

**ROK, Coil Center  
for Asian Customers since Aug. 7, 2012**

**woorinickel.com**



# WOORI

## WOORI OCEANTECH (Since May 21, 2008)

### Mil. & paramilitary

ROK Government  
Navy, Army, Airforce  
Coast Guard, Customs

Foreign Gov.  
Asian Countries

HQ & Yards : 3700m<sup>2</sup>  
Employee: 35 +

### Battery Industry

SAMSUNG & LG  
- the 1<sup>st</sup> subcontractors & others

### Metal Industry

POSCO  
HYUNDAI  
BNG STEEL  
POONGSAN, etc.

HQ & workshop: 900 m<sup>2</sup>  
Employee: 5 +

## WOORI GEC (Since Aug. 7, 2012)

### R & D CENTER (Since May 2, 2014)

- Advanced Naval Design
- High Speed Crafts over 50knots
- Unmanned Surface Vessel (USV)
- Naval Engineering with advanced carbon composite
- PSI by NMEA 2000 (Propulsion System Integration)

R & D: 561 m<sup>2</sup>  
Employee: 10 +

## SEA SERV (Since May 21, 2008)

- Diesel engine supply to ROK Navy, Coastguard: 70 sets with gearbox
  - \* CRM 2100Hp+ZF460 for 70ton, 100ton class patrol boats + SEATEK 1500Hp/ZF665 for HSC
- MRO(maintenance, repair, overhaul): 500 over engines were overhauled since 2008
  - \* CRM 2100Hp, MTU183, 2000, ZF 190, 365, 460 models
  - (Awarded MRO certificate from CRM and MTU by the education & training at premises, respectively)
- Monitoring systems & PSI with NMEA 2000 (Propulsion System Integration)
- Naval Engineering & Shiplift systems for ROK Navy base
- Surface Drive



## Governmental Defense Projects

### FIC Builder R&D CENTER

#### Fast Interceptor

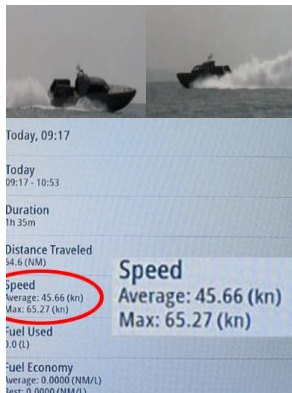
- Design (USV...)
- Engineering
- R & D
- Building (6~40m, 50kts +)

### Marine Services

- Shiplift Systems
- Evaluation Test
- Depot services
- After Sales Services

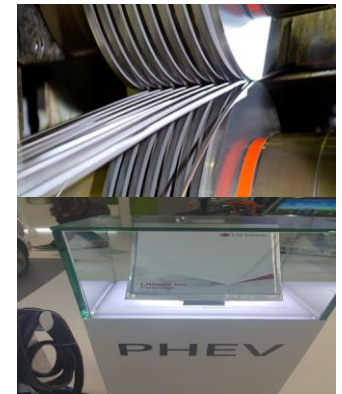
### SEA SERV PSI & MRO

- Propulsion System Integration (NMEA2000)
- High speed diesel engines with ZF Gearbox & Surface-Piercing Propeller
- MRO & Engineering Services



## NICKEL & Its Alloys, Asia Coil Center Exclusive Distributor of Auerhammer

- **Nickel & it's alloys**  
: Foils, Strips (Nickel 200, 201, 207, 233, 300)
- **Soft-Magnetic Alloys**  
: FeNi77CuMo FeNi80Mo, FeNi48, FeNi36
- **Sealing & Expansion Alloys**  
: FeNi29Co18Mn, FeNi47Cr5Al, FeNi36, 41, 46, 51
- **Nickel-Chrome-Alloys**  
: NiCr15Fe(600), NiCr23Fe(601)
- **Nickel-Copper-Alloys**  
: NiCu30Fe(400), NiCu45(404), NiCu30Al(500)
- **Copper-Nickel-Alloys:**  
• CuNi44Mn1(401), etc.
- **Thermostatic Bimetals,**
- **Welding consumable, Clads**



The background of the slide is a photograph of industrial machinery, likely a metal rolling mill, with a blue semi-transparent overlay on the left side. The machinery features large rollers and complex mechanical components. The text is overlaid on this background.

