | Test piece / Test direction |
|---|------------|-------------|---|---|----------------------------------|------------------------|-----------|-----------|-----------|-----------------------------------|--------------------------------|
| | | | Yield Point or Yield Resistance (N/mm ²) | Tensile Strength (N/mm ²) | Hole expansion rate (%) | Elongation (%) | | | | | |
| | | | | | | Nominal Thickness (mm) | | | | | |
| | | | | | | 1.6≤t<2.0 | 2.0≤t<2.5 | 2.5≤t<3.2 | 3.2≤t<4.0 | 4.0≤ | |
| Commercial | | NSAHC | (205≤) | (270≤) | — | — | — | — | — | JIS No. 5 rolling direction | |
| Commercial, automotive | | NSAH270C | (≤333) | 270≤ | — | 29≤ | 29≤ | 29≤ | 31≤ | | |
| Drawing | Grade 1 | NSAH270D | — | 270≤ | — | 32≤ | 33≤ | 35≤ | 37≤ | | |
| | Grade 2 | NSAH270E | — | 270≤ | — | 33≤ | 35≤ | 37≤ | 39≤ | | |
| Commercial, high strength | 340N class | NSAH340 | 245≤ | 340≤ | — | 20≤ | 20≤ | 20≤ | 20≤ | | |
| | 400N class | NSAH400 | 295≤ | 400≤ | — | 18≤ | 18≤ | 18≤ | 18≤ | | |
| | 440N class | NSAH440 | 335≤ | 440≤ | — | 18≤ | 18≤ | 18≤ | 18≤ | | |
| | 490N class | NSAH490 | 365≤ | 490≤ | — | 16≤ | 16≤ | 16≤ | 16≤ | | |
| Commercial, automotive, high strength | 310N class | NSAH310N | (185≤) | 310≤ | — | 33≤ | 34≤ | 36≤ | 38≤ | | |
| | 370N class | NSAH370N | 225≤ | 370≤ | — | 32≤ | 33≤ | 35≤ | 36≤ | | |
| | 400N class | NSAH400N | 255≤ | 400≤ | — | 31≤ | 32≤ | 34≤ | 35≤ | | |
| | 440N class | NSAH440N | 305≤ | 440≤ | — | 29≤ | 30≤ | 32≤ | 33≤ | | |
| High burring, high strength | 440N class | NSAH440B | 305≤ | 440≤ | (70≤) | 29≤ | 30≤ | 32≤ | 33≤ | | |

Base Metal (Hot-rolled coils)

| Type | | Designation | Tensile Test | | | | | | | | Test piece / Test direction |
|--|------------|-------------|---|---|----------------------------------|------------------------|-----------|-----------|-----------|------|--|
| | | | Yield Point or Yield Resistance (N/mm ²) | Tensile Strength (N/mm ²) | Hole expansion rate (%) | Elongation (%) | | | | | |
| | | | | | | Nominal Thickness (mm) | | | | | |
| | | | | | | 1.6≤t<2.0 | 2.0≤t<2.5 | 2.5≤t<3.2 | 3.2≤t<4.0 | 4.0≤ | |
| Drawing, automotive, high strength | 490N class | NSAH490R | 345≤ | 490≤ | — | 22≤ | 23≤ | 24≤ | 25≤ | 27≤ | JIS No. 5 perpen- dicular to rolling direction |
| | 590N class | NSAH590R | 440≤ | 590≤ | — | 17≤ | 18≤ | 18≤ | — | — | |

| Type | | Designation | Tensile Test | | | | | |
|---------------------------|------------|-------------|---|---|------------------------|-----------|-----------|--------------------------------|
| | | | Yield Point or Yield Resistance (N/mm ²) | Tensile Strength (N/mm ²) | Elongation (%) | | | Test piece / Test direction |
| | | | | | Nominal Thickness (mm) | | | |
| | | | | | 1.4≤t≤1.6 | 1.6<t≤3.0 | 3.0<t≤4.5 | |
| For use in steel pipes | 270N class | NSAHT270 | — | 270≤ | 30≤ | 32≤ | 35≤ | JIS No. 5 rolling direction |
| | 340N class | NSAHT340 | — | 340≤ | 25≤ | 27≤ | 30≤ | |
| | 410N class | NSAHT410 | — | 410≤ | 20≤ | 22≤ | 25≤ | |
| | 490N class | NSAHT490 | — | 490≤ | 15≤ | 18≤ | 20≤ | |

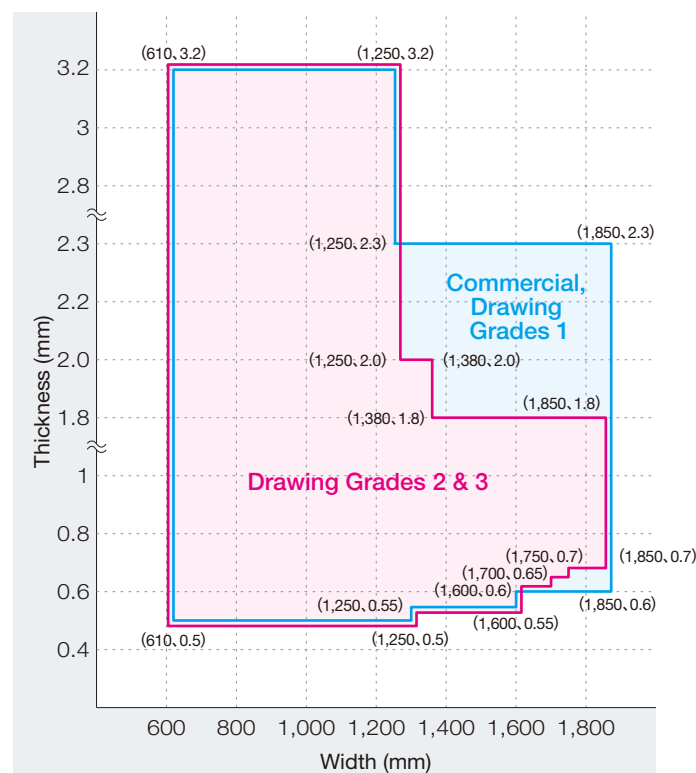
- Notes:
- Data for hole expansion is for reference. Details may be agreed upon between the producer and purchaser
The hole expansion rate is as per on JFS T 1001 (hole expansion test method).
 - Figures in parentheses are for reference.

Scope of Manufacturing

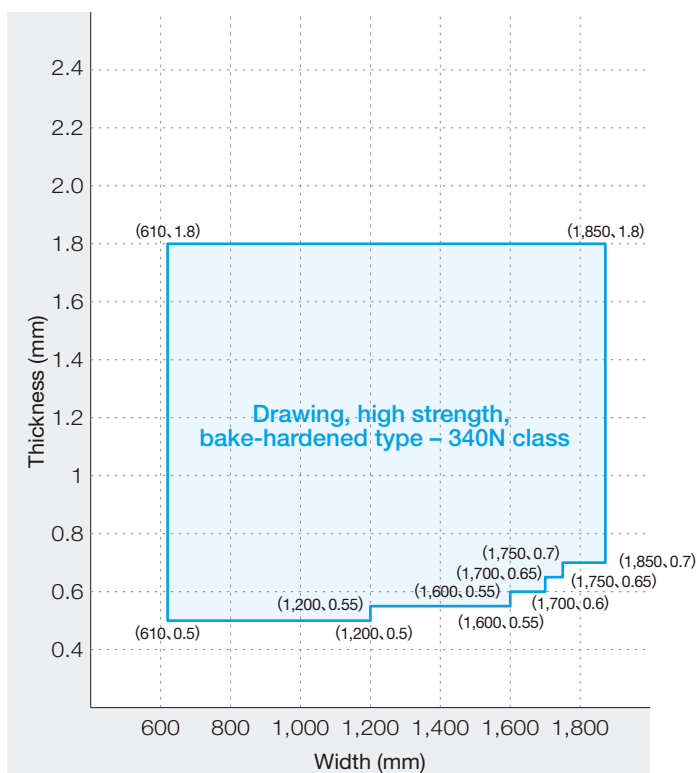
Available Sizes for Nominal Thickness and Width

For orders other than shown, please consult us in advance per product.

