



# EC-CERTIFICATE

(Full quality assurance system)



This is to certify that the company

## REDA Instrumente GmbH

Gänsäcker 34  
78532 Tuttlingen  
Germany

has implemented and maintains a full quality assurance system which applies to the products at every stage from design to final controls.

Through an audit, documented in a report, performed by DQS Medizinprodukte GmbH, it was verified that the management system fulfills the requirements of

## Annex II – excluding Section 4 of Council Directive 93/42/EEC concerning medical devices

with respect to the following medical devices:

Traumatological Implants and Instruments for HF-Surgery, Endoscopes and accessories according annex.

The manufacturer is subject to surveillance according to Annex II, Section 5. The CE marking with the Notified Body Identification Number (0297) may be affixed on the devices listed in the certificate. An EC Design Examination Certificate according to Annex II, Section 4 is required for class III devices covered by this certificate. The certificate is in the case of class I(s) devices (I(s) = class I products placed on the market in sterile conditions) limited to the aspects of manufacture concerned with securing and maintaining sterile conditions. The certificate is in the case of class I(m) devices (I(m) = class I devices with a measuring function) limited to the aspects of manufacture concerned with the conformity of the products with the metrological requirements.

|                              |            |
|------------------------------|------------|
| Certificate registration no. | 070894 MR2 |
| Certificate unique ID        | 170742825  |
| Effective date               | 2019-03-18 |
| Expiry date                  | 2023-05-07 |
| Frankfurt am Main            | 2019-03-18 |

## DQS Medizinprodukte GmbH

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Managing Director

Dr. Thomas Feldmann  
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DQS Medizinprodukte GmbH is a Notified Body according to Council Directive 93/42/EEC concerning medical devices with the Identification Number 0297.



**Annex to certificate**  
**Certificate registration No.: 070894 MR2**  
**Certificate unique ID: 170742825**  
**Effective date: 2019-03-18**

## **REDA Instrumente GmbH**

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78532 Tuttlingen  
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| <b>Device family</b>       | <b>Device</b>                      | <b>UMDNS</b> | <b>Class</b> |
|----------------------------|------------------------------------|--------------|--------------|
| Traumatological Implants   | Bone screws                        | 16-101       | I Ib         |
|                            | Bone wires                         | 16-104       | I Ib         |
| Instrumente for HF-surgery | <b>Monopolar and Bipolar</b>       |              |              |
|                            | HF-Electrode                       | 16-860       | I Ib         |
|                            | HF-Adapters                        | 11-494       | I Ib         |
|                            | Electrode Holders                  | 11-497       | I Ib         |
|                            | Electrodes active, foot controlled | 16-206       | I Ib         |
| Endoscopes and accessories | Endoscopes                         | 11-274       | I Ia         |
|                            | Laparoscope                        | 12-291       | I Ia         |
|                            | Thoracoscope                       | 14-047       | I Ia         |
|                            | Cystoscope                         | 17-145       | I Ia         |
|                            | Uretorenoscope                     | 17-690       | I Ia         |
|                            | Nephroscope                        | 15-290       | I Ia         |
|                            | Arthroscope                        | 10-198       | I Ia         |



# CERTIFICATE



This is to certify that the company

## REDA Instrumente GmbH

Gänsäcker 34  
78532 Tuttlingen  
Germany

has implemented and maintains a **Quality Management System**.

### Scope:

Manufacture Development and distribution of non-sterile surgical instruments, sterilization containers, ENT, dental, neuro- and ophthalmology instruments as well as non-sterile active and inactive medical products for endoscopy, orthopedics, HF electrodes and accessories as well as non-sterile implants for traumatology.

Through an audit, documented in a report, performed by DQS Medizinprodukte GmbH, it was verified that the management system fulfills the requirements of the following standard:

**DIN EN ISO 13485 : 2016 + AC : 2017-07**  
**EN ISO 13485 : 2016 + AC : 2016**  
**ISO 13485 : 2016**

|                              |               |
|------------------------------|---------------|
| Certificate registration no. | 070894 MP2016 |
| Certificate unique ID        | 170775706     |
| Effective date               | 2021-05-17    |
| Expiry date                  | 2024-05-16    |
| Frankfurt am Main            | 2021-04-30    |



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**Konformitätserklärung  
Declaration of Conformity**

