



## alform® N SERIES

### Normalized-rolled steels with excellent cold formability

Normalized-rolled alform® steels achieve the listed mechanical properties, even in as-delivered condition and after being additionally normalized. Compliance with narrowest manufacturing requirements yields perfect processing results. Depending on their respective strength class, these steels are employed for deep drawing, profiling and edging, etc., in a wide variety of applications.

These steel grades comply with all requirements of comparable steels pursuant to EN 10025-2.

#### Convincing advantages:

- » Very good suitability for cutting, punching and forming
- » Very good weldability because of low carbon equivalent
- » Improved properties with narrower limits than those of comparable standard steels

**Chemical composition**

Ladle analysis in weight percent and carbon equivalent

| alform® | C max. | Si max. | Mn max. | P max. | S max. | Al min. | Cr max. | Ni max. | Mo max. | Cu max. | V max. | Nb max. | Ti max. | B max. | CEV max. |
|---------|--------|---------|---------|--------|--------|---------|---------|---------|---------|---------|--------|---------|---------|--------|----------|
| 180 N   | 0.08   | 0.05    | 0.35    | 0.025  | 0.020  | 0.020   | 0.3     | 0.3     | 0.08    | 0.3     | 0.02   | 0.02    | 0.02    | 0.004  | 0.15     |
| 200 N   | 0.10   | 0.05    | 0.45    | 0.025  | 0.020  | 0.020   | 0.3     | 0.3     | 0.08    | 0.3     | 0.02   | 0.02    | 0.02    | 0.004  | 0.20     |
| 240 N   | 0.16   | 0.05    | 0.70    | 0.025  | 0.020  | 0.020   | 0.3     | 0.3     | 0.08    | 0.3     | 0.02   | 0.02    | 0.02    | 0.004  | 0.25     |
| 280 N   | 0.16   | 0.05    | 1.20    | 0.025  | 0.015  | 0.020   | 0.3     | 0.3     | 0.08    | 0.3     | 0.05   | 0.05    | 0.05    | 0.004  | 0.40     |
| 340 N   | 0.18   | 0.30    | 1.60    | 0.025  | 0.015  | 0.015   | 0.3     | 0.3     | 0.08    | 0.3     | 0.05   | 0.05    | 0.05    | 0.004  | 0.43     |
| 355 N   | 0.18   | 0.30    | 1.60    | 0.025  | 0.012  | 0.015   | 0.3     | 0.3     | 0.08    | 0.3     | 0.05   | 0.05    | 0.05    | 0.004  | 0.43     |
| 380 N   | 0.18   | 0.30    | 1.60    | 0.025  | 0.012  | 0.015   | 0.3     | 0.3     | 0.08    | 0.3     | 0.05   | 0.05    | 0.05    | 0.004  | 0.43     |

When these steel grades are to be **galvanized as Class 1**, the following restrictions apply:  
 Si 0.03% max. and P 0.018% max.; CEV = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15

**Mechanical properties: Tensile test**

Tensile test transverse to rolling direction

R<sub>p0.2</sub> applies for the yield strength in case of missing R<sub>eH</sub> and in arbitrary cases

A<sub>80</sub> for thicknesses < 3 mm

A<sub>5</sub> for thicknesses ≥ 3 mm

| alform® | Yield strength R <sub>eH</sub><br>[MPa] | Tensile strength R <sub>m</sub><br>[MPa] | Elongation [%] min. |                |
|---------|---|--|---------------------|----------------|
|         |   |  | A <sub>80</sub>     | A <sub>5</sub> |
| 180 N   | 180 – 290                               | 280 – 360                                | 28                  | 34             |
| 200 N   | 200 – 320                               | 320 – 400                                | 26                  | 32             |
| 240 N   | 240 – 360                               | 360 – 470                                | 23                  | 28             |
| 280 N   | 280 – 420                               | 430 – 530                                | 21                  | 26             |
| 340 N   | 340 – 485                               | 460 – 570                                | 20                  | 25             |
| 355 N   | 355 – 500                               | 470 – 580                                | 20                  | 25             |
| 380 N   | 380 – 520                               | 510 – 610                                | 19                  | 24             |

**Mechanical properties: Notch impact energy, edging radii, bending mandrel diameter**

| alform®    | Notch impact energy <sup>1)</sup> A <sub>v</sub><br>[Joule] |                            | Edging radii <sup>2)</sup><br>Ri min. at 90° edging |          |          | Bending<br>mandrel diameter<br>BgD min. (transverse<br>test specimens)<br>Sheet thickness = s |
|------------|---|----------------------------|---|----------|----------|---|
|            | N   | NE                         | s < 3 mm  | s 3-6 mm | s > 6 mm |   |
|            | Test temperature<br>-20 °C                                  | Test temperature<br>-40 °C |   |          |          |   |
| 180 N      | -   | -                          | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 200 N      | -   | -                          | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 240 N      | 27  | -                          | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 280 N      | 40  | -                          | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 340 N (NE) | 40  | 27 <sup>3)</sup>           | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 355 N (NE) | 40  | 27 <sup>3)</sup>           | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |
| 380 N (NE) | 40  | 27 <sup>3)</sup>           | 0.25 s  | 0.5 s    | 1.0 s    | 0 s   |

<sup>1)</sup> A<sub>v</sub> minimum mean value from three samples (ISO-V, longitudinal) as related to full-size specimen (10 x 10 mm).

<sup>2)</sup> Smallest permissible inside radius at 90° edging, Ri min

<sup>3)</sup> Values at -40 °C are guaranteed for limited dimension ranges and material is labeled **NE** upon request.

Notch impact energy can be measured from a plate thickness ≥ 3 mm upon request.

Note: Notch impact energy tests in thicknesses < 6 mm do not conform with applicable Euronorm standards.

**Example dimensions**

Maximum width per thickness

| alform® | Thickness [mm] |      |      |      |      |      |      |
|---------|----------------|------|------|------|------|------|------|
|         | 2.0            | 2.5  | 3.0  | 3.5  | 4.0  | 6.0  | 12.0 |
| 180 N   | 1600           | 1620 | 1620 | 1620 | 1620 | 1620 | 1620 |
| 200 N   | 1600           | 1620 | 1620 | 1620 | 1620 | 1620 | 1620 |
| 240 N   | 1600           | 1620 | 1620 | 1620 | 1620 | 1620 | 1620 |
| 280 N   | 1480           | 1620 | 1620 | 1620 | 1620 | 1620 | 1620 |
| 340 N   | 1270           | 1380 | 1500 | 1610 | 1620 | 1620 | 1620 |
| 355 N   | 1270           | 1380 | 1500 | 1610 | 1620 | 1620 | 1620 |
| 380 N   | 1270           | 1380 | 1500 | 1610 | 1620 | 1620 | 1620 |

Additional dimensions upon request.

Depending on the dimensions and strength, we also supply pickled, oiled and trimmed.

|               | Steel strip          | Slit steel strip | Cut sheets         | Cut shapes |                   |              |
|---------------|----------------------|------------------|--------------------|------------|-------------------|--------------|
| Width:        | 900 - 1620 (1750) mm | Thickness:       | up to 8 mm         | Thickness: | up to 20 mm       | upon request |
| Weight/Width: | 18 - 20 kg/mm        | Strip widths:    | beginning at 30 mm | Length:    | up to 12 m (18 m) |              |

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