Commercial, Drawing Grades 1, 2 and 3
(base metal: cold-rolled coils)



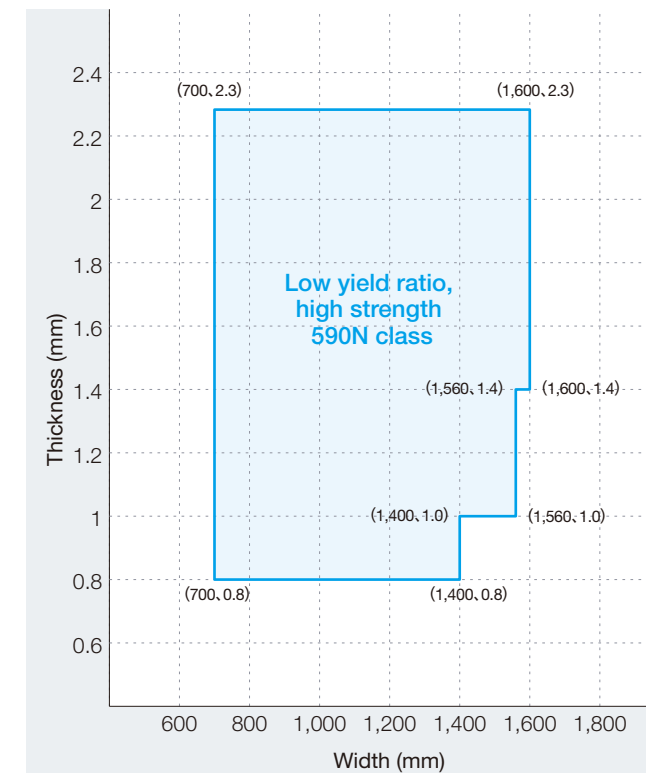
Drawing, high strength, bake-hardened type — 340N class
(base metal: cold-rolled coils)



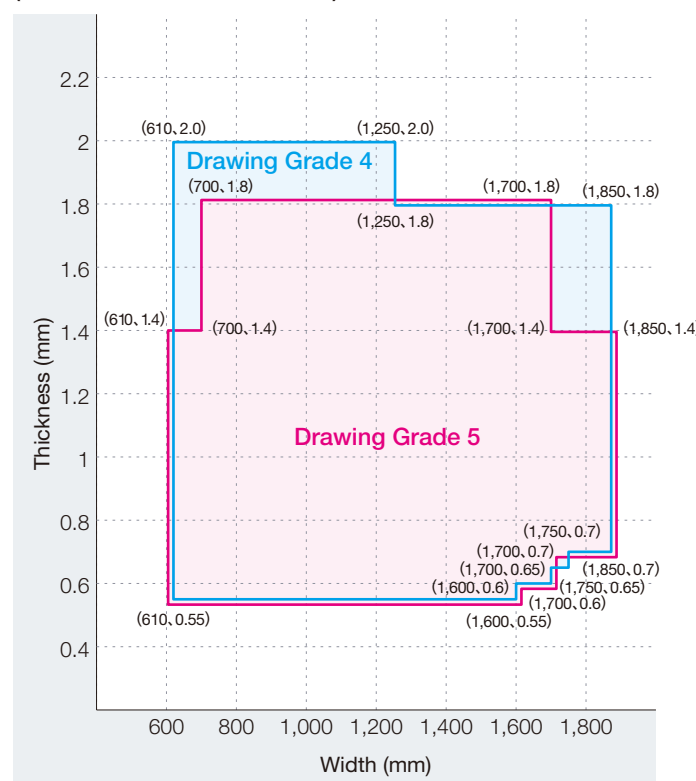
Deep drawing, high strength — 340N, 390N & 440N classes
(base metal: cold-rolled coils)



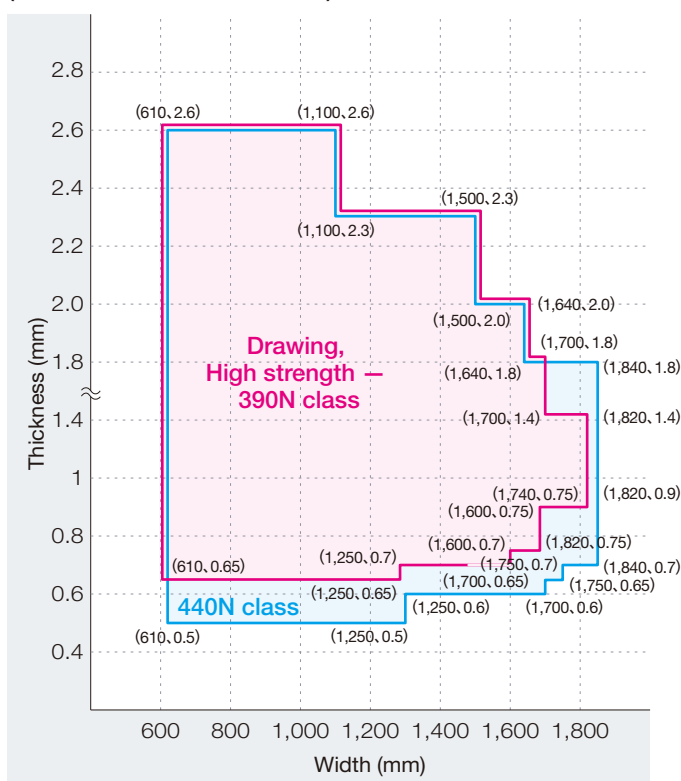
Low yield ratio, high strength — 590N class
(base metal: cold-rolled coils)



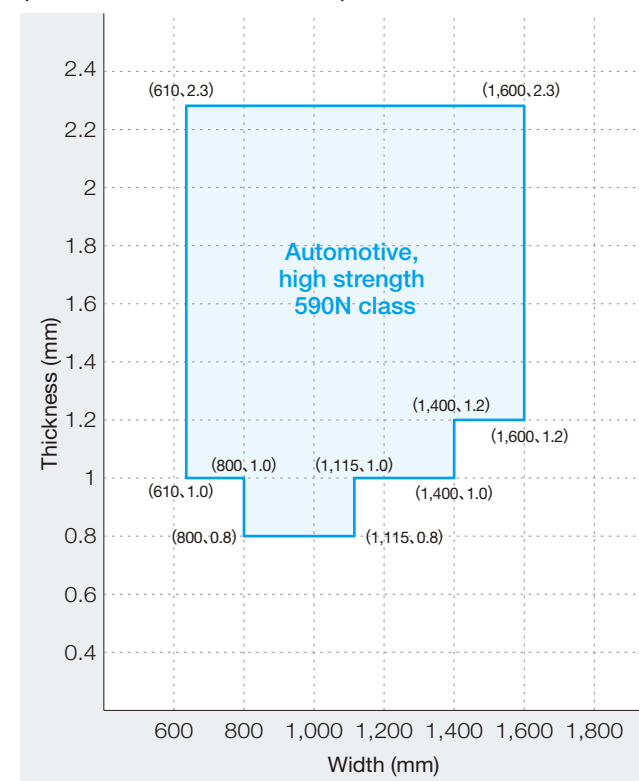
Drawing Grades 4 and 5
(base metal: cold-rolled coils)