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## 니켈 및 니켈합금

- 1) 순니켈 (Ni200, Ni201, Ni233, Ni300)
- 2) 연자성 합금(FeNi36, FeNi48, FeNi77CuMo, FeNi80Mo)
- 3) 클래드
- 4) 바이메탈
- 5) 극박판(니켈, 티타늄 등)
- 6) 밀봉 및 팽창 합금(인바/코바 계열 합금)
- 7) 니켈-크롬 합금(인코넬 계열 합금)
- 8) 니켈-동 합금(모넬 계열 합금)
- 9) 동-니켈 합금(CuNi8, CuNi10, CuNi15, CuNi44Mn1, ...)
- 10) 용접 재료(NiCr22Mo9Nb 등)

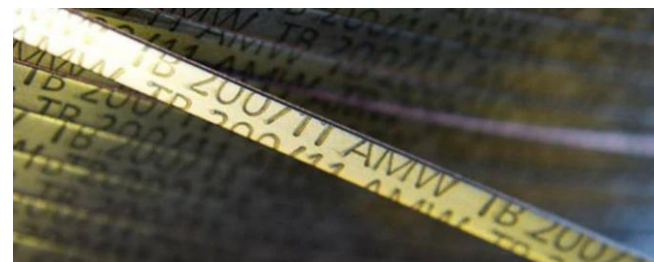
## 초고순도 니켈(4N, 5N)

- 1) 4N: Ni 99.997%
- 2) 5N: Ni 99.9993%, C 0.00035%
- 3) 플레이트, 시트, 박판, 바, 와이어, 복합 와이어



# Auerhammer Metallwerk

Wickeder Group



## Nickel & Nickel alloys

| Alloy            | Material UNS No. | Standard                            | min.<br>max. | Ni<br>(+Co) | C    | Cu   | Fe   | Mg   | Mn   | S     | Si   | Ti    |
|------------------|------------------|-------------------------------------|--------------|-------------|------|------|------|------|------|-------|------|-------|
| <b>BR-Ni99.6</b> | 2.406            | DIN 17740<br>DIN 17750              | min.         | 99.6        |      |      |      |      |      |       |      |       |
|                  |                  |                                     | max.         |             | 0.08 | 0.15 | 0.25 | 0.15 | 0.35 | 0.005 | 0.15 | 0.1   |
| <b>LC-Ni99.6</b> | 2.4061           | DIN 17740<br>DIN 17750              | min.         | 99.6        |      |      |      |      |      |       |      |       |
|                  |                  |                                     | max.         |             | 0.02 | 0.15 | 0.25 | 0.15 | 0.35 | 0.005 | 0.15 | 0.1   |
| <b>R-Ni99.2</b>  | 2.4066<br>N02200 | DIN 17740<br>DIN 17750<br>ASTM B162 | min.         | 99.2        |      |      |      |      |      |       |      |       |
|                  |                  |                                     | max.         |             | 0.1  | 0.25 | 0.4  | 0.15 | 0.35 | 0.005 | 0.25 | 0.1   |
| <b>LC-Ni99</b>   | 2.4068<br>N02201 | DIN 17740<br>DIN 17750<br>ASTM B162 | min.         | 99          |      |      |      |      |      |       |      |       |
|                  |                  |                                     | max.         |             | 0.02 | 0.25 | 0.4  | 0.15 | 0.35 | 0.005 | 0.25 | 0.1   |
| <b>Ni233</b>     | N02233           | ASTM F3                             | min.         | 99          |      |      |      | 0.01 |      |       |      |       |
|                  |                  |                                     | max.         |             | 0.1  | 0.1  | 0.1  | 0.1  | 0.3  | 0.008 | 0.1  | 0.005 |
| <b>Ni300</b>     | N03300           | ASTM F290                           | min.         | 97          |      |      |      | 0.2  |      |       |      | 0.2   |
|                  |                  |                                     | max.         |             | 0.4  | 0.25 | 0.6  | 0.5  | 0.5  | 0.01  | 0.35 | 0.6   |

