



# AUSTENITIC STAINLESS STEELS:

| Grade Designation |       | Chemical Composition - per cent |       |       |        |           |           |         |                  | Nearest Equivalent Specification |        |
|-------------------|-------|---------------------------------|-------|-------|--------|-----------|-----------|---------|------------------|----------------------------------|--------|
| AISI              | C Max | Mn Max                          | P Max | S Max | Si Max | Cr        | Ni        | Mo      | Other element    | I. S.                            | En     |
| 201               | .15   | 5.50/7.50                       | .06   | .03   | 1.0    | 16.0/18.0 | 3.5/5.5   | -       | N-.25 Max        | 10Cr17Mn6Ni4                     | -      |
| 202               | .15   | 7.50/10.0                       | .06   | .03   | 1.0    | 17.0/19.0 | 4.0/6.0   | -       | N-.25 Max        | -                                | -      |
| 301               | .15   | 2.0 max                         | .045  | .04   | 1.0    | 16.0/18.0 | 6.0/8.0   | -       | -                | 10Cr17Ni7                        | -      |
| 302               | .15   | 2.0                             | .045  | .030  | 1.0    | 17.0/19.0 | 8.0/10.0  | -       | -                | 07Cr18Ni9                        | En-58A |
| 304               | .08   | 2.0                             | .045  | .030  | 1.0    | 18.0/20.0 | 8.0/12.0  | -       | -                | 04Cr18Ni10                       | EN-58E |
| 304L              | .03   | 2.0                             | .045  | .030  | 1.0    | 18.0/20.0 | 8.0/12.0  | -       | -                | 02Cr18Ni11                       | -      |
| 309               | .20   | 2.0 max                         | .045  | .03   | 1.0    | 22.0/24.0 | 12.0/15.0 | -       | -                | -                                | -      |
| 310               | .25   | 2.0                             | .045  | .030  | 1.50   | 24.0/26.0 | 19.0/22.0 | -       | -                | 10Cr25Ni18                       | -      |
| 316               | .08   | 2.0                             | .045  | .030  | 1.0    | 16.0/18.0 | 10.0/14.0 | 2.0/3.0 | -                | 04Cr17Ni12Mo2                    | -      |
| 316L              | .03   | 2.0                             | .045  | .030  | 1.0    | 16.0/18.0 | 10.0/14.0 | 2.0/3.0 | -                | 02Cr17Ni12Mo2                    | -      |
| 317               | .08   | 2.0                             | .045  | .030  | 1.0    | 18.0/20.0 | 11.0/15.0 | 3.0/4.0 | -                | -                                | -      |
| 321               | .08   | 2.0                             | .045  | .030  | 1.0    | 17.0/19.0 | 9.0/12.0  | -       | Ti5xCmin .70 max | 04Cr18Ni10Ti20                   | En-58C |
| 347               | .08   | 2.0                             | .045  | .030  | 1.0    | 17.0/19.0 | 9.0/12.0  | -       | Cb/Ta 10xC min   | 04Cr18Ni10Nb-40                  | En-58G |

# FERRITIC STAINLESS STEELS:

|     |     |          |      |     |     |           |         |   |          |        |       |
|-----|-----|----------|------|-----|-----|-----------|---------|---|----------|--------|-------|
| 430 | .12 | 1.00     | .04  | .03 | 1.0 | 14.0/18.0 | -       | - | -        | 07Cr17 | En-60 |
| 446 | .20 | 1.50 max | .040 | .03 | 1.0 | 23.0/27.0 | .25 max | - | N.25 max | -      | -     |