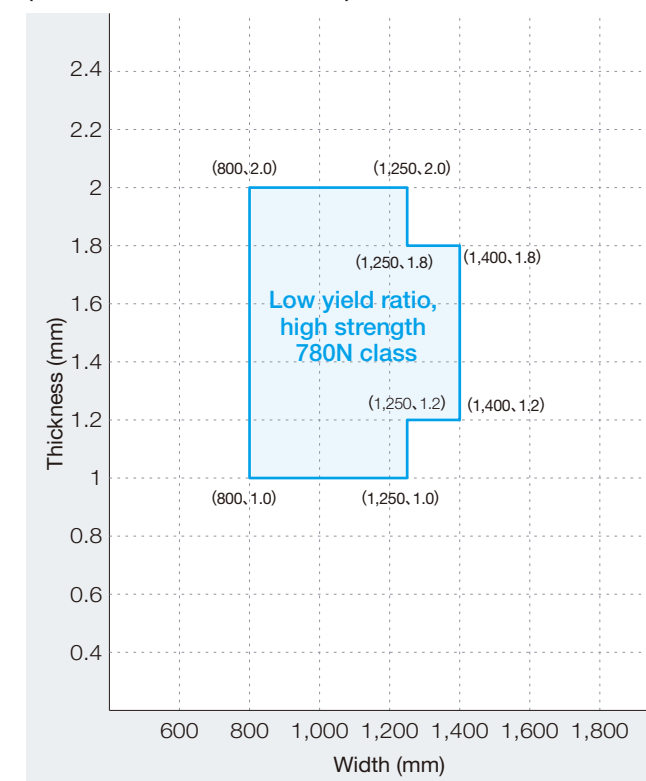
Drawing, High strength — 390 & 440N classes
(base metal: cold-rolled coils)



Automotive, high strength — 590N class
(base metal: cold-rolled coils)



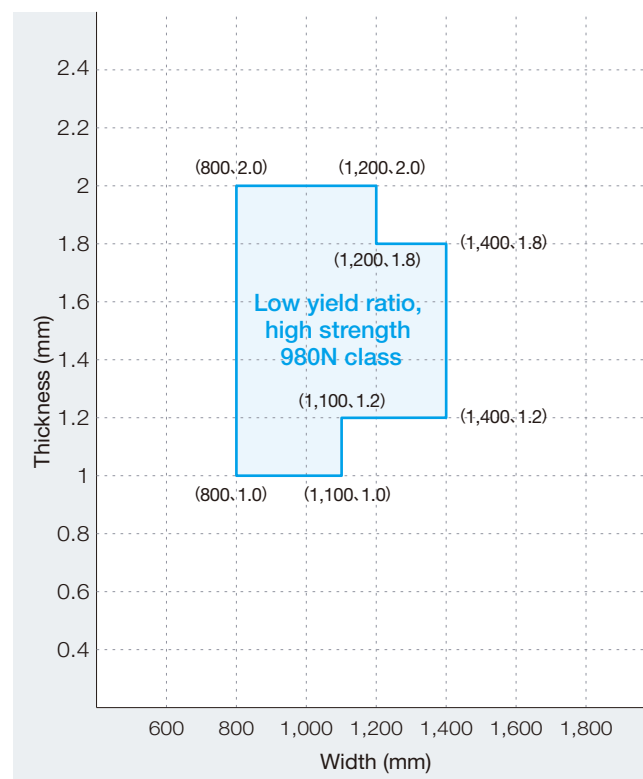
Low yield ratio, high strength — 780N class
(base metal: cold-rolled coils)



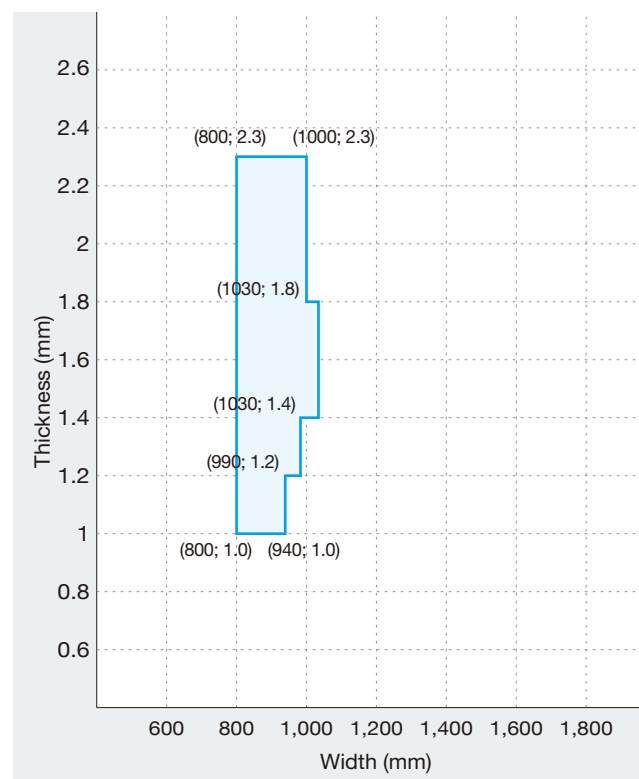
Scope of Manufacturing

Available Sizes for Nominal Thickness and Width

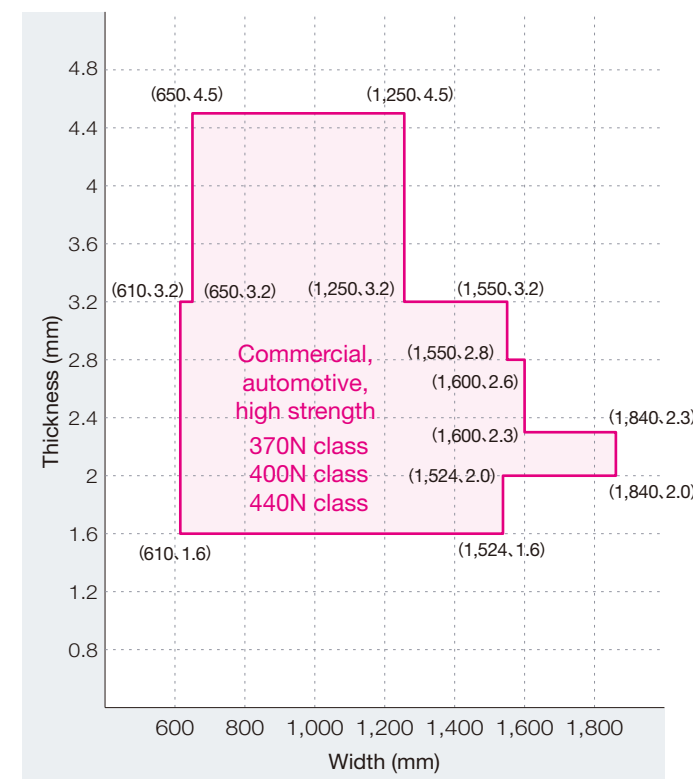
Low yield ratio, high strength – 980N class
(base metal: cold-rolled coils)