### Delivery Form (in mm)

| Form          | Thickness   | Width    | Length     | Coil-ID         | Coil-OD   |
|---------------|-------------|----------|------------|-----------------|-----------|
| Coil          | 0.10 - 3.00 | 10 - 320 |            | 300 / 400 / 500 | max. 1050 |
| Strip / Sheet | 0.40 - 2.00 | 50 - 320 | 500 - 3000 |                 |           |

## Sealing & Expansion Alloys

| Alloy               | Material<br>UNS No. | Standard                         | Ni        | Co        | Mn     | Al     | Cu     | Cr        | Si     | Fe      |
|---------------------|---------------------|----------------------------------|-----------|-----------|--------|--------|--------|-----------|--------|---------|
| <b>FeNi36</b>       | 1.3912              | SEW 385<br>DIN 17745             | <b>36</b> | ≤ 0.10    | ≤ 0.50 | ≤ 0.05 | ≤ 0.3  | ≤ 0.3     | ≤ 0.30 | balance |
| <b>FeNi41</b>       | 1.3917<br>K94100    | DIN 17745<br>ASTM F30            | <b>41</b> | ≤ 0.10    | ≤ 0.80 | ≤ 0.05 | ≤ 0.20 | ≤ 0.25    | ≤ 0.30 | balance |
| <b>FeNi46</b>       | 1.3920<br>K94600    | SEW 385<br>DIN 17745<br>ASTM F30 | <b>46</b> | ≤ 0.10    | ≤ 0.80 | ≤ 0.05 | ≤ 0.20 | ≤ 0.25    | ≤ 0.30 | balance |
| <b>FeNi51</b>       | 2.4478<br>N14052    | SEW 385<br>DIN 17745<br>ASTM F30 | <b>51</b> | ≤ 0.10    | ≤ 0.60 | ≤ 0.05 | ≤ 0.20 | ≤ 0.25    | ≤ 0.30 | balance |
| <b>FeNi29Co18Mn</b> | 1.3981<br>K94610    | SEW 385<br>DIN 17745<br>ASTM F15 | <b>29</b> | <b>17</b> | ≤ 0.50 | ≤ 0.05 | ≤ 0.20 | ≤ 0.20    | ≤ 0.20 | balance |
| <b>FeNi47Cr5Al</b>  |                     |                                  | <b>47</b> | ≤ 0.20    | ≤ 0.30 | ≤ 0.30 | ≤ 0.20 | 4.0 - 6.0 | ≤ 0.30 | balance |

## Nickel-Chrome-Alloys

| Alloy       | Material<br>UNS No. | Standard               | min.<br>max. | Ni<br>(+Co) | Cr | AL  | C     | Cu  | Fe  | Mn  | Si  | Ti  |
|-------------|---------------------|------------------------|--------------|-------------|----|-----|-------|-----|-----|-----|-----|-----|
| LC-NiCr15Fe | 2.4817              | DIN 17742              | min.         | 72          | 14 |     |       |     | 6   |     |     |     |
|             |                     |                        | max.         |             | 16 | 0.3 | 0.025 | 0.5 | 10  | 1   | 0.5 | 0.3 |
| NiCr15Fe    | 2.4816<br>N06600    | DIN 17742<br>ASTM B168 | min.         | 72          | 14 |     | 0.025 |     | 6   |     |     |     |
|             |                     |                        | max.         |             | 17 | 0.3 | 0.1   | 0.5 | 10  | 1   | 0.5 | 0.3 |
| NiCr23Fe    | 2.4851<br>N06601    | DIN 17742<br>ASTM B168 | min.         | 58          | 21 | 1   |       |     |     |     |     |     |
|             |                     |                        | max.         | 63          | 25 | 1.7 | 0.1   | 0.5 | 18  | 1   | 0.5 | 0.5 |
| NiCr9       |                     |                        | min.         |             | 9  |     |       |     |     | 0.2 | 0.1 |     |
|             |                     |                        | max.         | balance     | 10 | 0.1 | 0.1   | 0.1 | 0.3 | 0.4 | 0.2 | 0.1 |