# MARTENSITIC STAINLESS STEELS:

|          |     |         |      |      |      |           |           |   |   |                  |                  |
|----------|-----|---------|------|------|------|-----------|-----------|---|---|------------------|------------------|
| 403      | .15 | 1.00    | .040 | .030 | .50  | 11.5/13.0 | -         | - | - | -                | -                |
| 410      | .15 | 1.00    | .040 | .030 | 1.00 | 11.5/13.5 | -         | - | - | 12Cr13           | -                |
| 414      | .15 | 1.0 max | .040 | .03  | 1.0  | 11.5/13.5 | 1.25/2.50 | - | - | -                | -                |
| 420 Over | .15 | 1.00    | .040 | .030 | 1.00 | 12.0/14.0 | -         | - | - | 22Cr13<br>30Cr13 | En-56C<br>En-56D |
| 431      | .20 | 1.0 max | .040 | .03  | 1.0  | 15.0/17.0 | 1.25/2.50 | - | - | 15Cr16Ni2        | En-57            |

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### Typical Mechanical Properties of Stainless Steel Bars

| AISI Type   | Condition                  | UTS<br>Kg/mm2<br>min. | YS<br>(0.2% Offset)<br>Kg/mm2 min. | % El<br>in 50 mm.<br>min. | R. A. %<br>min. |
|-------------|----------------------------|-----------------------|------------------------------------|---------------------------|-----------------|
| AUSTENITIC  |                            |                       |                                    |                           |                 |
| 201         | Annealed                   | 53.0                  | 28.0                               | 40                        | 45              |
| 202         | "                          | 53.0                  | 28.0                               | 40                        | 45              |
| 302         | "                          | 53.0                  | 21.0                               | 40                        | 50              |
| 304         | Annealed<br>(Hot finished) | do                    | do                                 | do                        | do              |
| 304 L       |                            |                       |                                    |                           |                 |
| 309         |                            |                       |                                    |                           |                 |
| 310         |                            |                       |                                    |                           |                 |
| 316         |                            |                       |                                    |                           |                 |
| 316L        |                            |                       |                                    |                           |                 |
| 317         | Annealed<br>(Hot finished) | 53.0                  | 21.0                               | 40                        | 50.0            |
| 321         | "                          | do                    | do                                 | do                        | do              |
| 347         | "                          | do                    | do                                 | do                        | do              |
| FERRITIC    |                            |                       |                                    |                           |                 |
| 430         | Annealed                   | 49.0                  | 28.0                               | 20                        | 45              |
| 446         | "                          | 49.0                  | 28.0                               | 20                        | 45              |
| MERTENSITIC |                            |                       |                                    |                           |                 |
| 403         | Annealed                   | 49.0                  | 28.0                               | 20.0                      | 45.0            |
|             | Hardened & tempered        | 84.0                  | 63.5                               | 12.0                      | 40.0            |
| 410         | Annealed                   | 49.0                  | 28.0                               | 20.0                      | 45.0            |
|             | Hardened & tempered        | 84.0                  | 63.5                               | 12.0                      | 40.0            |
| 414         | Annealed                   | -                     | -                                  | -                         | -               |
|             | Intermediate Temper        | 81.0                  | 63,5                               | 15.0                      | 45.0            |

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### Typical Mechanical Properties of Stainless Steel Sheets / Plates