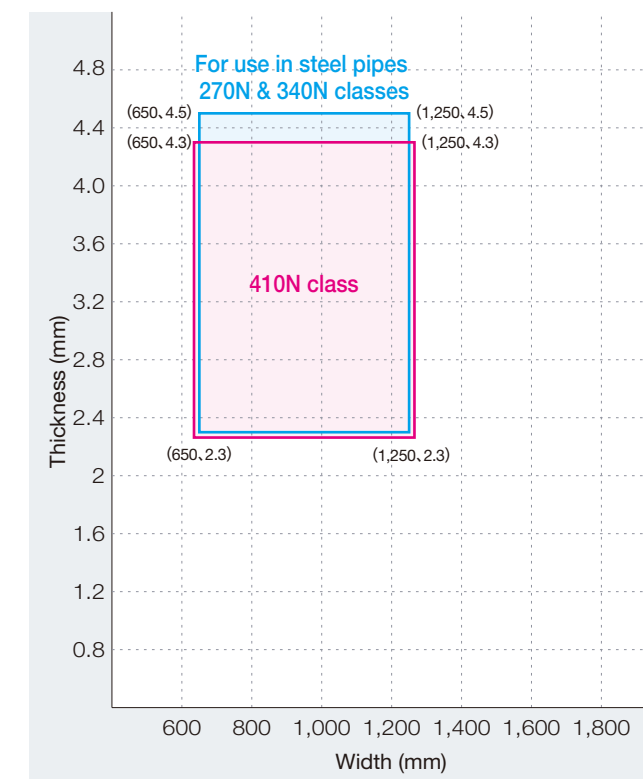
Row yield ratio, high strength – 1180N class
(base metal: cold-rolled coils)



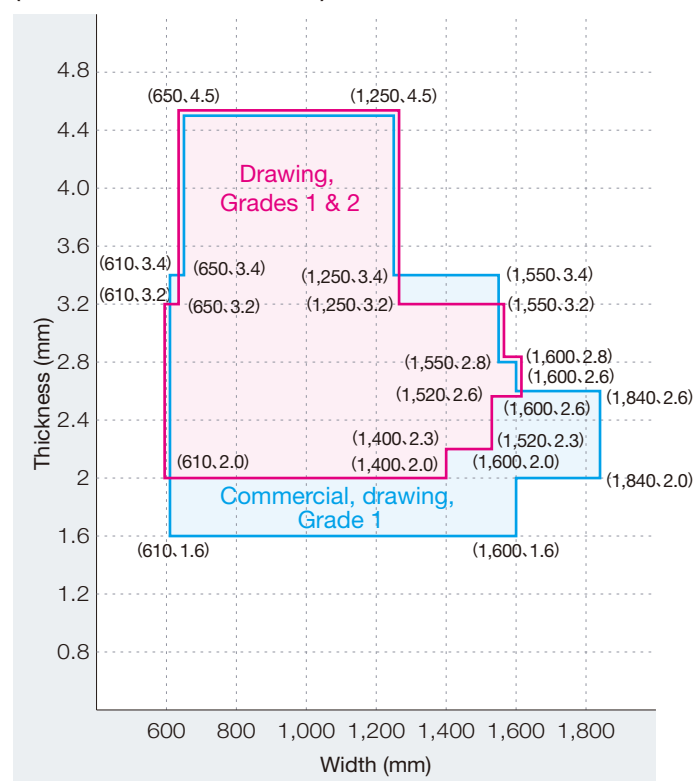
Commercial, automotive, high strength – 370N, 400N & 440N classes
(base metal: hot-rolled coils)



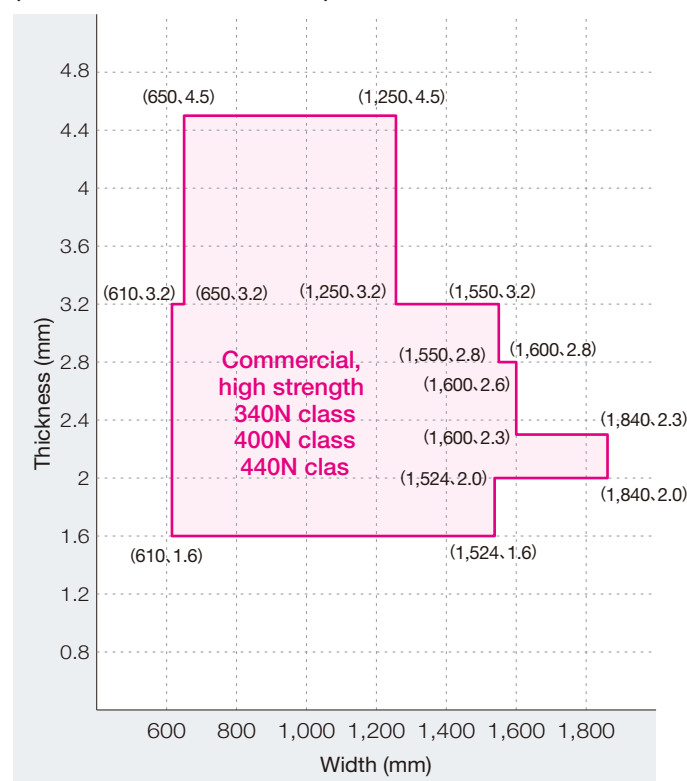
For use in steel pipes – 270N, 340N & 410N classes
(base metal: hot-rolled coils)



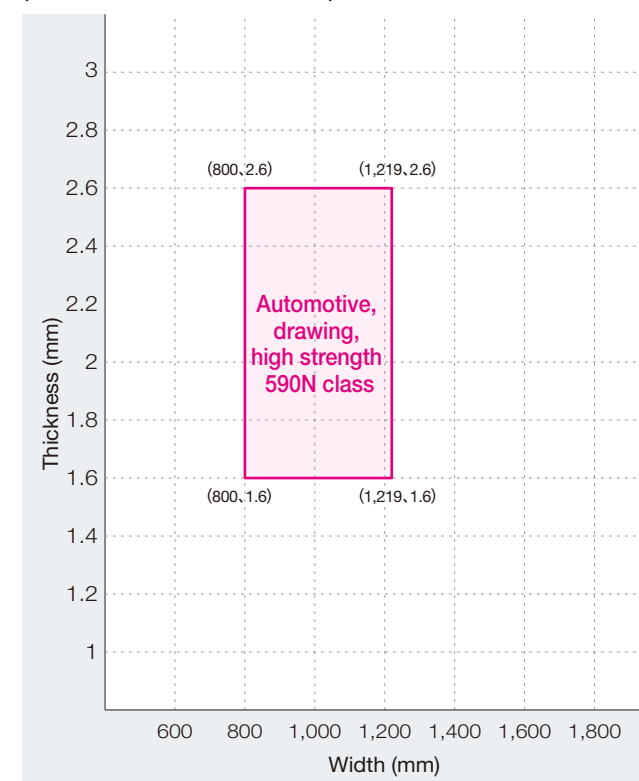
Commercial, drawing, Grades 1, 2 & 3
(base metal: hot-rolled coils)



