



|                |                   |                        |                            |
|----------------|-------------------|------------------------|----------------------------|
| <b>Quality</b> | <b>X2CrNi18-9</b> | <b>Austenitic</b>      | <i>Technical card 2018</i> |
| Number         | <b>1.4307</b>     | <b>Stainless Steel</b> | <i>Lucefin Group</i>       |

## Chemical composition

| C%      | Si%    | Mn%    | P%      | S% <sup>a)</sup> | Cr%       | Ni%      | N%     |                  |
|---------|--------|--------|---------|------------------|-----------|----------|--------|------------------|
| max     | max    | max    | max     | max              |           |          | max    |                  |
| 0,03    | 1,00   | 2,00   | 0,045   | 0,030            | 17,5-19,5 | 8,0-10,5 | 0,10   | EN 10088-3: 2014 |
| + 0.005 | + 0.05 | ± 0.04 | + 0.005 | ± 0.003          | ± 0.2     | ± 0.1    | + 0.01 |                  |

Product deviations are allowed

<sup>a)</sup> for improving machinability, it is allowed a controlled sulphur content of 0,015 % - 0,030 %; for polishability, it is suggested a controlled sulphur content of max 0,015 %

## Temperature °C

| Melting range                 | Hot-forming  | Solution annealing (Solubilization) +AT | Stabilizing          | Soft annealing +A | MMA welding – AWS electrodes  |
|-------------------------------|--------------|---|----------------------|-------------------|---|
| 1460-1400                     | 1200-930     | 1120-1000 water                         | not necessary        | not suitable      | <i>pre-heating</i> <i>post welding</i><br>not necessary      slow cooling |
| Sensitization                 | Quenching +Q | Tempering +T                            | Stress-relieving +SR |                   | joint with steel  |
| sensitization test at 700-450 | not suitable | not suitable                            | 450-200 furnace      |                   | carbon      CrMo alloyed      stainless                                   |
|                               |              |   |                      |                   | E309-E308      E309-E308      E308  |
|                               |              |   |                      |                   | <i>cosmetic welding</i><br>E308 L   |

**Chemical treatment** - Pickling (10% HNO<sub>3</sub>) + (2% HF) at 60° or cold - Passivation 20 - 50% HNO<sub>3</sub> cold

## Mechanical properties

**Heat-treated material** EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D

| size |     | Testing at room temperature |                       |         |         |                        |                        |                   |                    |
|------|-----|-----------------------------|-----------------------|---------|---------|------------------------|------------------------|-------------------|--------------------|
| mm   |     | R                           | Rp 0.2                | A%      | A%      | Kv <sub>2</sub> +20 °C | Kv <sub>2</sub> +20 °C | HBW <sup>a)</sup> |                    |
| from | to  | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min (L) | min (T) | J min (L)              | J min (T)              | max               |                    |
|      | 160 | 500-700                     | 175                   | 45      | -       | 100                    | -                      | 215               | +AT solubilization |
| 160  | 250 | 500-700                     | 175                   | -       | 35      | -                      | 60                     | 215               | +AT solubilization |

<sup>a)</sup> for information only (L) = longitudinal (T) = transversal

**Bright bars of heat-treated material** EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P

| size |                  | Testing at room temperature |                       |         |         |                        |                        |                    |  |
|------|------------------|-----------------------------|-----------------------|---------|---------|------------------------|------------------------|--------------------|--|
| mm   |                  | R                           | Rp 0.2                | A%      | A%      | Kv <sub>2</sub> +20 °C | Kv <sub>2</sub> +20 °C |                    |  |
| from | to               | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min (L) | min (T) | J min (L)              | J min (T)              |                    |  |
|      | 10 <sup>b)</sup> | 600-930                     | 400                   | 25      | -       | -                      | -                      |                    |  |
| 10   | 16               | 600-930                     | 380                   | 25      | -       | -                      | -                      | +AT solubilization |  |
| 16   | 40               | 500-830                     | 175                   | 30      | -       | 100                    | -                      |                    |  |
| 40   | 63               | 500-830                     | 175                   | 30      | -       | 100                    | -                      |                    |  |
| 63   | 160              | 500-700                     | 175                   | 45      | -       | 100                    | -                      |                    |  |
| 160  | 250              | 500-700                     | 175                   | -       | 35      | -                      | 60                     |                    |  |

<sup>b)</sup> in the range of 1 mm ≤ d < 5 mm, values are valid only for rounds – the mechanical properties of non round bars of < 5 mm of thickness have to be agreed at the time of request and order