## Soft-Magnetic Iron-Nickel-Alloys

| Alloy                  | Material<br>UNS No.                  | Standard   | Density           | B <sub>s</sub> | T <sub>c</sub> | H <sub>c</sub> <sup>1</sup> | μ <sub>0.4</sub> <sup>1</sup> | μ <sub>max</sub> <sup>1</sup> | E-Modulus |
|------------------------|--------------------------------------|--|-------------------|----------------|----------------|-----------------------------|-------------------------------|-------------------------------|-----------|
|                        |                                      |  | g/cm <sup>3</sup> | T              | °C             | A/m                         | DC-<br>AC                     | DC-<br>AC                     | GPa       |
| <b>FeNi36</b>          | 1.3910<br>1.3911                     | DIN 17745<br>DIN 17405<br>DIN EN 60404-8-6                               | 8.15              | 1.2            | 240            | 10                          | 6,000<br>5,000                | 25,000<br>20,000              | 135       |
| <b>FeNi48</b>          | 1.3922<br>1.3926<br>1.3927<br>K94840 | DIN 17745<br>DIN 17405<br>DIN EN 60404-8-6<br>ASTM A753                  | 8.25              | 1.5            | 470            | 4                           | 10,000<br>8,000               | 150,000<br>70,000             | 150       |
| <b>FeNi77<br/>CuMo</b> | 2.4530<br>2.4595<br>2.4596           | DIN 17745<br>DIN 17405<br>DIN EN 60404-8-6                               | 8.76              | 0.75           | 410            | 0.5                         | 200,000<br>80,000             | 300,000<br>100,000            | 195       |
| <b>FeNi80<br/>Mo</b>   | 2.4545<br>2.4595<br>2.4596<br>N14080 | DIN 17745<br>DIN 17405<br>DIN EN 60404-8-6<br>ASTM A 753<br>MIL-N-14411C | 8.75              | 0.75           | 410            | 0.5                         | 250,000<br>100,000            | 300,000<br>150,000            | 195       |

<sup>1</sup> measured on ring cores, thickness 0.2 mm

B<sub>s</sub> = Saturation Flux Density / T<sub>c</sub> = Curie Temperature / H<sub>c</sub> = Coercive Field Strength / μ<sub>0.4</sub> = Initial Permeability / μ<sub>max</sub> = Maximum Permeability

DC = Direct Current / AC = Alternating Current / f = 50 Hz

## Nickel-Copper-Alloys

| Alloy           | Material<br>UNS No. | Standard               | min.<br>max. | Ni<br>(+Co) | AL   | C    | Cu      | Fe  | Mn  | Si  | Ti  |
|-----------------|---------------------|------------------------|--------------|-------------|------|------|---------|-----|-----|-----|-----|
| <b>NiCu30Fe</b> | 2.4360<br>N04400    | DIN 17743<br>ASTM B127 | min.         | 63          |      |      | 28      | 1   |     |     |     |
|                 |                     |                        | max.         |             | 0.5  | 0.15 | 34      | 2.5 | 2   | 0.5 | 0.3 |
| <b>NiCu30Al</b> | 2.4375<br>N05500    | DIN 17743              | min.         | 63          | 2.2  |      | 27      | 0.5 |     |     | 0.3 |
|                 |                     |                        | max.         |             | 3.5  | 0.2  | 34      | 2   | 1.5 | 0.5 | 1   |
| <b>NiCu45</b>   | N04404              | ASTM F96               | min.         | 54.5        |      |      |         |     |     |     |     |
|                 |                     |                        | max.         | 55.5        | 0.05 | 0.1  | balance | 0.3 | 0.1 | 0.1 |     |

## Copper-Nickel-Alloys

| Alloy                   | Material<br>UNS No.        | Standard             | Ni<br>(+Co) | Cu      | Fe        | Mn        | C     |
|-------------------------|----------------------------|----------------------|-------------|---------|-----------|-----------|-------|
| <b>CuNi8</b>            |                            |                      | ≤ 8.0       | balance | ≤0.1      | ≤ 0.3     |       |
| <b>CuNi10</b>           | 2.0811<br>C70700           | DIN 17471            | ≤ 11.0      | balance | ≤ 0.1     | ≤ 0.3     |       |
| <b>CuNi15</b>           |                            |                      | 14.0 - 16.0 | balance | ≤ 0.3     | ≤ 0.5     |       |
| <b>CuNi20</b>           | CN104<br>C71000            | BS 2870              | 19.0 - 20.0 | balance | ≤ 0.2     | ≤ 0.5     |       |
| <b>CuNi30</b>           | C71580                     |                      | 29.0 - 32.0 | balance | ≤ 0.5     | ≤ 0.3     | ≤ 0.1 |
| <b>CuNi44<br/>Mn1</b>   | 2.0842<br>N04401<br>C72150 | DIN 17664            | 43.0 - 45.0 | balance | ≤ 0.5     | 0.5 -2.0  | ≤ 0.1 |
| <b>CuNi10<br/>Fe1Mn</b> | CW352H<br>C70600           | EN 1652<br>ASTM B122 | 9.0 - 11.0  | balance | 1.0 - 1.8 | 0.5 - 1.0 | ≤ 0.1 |
| <b>CuNi30<br/>Mn1Fe</b> | CW354H<br>C71500           | EN 1652<br>ASTM B122 | 30.0 - 32.0 | balance | 0.4 - 1.0 | 0.4 - 1.0 | ≤0.1  |