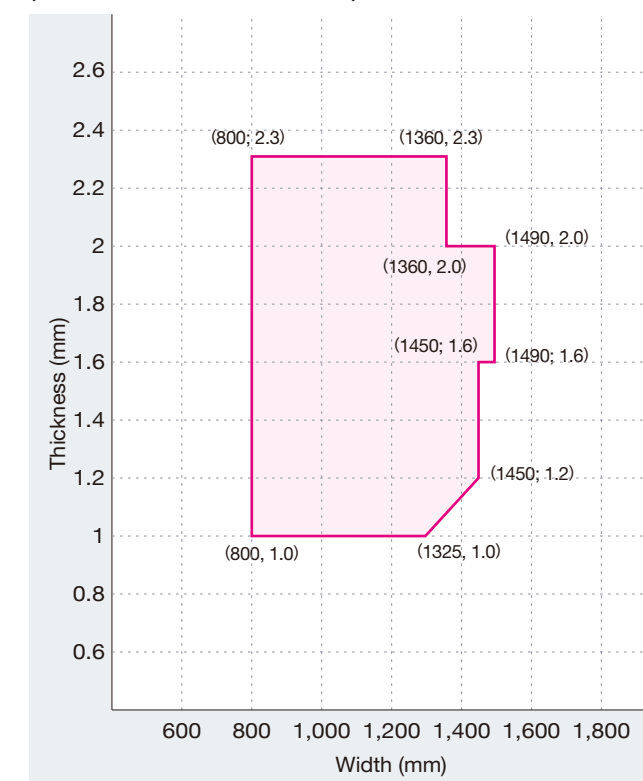
Commercial, high strength – 340N, 400N & 440N classes
(base metal: Hot-rolled coils)



Automotive, drawing, high strength – 590N class
(base metal: hot-rolled coils)



Hot Stamping – 1500 class
(base metals: Hot-rolled coils)

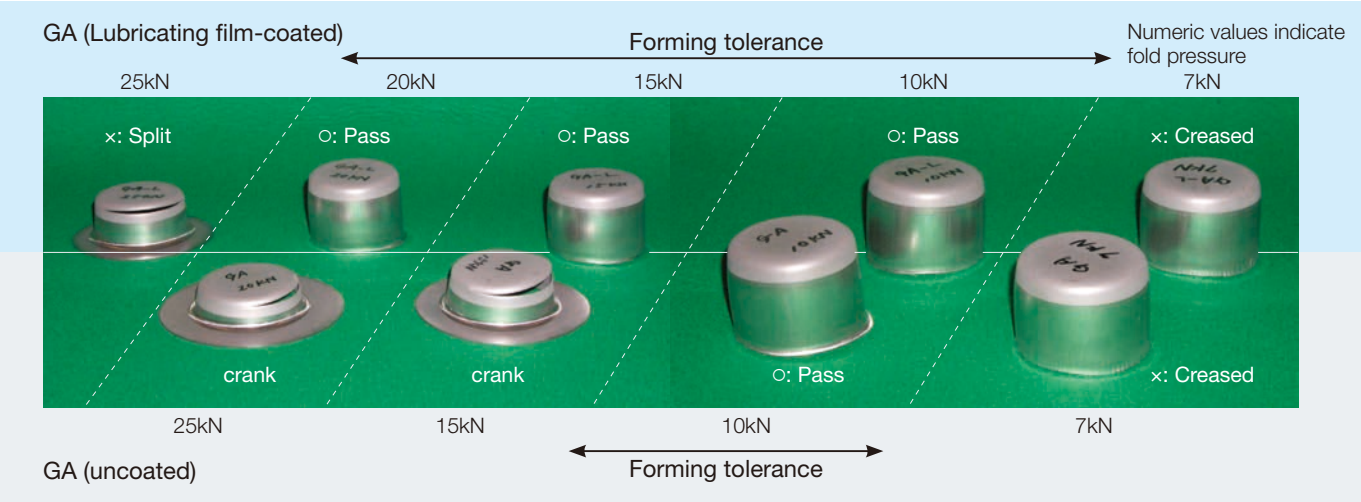


Quality Attributes

Press Formability

DURGRIP is widely used from simple bending to advanced drawing in the same way as the hot- and cold-rolled steel sheets of the base metal that is used. Select an appropriate material grade with due consideration for the shape of the parts used. A lubricating film-coated type can also be selected.

Press Formability

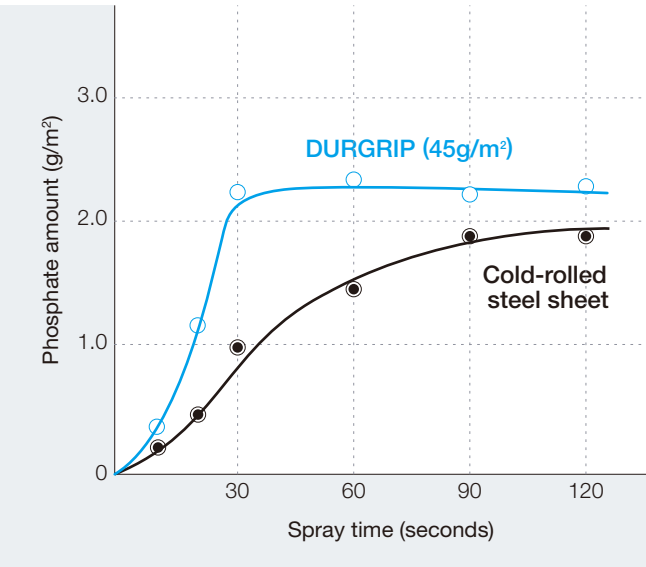


Painting

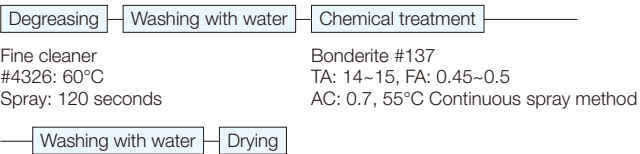
Phosphate treatment

Even phosphate treatment can be applied to the surface of NS Silver Alloy. (P comparison: Proportion of $Zn_2Fe(PO_4)_2 \cdot 4H_2O$ within the film crystal)

An example of DURGRIP's phosphate treatment



Treatment processes:



Phosphate film type examples

| | DURGRIP | Cold rolled steel sheet |
|---|---------|-------------------------|
| Immersion type Treatment conditions: Immersion type Scanning electron microscope image x400 | | |
| Spray type Treatment conditions: Continuous spray method Bonderite #137 TA: 14~15 FA: 0.45~0.5 AC: 0.7, 55°C Scan- ning electron microscope image x300 | | |

Paint adhesion

DURGRIP has minute concave and convex imperfections on the surface, so paint adheres very well.