(L) = longitudinal (T) = transversal

**Forged +AT solubilization**

| size |     | Testing at room temperature |                       |         |         |           |           |            |                   |
|------|-----|-----------------------------|-----------------------|---------|---------|-----------|-----------|------------|-------------------|
| mm   |     | R                           | Rp 0.2                | A%      | A%      | Kv +20 °C | Kv +20 °C | Kv -196 °C |                   |
| from | to  | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min (L) | min (T) | J min (L) | J min (T) | J min (T)  |                   |
|      | 250 | 460-680                     | 180                   | -       | 35      | 100       | 60        | -          | UNI EN 10250-4:01 |
|      | 250 | 500-700                     | 200                   | 45      | 35      | 100       | 60        | 60         | UNI EN 10222-5:01 |

**Work-hardened by cold-drawing** EN 10088-3: 2014 condition 2H (es. +AT+C)

| size |    | Testing at room temperature |                       |     |          |                     |
|------|----|-----------------------------|-----------------------|-----|----------|---------------------|
| mm   |    | R                           | Rp 0.2                | A%  |          |                     |
| from | to | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min |          |                     |
|      | 35 | 700-850                     | 350                   | 20  | +AT+C700 | cold-drawn material |
|      | 25 | 800-1000                    | 500                   | 12  | +AT+C800 | cold-drawn material |

**Transition curve** determined by Kv impacts. Material solubilized at 1050 °C

|         |    |      |      |     |     |     |     |     | +AT material - approximate values |                   |                   |    |
|---------|----|------|------|-----|-----|-----|-----|-----|-----------------------------------|-------------------|-------------------|----|
| Average | J  | 230  | 230  | 232 | 236 | 245 | 268 | 290 | °C                                | R                 | Rp 0.2            | A% |
| Test at | °C | -160 | -120 | -80 | -40 | 0   | +40 | +80 |                                   | N/mm <sup>2</sup> | N/mm <sup>2</sup> | %  |
|         |    |      |      |     |     |     |     |     | +24                               | 550               | 200               | 45 |
|         |    |      |      |     |     |     |     |     | -80                               | 830               | 220               | 35 |
|         |    |      |      |     |     |     |     |     | -196                              | 1200              | 300               | 30 |

Effect of cold-working (hot-rolled +AT+C). Approximate values

|                    |                   |     |     |      |      |      |      |      |      |      |
|--------------------|-------------------|-----|-----|------|------|------|------|------|------|------|
| R                  | N/mm <sup>2</sup> | 650 | 850 | 1000 | 1100 | 1190 | 1280 | 1380 | 1500 | 1570 |
| R <sub>p 0.2</sub> | N/mm <sup>2</sup> | 300 | 400 | 650  | 790  | 950  | 1120 | 1270 | 1370 | 1420 |
| A                  | %                 | 45  | 38  | 32   | 25   | 20   | 18   | 12   | 10   | 8    |
| Reduction          | %                 | 0   | 10  | 20   | 30   | 40   | 50   | 60   | 70   | 75   |

Minimum yield stress and tensile strength values at high temperatures on material +AT, EN 10088-3: 2014 / EN 10269: 2001

|                    |                   |     |     |     |     |     |     |     |     |     |     |
|--------------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| R <sub>p 0.2</sub> | N/mm <sup>2</sup> | 145 | 130 | 118 | 108 | 100 | 94  | 89  | 85  | 81  | 80  |
| R                  | N/mm <sup>2</sup> | 410 | 380 | 360 | 350 | 340 | 340 | 330 | -   | -   | -   |
| Test at            | °C                | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 |

|                                |                                    |       |      |      |      |      |      |      |
|--------------------------------|------------------------------------|-------|------|------|------|------|------|------|
| Thermal expansion              | 10 <sup>-6</sup> • K <sup>-1</sup> | ▶     | 16.0 | 16.5 | 17.0 | 18.0 | 18.0 |      |
| Modulus of elasticity          | long. GPa                          | 200   | 194  | 186  | 179  | 172  |      | 127  |
| Poisson number                 | ν                                  | 0.28  |      |      |      |      |      |      |
| Electrical resistivity         | Ω • mm <sup>2</sup> /m             | 0.72  |      | 0.86 |      | 1.00 | 1.11 | 1.21 |
| Electrical conductivity        | Siemens•m/mm <sup>2</sup>          | 1.37  |      |      |      |      |      |      |
| Specific heat                  | J/(Kg•K)                           | 500   |      | 503  |      | 520  | 541  | 559  |
| Density                        | Kg/dm <sup>3</sup>                 | 7.90  |      |      |      |      |      |      |
| Thermal conductivity           | W/(m•K)                            | 15.0  | 16.3 | 17.2 | 18.7 | 20.2 |      | 25.8 |
| Relative magnetic permeability | μ <sub>r max</sub>                 | 1.021 |      |      |      |      |      |      |
| °C                             |                                    | 20    | 100  | 200  | 300  | 400  | 600  | 800  |