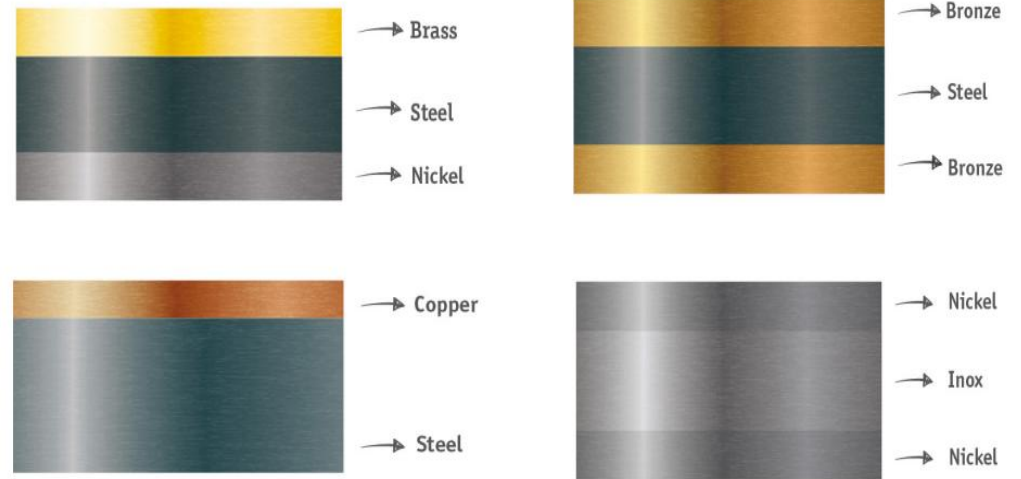
## Welding Consumables

| Alloy                        | Numeric abbrev. | Class.               | UNS-No. | min.<br>max. | Ni | Co  | Cu  | Fe  | C    | Cr   | Mn  | Si  | Ti  | Mo   | Nb   | AL  | W | V   |
|------------------------------|-----------------|----------------------|---------|--------------|----|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|---|-----|
| <b>DIN EN ISO 18274:2011</b> |                 | <b>AWS 5.14:2011</b> |         |              |    |     |     |     |      |      |     |     |     |      |      |     |   |     |
| <b>NiCr30<br/>Fe9</b>        | Ni 6052         | EQNiCrFe-7           | N06052  | min.         | 54 |     |     | 7   |      | 28   |     |     |     |      |      |     |   |     |
|                              |                 |                      |         | max.         |    |     | 0.3 | 11  | 0.04 | 31.5 | 1   | 0.5 | 1   | 0.5  | 0.1  |     |   |     |
| <b>NiCr23<br/>Mo16</b>       | Ni 6059         | EQNiCrMo-13          | N06059  | min.         | 56 |     |     |     |      | 22   |     |     |     | 15   |      | 0.1 |   |     |
|                              |                 |                      |         | max.         |    | 0.3 | 0.5 | 1.5 | 0.01 | 24   | 0.5 | 0.1 | 0.5 | 16.5 |      | 0.4 |   | 0.3 |
| <b>NiCr20<br/>Mn3Nb</b>      | Ni 6082         | EQNiCr-3             | N06082  | min.         | 67 |     |     |     |      | 18   | 2.5 |     |     |      | 2    |     |   |     |
|                              |                 |                      |         | max.         |    |     | 0.5 | 3   | 0.1  | 22   | 3.5 | 0.5 | 0.7 |      | 3    |     |   |     |
| <b>NiCr22<br/>Mo9Nb</b>      | Ni 6625         | EQNiCrMo-3           | N06625  | min.         | 58 |     |     |     |      | 20   |     |     |     | 8    | 3.15 |     |   |     |