Examples of paint adhesion (Initial adhesion)

| DURGRIP(galvanized) | DURGRIP(galvannealed) | Cold rolled steel sheet |
|--|-----------------------|-------------------------|
| | | |
| Treatment conditions: Dipping phosphate treatment, Cation ED 20 μ printing Assessment test: After drawing a grid pattern, Erichsen bulging, Sellotape peeling | | |

Examples of exterior appearance of base metal surface before painting (scanning electron microscope image x1,000)

| DURGRIP(galvanized) | DURGRIP(galvannealed) | Cold-rolled steel sheet |
|---------------------|-----------------------|-------------------------|
| | | |

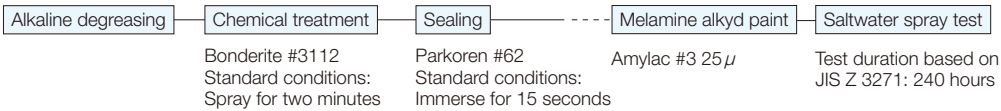
Corrosion-resistance of general painting

The DURGRIP coating is formed at almost δ 1 equivalence ($FeZn_7$; iron density: 10%). Accordingly, there are minute concave and convex imperfections on the surface, and a thicker inert oxide film is applied than in the case of galvanized sheets that are not subject to alloying treatment, ensuring much greater corrosion resistance when painted in most cases.

Examples of corrosion resistance when painted (Saltwater spray test)

| DURGRIP(galvanized) | DURGRIP(galvannealed) | Cold-rolled steel sheet |
|---------------------|-----------------------|-------------------------|
| | | |

Painting processes:



Quality Attributes

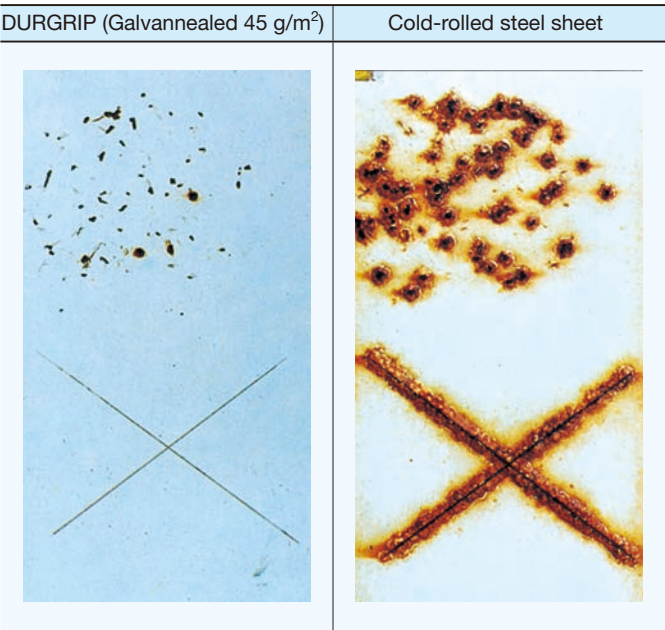
Corrosion resistance for electro-deposition coating

DURGRIP efficiently prevents swelling of paint coatings and scabbing in damaged areas with various corrosion-resistance tests implemented on the assumption of use as internal or external automotive panels.

(1) Chipping corrosion resistance

The following photos show the results for saltwater spray tests and exposure to air, and the performance of DURGRIP is clearly superior.

Examples of triple-coated corrosion resistance to chipping



Sample preparation process

Bonderite #137, Spray for two minutes

Electron #7000 20 μ

Amylac TP16R 25 μ

Amylac #030 30 μ

Test method

Immersion in 38° warm water for 120 hours

Chipping and cross cutting

Exposure to the elements for six months, 3% NaCl sprayed daily

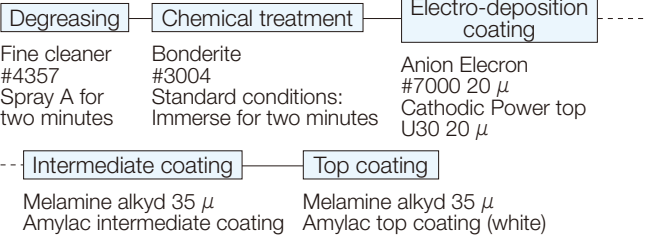
(2) Corrosion due to repeated drying and wetting

In practice, these materials are subject to repeated drying and wetting, so a promotion test that combines wet/dry cycles is close to reality.

Saltwater spray exposure test results are presented in the following photos.

| Type | DURGRIP (Galvanized) | DURGRIP (Galvannealed) | Cold-rolled steel sheet |
|-----------------------------------|----------------------|------------------------|-------------------------|
| Paint type | | | |
| | | | |
| Single electro-deposition coating | | | |
| | | | |
| Triple coating (Melamine alkyd) | | | |
| | | | |

Painting processes:



Test method: Saltwater spray/exposure to air, 3% saltwater spray once a day

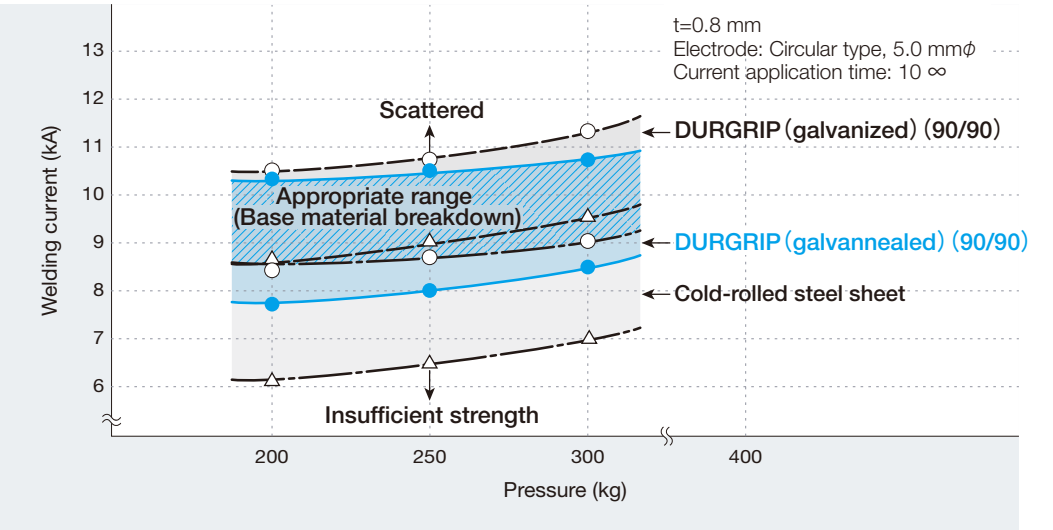
Welding

When resistance welding of galvanized steel sheet is compared with cold-rolled steel, in general, the appropriate welding condition will be a high heat input zone. This is because the zinc itself is a soft metal with a low melting point, and thus melts and diffuses in the initial stages of electrification, while heat generation is minimized for overlapping areas since less electrical current is required.

Direct spot welding

An example of conditions for appropriate welding of galvanized steel sheet is shown below. Appropriate welding current range for galvanized steel sheet is higher than that for cold-rolled steel sheet.