| AISI Type   | Condition | UTS<br>Kg/mm2<br>min. | YS<br>(0.2% Offset)<br>Kg/mm2 mm. | % El<br>in 50 mm.<br>min. | Hardness<br>Max<br>RB. |
|-------------|-----------|-----------------------|-----------------------------------|---------------------------|------------------------|
| AUSTENITIC  |           |                       |                                   |                           |                        |
| 201         | Annealed  | 67.0                  | 31.5                              | 40.0                      | -                      |
| 202         | "         | 63.5                  | 31.5                              | 40.0                      | -                      |
| 301         | "         | 53.0                  | 21.0                              | 40.0                      | 94                     |
| 302         | "         | 53.0                  | 21.0                              | 40.0                      | 94                     |
| 304         | "         | 53.0                  | 21.0                              | 40.0                      | 94                     |
| 304 L       | "         | 49.0                  | 17.5                              | 40.0                      | 94                     |
| 309         | "         | 53.0                  | 21.0                              | 40.0                      | 95                     |
| 310         | "         | 53.0                  | 21.0                              | 40.0                      | 95                     |
| 316         | "         | 53.0                  | 21.0                              | 40.0                      | 96                     |
| 316L        | "         | 49.0                  | 17.5                              | 40.0                      | 96                     |
| 317         | "         | 53.0                  | 21.0                              | 35.0                      | 96                     |
| 321         | "         | 53.0                  | 21.0                              | 40.0                      | 94                     |
| 347         | "         | 53.0                  | 21.0                              | 40.0                      | 94                     |
| FERRITIC    |           |                       |                                   |                           |                        |
| 430         | "         | 45.5                  | 21.0                              | 22.0                      | 94                     |
| 446         | "         | 53.0                  | 28.0                              | 20.0                      | 95                     |
| MERTENSITIC |           |                       |                                   |                           |                        |
| 403         | "         | 45.5                  | 21.0                              | 22.0                      | 94                     |
| 410         | "         | 45.5                  | 21.0                              | 22.0                      | 88                     |

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### Typical Characteristics and Applications of Stainless Steels.

| AISI Type          | Characteristics                                                                                                                                                                 | Typical Applications                                                                                                                                                                                                                                    |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AUSTENITIC</b>  |                                                                                                                                                                                 |                                                                                                                                                                                                                                                         |
| 302                | General purpose stainless Steels.                                                                                                                                               | Widely used for severely formed parts.                                                                                                                                                                                                                  |
| 304                | General purpose stainless steal specially for welded construction,                                                                                                              | For welded construction and heavy wall vessels formed in a number of draws.                                                                                                                                                                             |
| 304L               | Low carbon modification of type 304, restricts carbide precipitation during welding.                                                                                            | For welded construction ensuring superior results in overcoming the problem of carbide precipitation in the weld zone without post annealing. Can be used in range of 420-820°C for upto 4 hrs. without becoming susceptible to intergranular corrosion |
| 321                | Stabilized 18/8 type with titanium; Not sensitive to intergranular corrosion within the carbide precipitation range of 420 to 870°C, corrosion resistance comparable to 304.    | Used in Oxidising corrosive environments within 420 to 870°C for welded construction. No annealing required after welding.                                                                                                                              |
| 347                | Stablized 18/8 type with columbium. Corrosion resistance comparable to type 304.                                                                                                | Used within 420-870°C for welded construction. No annealing required after welding.                                                                                                                                                                     |
| 316                | High creep strength, superior corrosion resisting properties in reducing atmosphere.                                                                                            | Used in industries in such medias as Sulphurous acid. Sulphuric acid. Phosphoric acid, formic acids & various organic acids for better corrosion resistance than 18/8 type.                                                                             |
| 316L               | Low. carbon modification of 316.                                                                                                                                                | Used in Place of 316 for maximum corrosion resistance properties. Applied when annealing after welding is impossible.                                                                                                                                   |
| 310                | Excellent high temperature properties with good ductility & weldability,                                                                                                        | Used upto 1150°C for continuous service & 1050 for intermittent service in oxidising atmosphere.                                                                                                                                                        |
| <b>FERRITIC</b>    |                                                                                                                                                                                 |                                                                                                                                                                                                                                                         |
| 430                | Good combination of corrosion resistance, useful mechanical properties & good formability. Not hardenable by heat treatment.                                                    | Utensiis, hardwares, fasteners, appliances, furnace parts. Nitric acid processing equipments etc.                                                                                                                                                       |
| <b>MERTENSITIC</b> |                                                                                                                                                                                 |                                                                                                                                                                                                                                                         |
| 403                | 12% Cr ensuring high degree of cleanliness; hardenable by heat treatment.                                                                                                       | Reactor components, turbine blades and rings & other highly stressed parts.                                                                                                                                                                             |
| 410                | General purpose corrosion & heat resisting steel; gives maximum corrosion resistance after heat treatment Hardenable by heat treatment.                                         | Cutlery, shafts, cracking tower, bubbler caps & trays for oil & gas industry, beater bars for paper & pulp industries etc.                                                                                                                              |
| 420                | Good ductility in annealed condition ; hardenable to highest hardness of all 12%Cr types; gives best corrosion resistance properties in hardened, ground or polished condition. | Cutlery, surgical instruments, valves etc.                                                                                                                                                                                                              |