|                              |                 |                      |         | max.         |    |     | 0.5 | 5   | 0.1  | 23   | 0.5 | 0.5 | 0.4 | 10   | 4.15 | 0.4 |   |     |
| <b>NiCr15<br/>Mo16Fe6W4</b>  | Ni 6276         | EQNiCrMo-4           | N10267  | min.         | 50 |     |     | 4   |      | 14.5 |     |     |     | 15   |      |     | 3 |     |
|                              |                 |                      |         | max.         |    | 2.5 | 0.5 | 7   | 0.02 | 16.5 | 1   | 0.8 |     | 17   |      |     |   | 4.5 |
| <b>NiCu30<br/>Mn3Ti</b>      | Ni 4060         | EQNiCu-7             | N04060  | min.         | 62 |     | 28  |     |      |      | 2   |     | 1.5 |      |      |     |   |     |
|                              |                 |                      |         | max.         |    |     | 32  | 2.5 | 0.15 |      | 4   | 1.2 | 3   |      | 0.3  | 1.2 |   |     |
| <b>NiTi3</b>                 | Ni 2061         | EQNi-1               | N02061  | min.         | 92 |     |     |     |      |      |     |     | 2   |      |      |     |   |     |
|                              |                 |                      |         | max.         |    |     | 0.2 | 1   | 0.15 |      | 1   | 0.7 | 3.5 |      |      | 1.5 |   |     |

## Clad Materials

| Material Options       |  |
|------------------------|--|
| <b>Copper</b>          | Cu-PHC, etc.   |
| <b>Nickel</b>          | Ni 99.2 / LC-Ni 99 / LC-Ni 99.6, etc.  |
| <b>Brass</b>           | CuZn10 / CuZn37 / CuZn25, etc.   |
| <b>Bronze</b>          | CuSn6, etc.  |
| <b>Alloys</b>          | Nickel-, Iron-Nickel-, Copper-Alloys   |
| <b>Stainless Steel</b> | 1.4301 / 1.4306 / 1.4310 / 1.4541 /<br>1.4404 / 1.4512 / 1.4521 / 1.4571, etc. |
| <b>Unalloyed Steel</b> | DC04 / DD11 / DD14 / C10, etc.   |

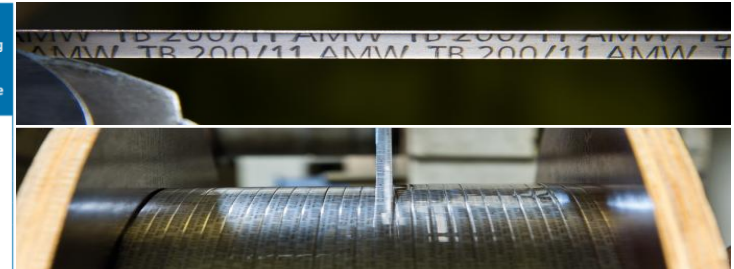
### Samples of two layer and three layer



[www.clad-configurator.de](http://www.clad-configurator.de) you can create your individual cladding strip with up to five layers in different thickness ratios