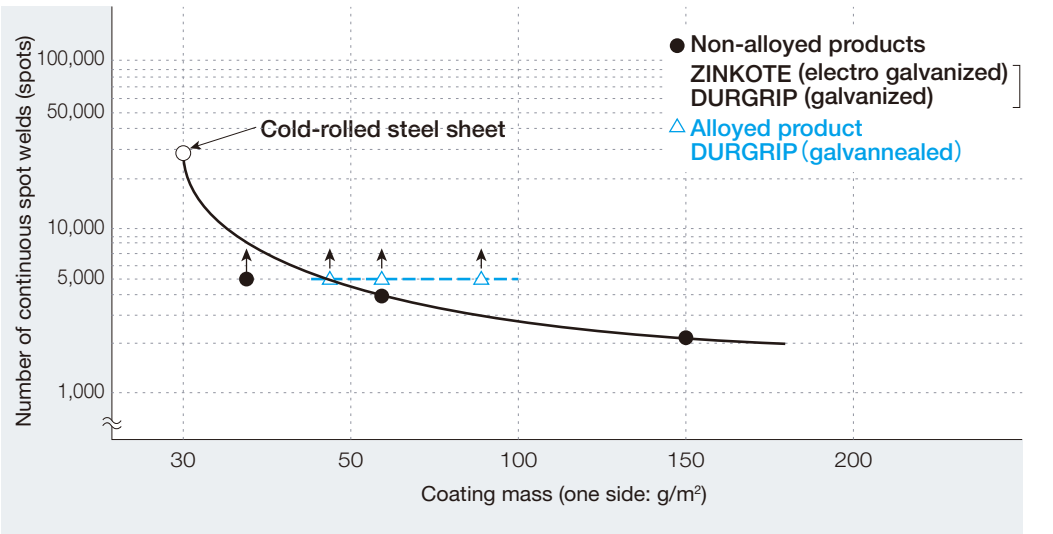
An example of conditions for appropriate welding of galvanized steel sheet



Continuous spot weldability:

With continuous spot welding, when the number of spots is greater, the tip of the electrode is more easily contaminated with the zinc-iron alloy, and thus its weldability deteriorates. The thicker this protective coating is, the more evident this tendency becomes. If electroplated to create a thinner coating, continuous spot welding of some 5,000 spots or more is possible, but with thicker coatings, the tip of the electrode must be cleaned appropriately. In this respect, our DURGRIP is comparatively beneficial, and work can continue for at least 5,000 spots.

Example of continuous spot weldability for galvanized steel sheets



Usage Precautions

If inappropriately handled or used, hot-dip galvanized sheet cannot demonstrate their characteristic properties. Please pay attention to the following usage precautions.

Storage and Loading/Unloading

1. Exposure to water during loading/unloading and storage may cause corrosion. Strictly avoid loading/unloading during rain and prevent exposure to seawater and condensation. Also, avoid storage in atmospheres of high humidity or sulfur dioxide. Indoor storage under dry, clean conditions is recommended.
2. Broken or torn packaging paper must be repaired.



Warning!

- Falling and rolling coils are very dangerous, as is the collapse of piled sheets.

Handling

1. This product must be handled carefully to avoid damaging the coating or film treatment on the surface. Perspiration and fingerprints may impair paint adhesion and corrosion resistance.
2. In these cases, post-processing or repairs must be implemented if necessary.

Press Forming

1. When applying severe press forming, there are cases in which the coating film is damaged. Prior confirmation is requested when such press forming is applied.
2. In press forming, some types of extreme pressure additives contained in lubricating oil can cause melting and corrosion of the surface coating films and base metals. Prior confirmation is requested when such additives are used. Excessive damage to surface layers during press forming will adversely affect paint adhesion and corrosion resistance.



Attention!

- When removing (cutting) the coil binding hoops (bands) prior to use, make sure that the end of the coil is pinned down directly beneath the center of the coil in order to prevent the end of the coil from suddenly springing out of the coil end; alternatively, be certain to remove the binding in a location where safety can be assured and no danger would be posed if the coil end were to spring out upon release.
- Coils are formed by winding flat sheets. When the binding hoops or other external restraints that keep the sheet in coil form are removed and the coil end is freed, the end of the coil will spring out to return to its flat state. Furthermore, there have also been cases when the coil bindings work loose, allowing the coil to spring out. Such cases may endanger people nearby and cause damage, so great care must be paid when removing the coil binding hoops (bands).

Welding and Brazing

1. In resistance welding, because the electrodes are soiled by the pick up of zinc, they should be properly maintained and replaced at regular intervals. In seam welding, the service life of electrodes can be extended by using a knurl-gear driving system.
2. In welding, fumes consisting mainly of zinc oxides are generated. Although the effect of these fumes will differ depending on the working environment, it is recommended that welding be conducted in a well-ventilated place.
3. In brazing, avoid high-temperature brazing using silver and other brazing fillers. Penetration of zinc alloy into crystal boundaries can occur, thereby causing brittle fracture in some cases.

Degreasing

1. The use of weak alkaline-type and organic solvents and non-ionic-type detergents is recommended for degreasing. Some types of degreasing agents such as strong alkaline agents cause melting of the coating films and corrosion of the zinc. Prior confirmation is requested when such agents are used.
2. In the case of degreasing at high temperatures (more than 60°C) or using ultrasonic cleaning, there are cases in which the coating film is damaged. Due care should be taken to prevent this.
3. Conduct sufficient drying after degreasing. Handling in an insufficiently dry state may cause the coating film to peel off.
4. In alkali ion cleaning, there are cases in which oily substances remaining in the cleaning water may adversely affect the coating film. Prior confirmation is requested when such cleaning is applied.

Painting

DURGRIP is a steel sheet to be painted. It is not intended for use without prior coating.

Aging

Generally, steel sheets tend to show deterioration in quality over time. For example: degraded formability, stretcher stains, and coil breaks. To avoid this, usage at the earliest possible time is recommended. However, this problem can be avoided if products with aging resistance are selected.

Others

1. Prior confirmation is requested when the product is to be exposed to high temperature conditions for a long time.
2. Avoid using in acid and strong alkaline environments. (There are cases in which phosphate zinc and other chemical treatments used for treating the base steel sheets for painting can have high acidity and cause the film to melt.)

Ordering Guidelines

When placing an order, please confirm the following in accordance with the purpose of the order.

Specifications

Depending on the severity and method of fabrication to be undertaken, choose the appropriate specification from those shown in this catalog.

Coating Mass

Select the most suitable coating mass according to the required corrosion resistance, application conditions, and fabrication methods.

Dimensions

The size of galvanized steel sheets (thickness, width and length) is the basic condition for product yield. Design the product with reference to the range of available sizes described in this catalog. Sizes are available in 0.05-mm increments for thickness and 1-mm increments for width and length.

Coil

Select coils or cut-length sheets according to shear and fabrication conditions. The selection of coils will effectively improve product yield by allowing continuous and automated operation. In the case of coils, however, some defective parts may unavoidably be included because their removal, based on inspection, is impossible.

Edge Finish

Please indicate if the order requires a milled edge or a slit edge.

Surface Treatment

Select the most suitable surface treatment from among those described in this catalog according to the treatment method after fabrication and the application conditions.

Oiling

The decision whether or not to apply rust-preventing oil can be made separately from the kind of surface treatment. Oiling is recommended in order to improve intermediate rust resistance, to mitigate fingerprints and damage during handling, and to maintain lubrication during press forming. Meanwhile, oiling is indispensable for galvanized sheets lacking surface treatment.

Package Mass

Specify the package mass according to the local loading/unloading capacity and work efficiency. The heavier the coil mass, the higher the work efficiency. In the case of coils, specify the maximum mass (unit minimum mass if necessary).

Internal and External Diameters

In the case of coils, specify the inside and outside coil diameters according to the specifications of the uncoilers on the shearing line.

When selecting inside diameters, it is necessary to consider the occurrence of break and reel marks on the area of the inside diameter, depending on the thickness.