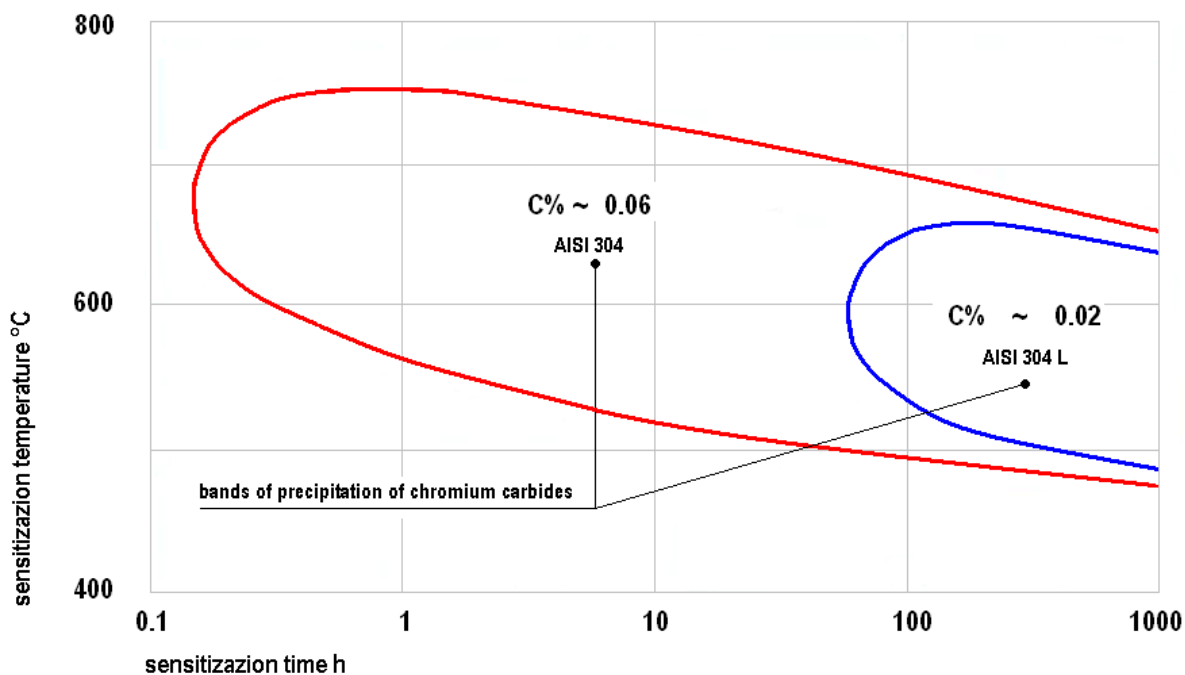
The symbol ▶ indicates temperature between 20 °C and 100 °C, 20 °C and 200 °C .....

|                      |             |                                 |             |                  |                 |   |
|----------------------|-------------|---------------------------------|-------------|------------------|-----------------|---|
| Corrosion resistance | Atmospheric |                                 | Chemical    |                  |                 | x intercrystalline corrosion, rural and urban atmospheres |
|                      | Fresh water | <i>industrial</i> <i>marine</i> | <i>mild</i> | <i>oxidizing</i> | <i>reducing</i> |   |
| x                    | x           | x                               | x           | x                | x               |   |

|                            |  |
|----------------------------|--|
| Magnetic                   | no   |
| Machinability              | high   |
| Hardening                  | cold-drawn and other cold plastic deformations                     |
| Service temperature in air | continuous service up to 850 °C; intermittent service up to 800 °C |

|            |        |        |            |           |       |             |                   |
|------------|--------|--------|------------|-----------|-------|-------------|-------------------|
| Europe     | USA    | USA    | China      | Russia    | Japan | India       | Republic of Korea |
| EN         | UNS    | ASTM   | GB         | GOST      | JIS   | IS          | KS                |
| X2CrNi18-9 | S30403 | (304L) | 00Cr19Ni10 | 03Ch18N11 |       | X02Cr18Ni11 |                   |

Sensitization diagram



Flow of the chrome carbides precipitation as a function of the percentage of carbon