## Thermostatic Bimetals

| Grade         | Specific Thermal Curvature<br>20 °C - 130 °C<br>10 <sup>-4</sup> /K | Specific Thermal Deflection<br>20 °C - 100 °C<br>10 <sup>-4</sup> /K | Specific Electrical Resistivity<br>at 20 °C<br>Ω • mm <sup>2</sup> /m | Linearity Range<br>°C | Max. Operating Temperature<br>°C | Cladding Layer on high exp. side | High Expansion Side | Intermediate Layer | Low Expansion Side | Cladding Layer on low exp. side |           |
|---------------|---|--|---|-----------------------|----------------------------------|----------------------------------|---------------------|--------------------|--------------------|---------------------------------|-----------|
| 1 TB 230/110  | 43.0 ± 5 %  | 22.5   | 1.08 ± 5 %  | +20 to 230            | 350                              | none                             | MnNi16Cu10          | none               | FeNi32Co6          | none                            |           |
| 2 TB 208/110  | 39.0 ± 5 %  | 20.8   | 1.10 ± 5 %  | -20 to 200            |                                  |                                  | MnCu18Ni10          | none               | FeNi36             |                                 |           |
| 3 TB 200/80   | 38.9 ± 5 %  | 20.8   | 0.82 ± 5 %  |                       |                                  |                                  | MnNi16Cu10          | FeNi36/Ni          |                    |                                 |           |
| 4 TB 200/60   | 38.8 ± 5 %  | 20.6   | 0.58 ± 5 %  |                       |                                  |                                  | FeNi36/Ni           |                    |                    |                                 |           |
| 5 TB 200/60Fe | 38.8 ± 5 %  | 20.6   | 0.58 ± 5 %  |                       |                                  |                                  | Fe                  |                    |                    |                                 |           |
| 6 TB 200/40   | 38.5 ± 5 %  | 20.5   | 0.40 ± 5 %  |                       |                                  |                                  | FeNi36/Ni           |                    |                    |                                 |           |
| 7 TB 200/40Cu | 38.5 ± 5 %  | 20.5   | 0.40 ± 10 %   |                       |                                  |                                  | MnCu18Ni10          | Cu                 |                    |                                 |           |
| 8 TB 200/40Fe | 38.5 ± 5 %  | 20.5   | 0.40 ± 5 %  |                       |                                  |                                  | MnNi16Cu10          | Fe                 |                    |                                 |           |
| 9 TB 200/30   | 38.6 ± 5 %  | 20.3   | 0.30 ± 7 %  |                       |                                  |                                  | MnCu18Ni10          | Cu                 |                    |                                 |           |
| 10 TB 200/25  | 38.6 ± 5 %  | 20.3   | 0.249 ± 7 %   |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 11 TB 200/20  | 38.5 ± 5 %  | 20.2   | 0.21 ± 7 %  |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 12 TB 200/17  | 38.4 ± 5 %  | 20.1   | 0.166 ± 7 %   |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 13 TB 200/15  | 38.4 ± 5 %  | 20.1   | 0.15 ± 7 %  |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 14 TB 200/11  | 37.8 ± 5 %  | 20.1   | 0.11 ± 7 %  |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 15 TB 200/10  | 37.5 ± 5 %  | 20.0   | 0.10 ± 7 %  |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 16 TB 185/08  | 37.5 ± 5 %  | 19.4   | 0.08 ± 10 %   |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 17 TB 180/05  | 33.8 ± 5 %  | 17.9   | 0.048 ± 10 %  |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 18 TB 175/05  | 32.4 ± 5 %  | 17.5   | 0.05 ± 10 %   |                       |                                  |                                  |                     | Cu                 |                    |                                 |           |
| 19 TB 170/03  | 31.6 ± 5 %  | 16.2   | 0.033 ± 15 %  |                       |                                  |                                  | MnNi16Cu10          | Cu                 |                    |                                 | FeNi32Co6 |
| 20 TB 140/140 | 28.4 ± 5 %  | 14.6   | 1.40 ± 5 %  |                       |                                  |                                  | MnNi16Cu10          | none               |                    |                                 | FeNi36    |
| 21 TB 140/135 | 28.5 ± 5 %  | 14.7   | 1.35 ± 5 %  |                       | MnCu18Ni10                       | none                             |                     |                    |                    |                                 |           |
| 22 TB155/78   | 28.5 ± 5 %  | 15.5   | 0.78 ± 5 %  | FeNi20Mn6             | none                             |                                  |                     |                    |                    |                                 |           |
| 23 TB155/78B  | 28.5 ± 5 %  | 15.5   | 0.78 ± 5 %  | X60Ni14Mn7            | none                             |                                  |                     |                    |                    |                                 |           |
| 24 TB150/78   | 27.6 ± 5 %  | 14.9   | 0.78 ± 5 %  | FeNi20Mn6             | none                             |                                  |                     |                    |                    |                                 |           |
|               |   |  |   | FeNi20Mn6             | none                             |                                  |                     |                    |                    |                                 |           |



### 5. Dimension tolerances for stretch-levelling strip

**Straightness of strip edge in longitudinal direction (edge camber)**

The allowed straightness deviation is stipulated in DIN 1715 and measured on a test piece having a length of 1,000 mm.