Dimensional Accuracy (Sheet thickness, width, length)

Dimensional accuracy of thickness, width and length is guaranteed within the range of sizes described in this catalog. However, there are cases that require strict size specifications with respect to assembly accuracy and dimensional accuracy of the parts, depending on the application conditions of the finished products. In such cases, please consult us in advance to clarify your specifications.

Applications, Fabrication Methods and Other Issues

NIPPON STEEL implements quality control to better suit the intended application. For that purpose, it is requested that the intended application, fabrication method, and any other requirements be clearly indicated.

Packaging and Labeling

The finished product is packaged and shipped as per normal procedure for steel to ensure that it is handled and stored with care prior to its use. The external layer of packaging consists of a packaging label that contains details of the finished product that it is affixed to. Furthermore, the Package Card is also included, which is the warranty for the product in question.

The Package Card is used when taking receipt of the product and confirming its condition. The information contained on the Package Card and labels is detailed herein.

Packaging Labels and Package Cards

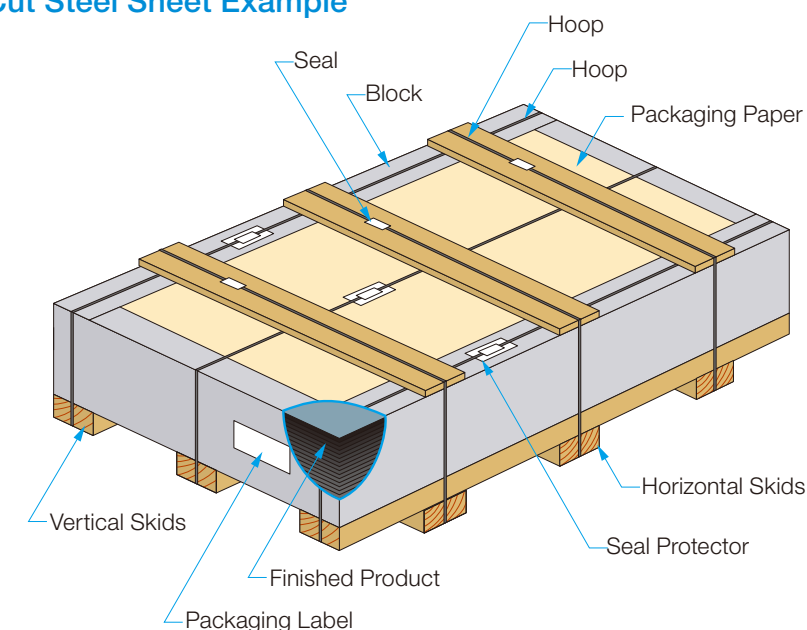
| Item | Title Name | Notation Method |
|---|-------------------|--|
| | Packaging Label | |
| ① Product Name | Not shown | Product name is displayed |
| Class/Grade | Not shown | Class and grade of materials used are displayed |
| JIS Certification Mark, JIS Certifying Body, JIS Certification Number | Not shown | Only the applicable materials are displayed. |
| ② Spec Designation | Specification | The spec code for the finished product is displayed (see note below) |
| ③ Coating | Weight | The weight is displayed |
| ④ Dimensions | Dimensions | The dimensions are displayed |
| Number of Sheets | Number of Sheets | Only for cut sheets |
| ⑤ Mass | Net Quantity | This is displayed depending on the contractual arrangements (actual quantity or estimated value) |
| Length | Length | Contractual estimate or specific coil length is displayed |
| ⑥ Inspection Number | Inspection Number | Displayed on each package |
| ⑦ Coil Number | Coil Number | Displayed for each production lot |
| Month and Date of Manufacture | — | The date of manufacture is displayed |
| Customer Name | Not shown | The customer name is displayed |
| ⑧ Company and Works Name | Not shown | “(Location Name) WORKS (or AREA), NIPPON STEEL CORPORATION” is displayed |

Example of a Packaging Label

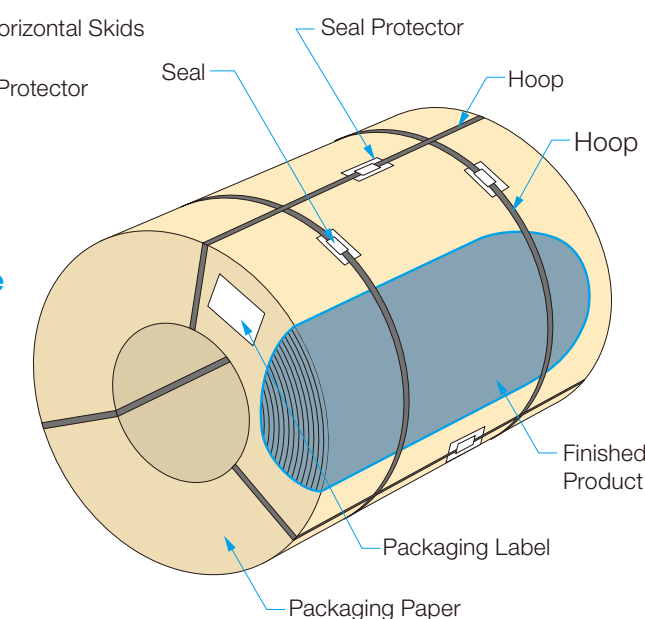
| | | |
|--|--|--|
| <div style="font-size: 2em; font-weight: bold; margin-bottom: 10px;">DURGRIP^①</div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="margin: 0;">SPECIFICATION</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">NSAC270D: S G L O N^②</p> </div> <div style="width: 35%; text-align: right;"> <p style="margin: 0;">COATING^③</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">060</p> </div> </div> <div style="margin-top: 10px;"> <p style="margin: 0;">SIZE</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">1.200 X 1219 X COIL^④</p> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p style="margin: 0;">NET MASS(ACT)</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">9,215LBS</p> </div> <div style="width: 45%;"> <p style="margin: 0;">GROSS MASS(ACT)^⑤</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">9,337LBS</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p style="margin: 0;">INSPECTION No.^⑥</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">5-67738-02</p> </div> <div style="width: 45%;"> <p style="margin: 0;">COIL No.^⑦</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">61-31332</p> </div> </div> | | |
| <div style="display: flex; align-items: center; justify-content: center; height: 100px;"> <div style="text-align: center;"> <p style="font-size: 1.2em; font-weight: bold; margin: 0;">NIPPON STEEL CORPORATION^⑧</p> <p style="font-size: 1.2em; font-weight: bold; margin: 0;">WORKS (or AREA)</p> <p style="font-size: 1.2em; font-weight: bold; margin: 0;">MADE IN JAPAN</p> </div> </div> | | |

An Example of Packaging

Cut Steel Sheet Example



Coil Example



Note: Notation Used for Specifications

For JIS Standards

JIS G 3302 SGCD2 : S M O(N)
 ① ② ③ ④ ⑤

- ① : Spec Number ④ : Surface Treatment Code
② : Spec Designation ⑤ : Oiling Designation
③ : Skin-pass Code

For NIPPON STEEL Specifications

NSAC270D : S G L O N

- ① : Spec Number ④ : Surface Treatment Code
② : Skin-pass Code ⑤ : Oiling Designation (When no oils are used, this is given the value X)
③ : Surface Finish Code ⑥ : Code for the amount of oil to be applied