\*Austenitic stainless steels are not hardenable by heat treatment. These can be hardened by cold work only.



| USA   |        | West Germany         |                    | Great Britain            |                      | Poland            |            | Romania              |              | Soviet Union | Sweden    | Czecho-slovakia | Hungary             |           | Bulgaria            |      | East Germany        |                  |                               | Franca      | Italy        | Japan     |
|-------|--------|----------------------|--------------------|--------------------------|----------------------|-------------------|------------|----------------------|--------------|--------------|-----------|-----------------|---------------------|-----------|---------------------|------|---------------------|------------------|-------------------------------|-------------|--------------|-----------|
| AISI  | SAE    | Stand-<br>ard<br>no. | DIN<br>designation | BS970:<br>Part<br>4:1970 | En Steel<br>replaced | Spec<br>no.<br>PN | Type       | Spec.<br>no.<br>STAS | Type         | GOST         | SIS-14-   | CSN             | Spec.<br>no.<br>MSZ | Type      | Spec.<br>no.<br>BDS | Type | Spec.<br>no.<br>TGL | Type             | Charac-<br>teristic<br>number | AFNOR       | UN1          | Notation  |
| 201   |        |                      |                    |                          |                      |                   |            | 3583                 | 10AzMNC170   |              |           |                 |                     |           |                     |      |                     |                  |                               |             |              | SUS 201   |
| 202   |        | 1.4371               | X8CrMnNi189        | 284S16                   |                      | 86020             | OH17N4G8   |                      |              | 12Kh17G9AN4  |           | 17460           | 4360                | K031      | 6738                | 14   | 7143                | X10CrMnNiN17.9.4 | 9840                          |             |              | SUS 202   |
| 301   | 30301  | 1.4310               | X12CrNi177         | 301S21                   |                      |                   |            |                      |              |              |           |                 |                     |           |                     |      | 7143                | X12CrNi17.7      | 6980                          | Z12CN17-08  | X12CrNi1707  | SUS 301   |
| 302   | 30302  | 1.4300               | X12CrNi188         | 302S25                   | 58A                  | 86020             | 1H18N9     | 3583                 | 10NC180      | 12Kh18N9     | 2330/2331 | 17241           | 4360                | K032      | 6738                | 16   | 7143                | X10CrNi18.9      | 6940                          | Z10CN18-09  | X10CrNi1809  | SUS 302   |
| 302B  | 30302B | 1.4330               |                    |                          |                      |                   |            |                      |              |              |           |                 |                     |           |                     |      |                     |                  |                               |             |              |           |
| 303   | 30303  | 1.4305               | X12CrNiS188        | 303S21                   | 58M                  |                   |            |                      |              |              | 2346      |                 |                     |           |                     |      |                     |                  |                               | Z10CNF18-09 | X10CrNiS1809 | SUS 303   |
| 303Se | 30303S | 1.4305               | X12CrNiSi188       | 303S41                   | 58M                  |                   |            |                      |              |              | 2346      |                 |                     |           |                     |      |                     |                  |                               |             | X10CrNiS1809 | SUS 303Sa |
| 304   | 30304  | 1.4301               | X5CrNi189          | 304S15                   | 58E                  | 86020             | OH18N9     | 3583                 | 7NC180       | 08Kh18N10    | 2332/2333 | 17240           | 4360                | K033      | 6738                | 15   | 7143                | X5CrNi18.10      | 6950                          | Z6CN18-09   | X5CrNi1810   | SUS 304   |
| 304L  | 30304L | 1.4306               | X2CrNi189          | 304S12                   |                      | 86020             | OOH18N10   |                      |              |              | 2352      | 17249           | 4360                | K041      |                     |      | 7143                | X3CrNi18.10      | 6970                          | Z2CN18-10   | X2CrNi1811   | SUS 304L  |