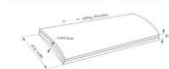


Tighter edge camber tolerance can be agreed.

| strip width<br>mm | max. deviation h from<br>straight line<br>mm |
|-------------------|--|
| ≤ 10              | by arrangement                               |
| > 10 to 25        | 5  |
| > 25 to 40        | 3.5  |
| > 40 to 125       | 2.5  |
| > 125             | 2  |

**Surface flatness across strip width (cross bow)**

The cross curvature can be agreed depending on strip width, strip thickness and material.



**Surface flatness in rolling direction (waviness)**

The waviness is the ratio of wave height h to wavelength L and stipulated in DIN 1715.



| Thickness s<br>mm | Waviness h/L<br>% |
|-------------------|-------------------|
| ≤ 1.00            | max. 3            |
| > 1.00            | max. 2            |

**Surface flatness in rolling direction (coil set)**

Coil set can be agreed. It can be confirmed in rolling direction, in the opposite direction or with a +/- tolerance. The test is carried out on a 300 mm long test piece hanging on a measuring device.



### Edge properties

The standard production route provides strip with low slitting burr edges. The burr must not exceed 10 % of the strip thickness for material having a strip thickness up to 0.50 mm. For a thickness above 0.50 mm, the burr must not exceed 0.050 mm in height. Deburred or rounded edges can be agreed for a strip thickness of 0.5 to 1.5 mm. The edge radius for rounded edges can be 10 % to 40 % of the strip thickness with a minimum radius of 0.1 mm and a maximum radius of 0.5 mm. The minimum edge radius tolerance can be agreed and represents +/- 0.05 mm of the nominal edge radius.

### 6. Marking

A permanent marking is applied to the high expansion side of the strip, preferably by an etching process. This marking must not affect the thermostatic bimetal properties. If required, the marking can be embossed on strip having a minimum thickness of 0.60 mm. Delivery of strip marked on the low expansion side or without any marking has to be agreed separately.

자세한 사항은 [링크 참조](#)

## Metal Foils up to 0.002 mm thin

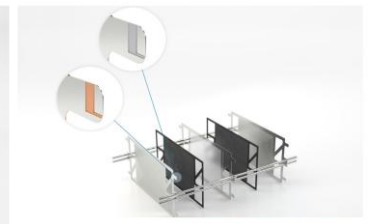
|                         |  |   |       |        |        |      |
|-------------------------|--|---|-------|--------|--------|------|
| <b>Pure Metals</b>      | Nickel (2.4060) / Copper (2.0076) / Titanium Grade 1 (3.7025) / Tantalum / Silver / etc. |   |       |        |        |      |
| <b>Alloys</b>           | Iron-Nickel:   | Alloy42 (1.3917) or similar acc. to DIN 17745 or ASTM F30   |       |        |        |      |
|                         | Copper-Nickel:   | CuNi44 (2.0842) or similar acc. to DIN 17471 or ASTM B122   |       |        |        |      |
|                         | Nickel-Copper:   | NiCu30Fe (2.4360) or similar acc. to DIN 17743 or ASTM B127 |       |        |        |      |
|                         | Nickel-Chromium:   | NiCr15Fe (2.4816) or similar acc. to DIN 17742 or ASTM B168 |       |        |        |      |
| <b>Stainless Steels</b> | DIN:   | 1.4301  | 1.431 | 1.4404 | 1.4568 | etc. |
|                         | AISI:  | 304   | 301   | 316L   | 631    | etc. |
| <b>Hire Work</b>        | We are pleased to roll your metal strip or foil down to a few microns in thickness.      |   |       |        |        |      |

| Delivery Condition   |           |   |
|----------------------|-----------|---|
| Temper condition     | Thickness | Width   |
| <b>soft annealed</b> | > 10 µm   | 4 - 100 mm slit edge or 60 - 110 mm rolled edge |
| <b>hard rolled</b>   | > 5 µm    | 2 - 100 mm slit edge or 60 - 110 mm rolled edge |
| <b>hard rolled</b>   | ≤ 5 µm    | 5 - 100 mm slit edge or 60 - 110 mm rolled edge |

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# Directions

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