| 309   | 30309  | 1.4828               | X15CrNiSi2012      | 309S24                   |                      | 86022             | H20N13S2   | 3583                 | 15SNC20n     | 20kh25N14S2  |           |                 |                     |           | 6738                | 21   | 7061                | X15CrNiSi20.13   |                               |             | X16CrNi2314  | SUH 309   |
| 309S  | 30309S |                      |                    |                          |                      |                   |            |                      |              |              |           |                 |                     |           |                     |      |                     |                  |                               |             |              | SUS 309S  |
| 310   | 30310  | 1.4841               | X15CrNiSi2520      | 310S24                   |                      | 86022             | H25N20S2   | 3583                 | 15SNC250     | 20Kh25N20S2  |           | 17255           |                     |           | 6738                | 22   | 7061                | X15CrNiSi25.20   | 8130                          |             | X22CrNi2520  | SUH 310   |
| 310S  | 30310S | 1.4845               | X12CrNi2521        |                          |                      | 86022             | H23N18     |                      |              |              | 2361      |                 |                     |           |                     |      |                     |                  |                               |             |              | SUS 310S  |
| 316   | 30316  | 1.4401               | X5CrNiMo1810       | 316S16                   | 58J                  |                   |            | 6855                 | T12MSMoNC180 |              | 2347/2343 | 17352           |                     |           | 5084                | 21   | 7143                | X5CrNiMo18.11    | 8870                          | Z6CND17-11  | X5CrNiMo1712 | SUS 316   |
| 316L  | 30316L | 1.4404               | X2CrNiMo1810       | 316S12                   |                      | 86020             | OOH17N14M2 |                      |              |              | 2353      | 17350           | 4360                | K038      |                     |      |                     |                  |                               | Z2CND17-12  |              | SUS 316L  |
| 317   | 30317  | 1.4449               | X5CrNiMo1713       | 317S16                   |                      |                   |            |                      |              |              |           |                 |                     |           |                     |      |                     |                  |                               | Z2CND17-13  | X2CrNiMo1712 | SUS 317   |
| 3171  |        | 1.4435               | X2CrNiMo1812       | 317S12                   |                      |                   |            |                      |              | 03Ch17N14M2  |           |                 |                     |           |                     |      |                     |                  |                               |             |              | SUS 317L  |
| 321   | 30321  | 1.4541               | X10CrNiTi189       | 321S20                   |                      |                   | OH18N9T    | 3583                 | 7TNC180      | 1Kh18NIOT    | 2337      | 17248           | 4360                | K036/K037 | 6738                | 18   | 7143                | X8CrNiTi18.10    | 8940                          | Z10CNT18-11 |              | SUS321    |
|       |        |                      |                    | 321S12                   | 58B&58               | 86020             | OH18N10T   |                      |              |              |           |                 |                     |           |                     |      |                     |                  |                               | 26CNT18-11  | X6CrNiTi1811 |           |
| 347   | 30347  | 1.4550               | X10CrNiNb189       | 347S17                   | 58F&58G              | 86020             | OH18N12Nb  | 3583                 | 7NbNC180     | 08KM8N12B    | 2338      |                 | 4360                | K034      |                     |      |                     |                  |                               | Z6CNNb18-11 | X8CrNiNb1811 | SUS 347   |
| 403   | 51403  | 1.4006               | X10Cr13            | 403S17                   |                      |                   |            | 3583                 | 12C130       | 12Kh13       | 2302      | 17021           | 4360                | K02       | 6738                | 4    | 7143                | X10Cr13          | 4640                          |             |              |           |

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