**REDA INSTRUMENTE GMBH**

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Fax: +49 (0)74 62 / 9445-20  
e-Mail: info@reda-instrumente.de

erklärt hiermit unter eigener Verantwortung, dass alle Artikel der Produktgruppe  
*herewith declare under our own responsibility, that all items of the product group*

**Instrumente und Geräte für die Chirurgie der Klasse I, IIa + IIb**

gemäß unseren Katalogen Standard Chirurgische Instrumente, Titan Instrumente, HF Monopolar und Bipolar,  
Neuro Chirurgie Instrumente, Dental Instrumente,  
Steril Container, Endoskope und Zubehör für flexible und starre Endoskopie

**Instruments and Equipment for surgery of Class I, IIa + IIb**

in refer to our catalogues General Surgical Instruments, Titanium Instruments, Neuro Surgery Instruments, Dental  
Instruments, HF Monopolar and Bipolar,  
Sterilization Containers, Endoscopes and Accessories for flexible and rigid Endoscopy

klassifiziert gemäß RL 93/42/EWG (M5), Anhang IX, Regel 1, 6, 7 und 11 in Risikoklasse I, IIa + IIb  
*classified according to MDD 93/42/EEC (M5) annex IX rule 1, 6, 7 and 11 into risk class I, IIa + IIb*

unter Berücksichtigung folgender Richtlinie gefertigt wurden:  
*have been manufactured under consideration of following Council Directive:*

**EG-Richtlinie 93/42/EWG (M5)  
European Medical Device Directive 93/42/EEC (M5)**

Angewandtes Konformitätsbewertungsverfahren nach Richtlinie 93/42/EWG (M5), Anhang II.

Die gelisteten Produkte sind konform mit den Grundlegenden Anforderungen des Anhang I der EG-Richtlinie  
93/42/EWG (M5) und werden somit

mit **CE** bzw. **CE0297** gekennzeichnet, von uns in Verkehr gebracht

Das Konformitätsbewertungsverfahren der Klassen IIa und IIb wurde durch unsere Benannte Stelle DQS GmbH,  
Frankfurt, Notified Body Code 0297 durchgeführt.

*Applied conformity assessment according Annex II of MDD 93/42/EEC (M5).*

*The listed products are conform to the essential requirements of the Medical Device Directive 93/42/EEC (M5)  
Annex I and are therefore placed into market*

with **CE** or with **CE0297** by us.

*The conformity assessment for class IIa and IIb has been performed by our notified body DQS GmbH, Frankfurt,  
notified body code 0297.*

**Tuttlingen, February 2020**



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Regina Hehl  
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Managing Director



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Thomas Bends  
Quality Manager



The Global Language of Business

# 2019

## Participation in the global GS1 system

GS1 Germany hereby confirms  
that the company

**REDA Instrumente GmbH**

**Tuttlingen**

is part of the global GS1 System with the  
Global Location Number (GLN):

**40 63058 00000 8**

The GLN ensures the uniqueness of the licensee and  
entitles him to use the GS1 Standards in all  
business processes.

GS1 Identification Standards:  
GTIN (Global Trade Item Number),  
SSCC (Serial Shipping Container Code), etc.

GS1 Data Carrier Standards:  
EAN-13, GS1-128, GS1 DataMatrix, etc.

GS1 Communication Standards:  
EANCOM®, GS1 XML, EPCIS, etc.

The GS1 Standards comply, among other things,  
with the following international rules: ISO 9735,  
ISO/IEC 15418, ISO/IEC 15459, ISO/IEC 18000-3,  
ISO/IEC 18000-6. The GS1 Codes also meet  
symbology standards of ISO, EN and DIN.

Therefore, the optimum conditions required for the  
seamless cross-company, transnational and  
industry-wide exchange of data and goods along  
the value chain are met.

GS1 Germany – as a member of the international  
GS1 community – represents the worldwide  
applicable GS1 Standards for the German market.

Cologne, 21/01/2019

A handwritten signature in blue ink, appearing to read 'Thomas Fell'.

Thomas Fell  
GS1 Germany GmbH

# CERTIFICATE



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

| <b>STRUMENTI<br/>Instruments</b>  | <b>MATERIALE<br/>Material</b>                             | <b>DIN<br/>EN 10088-1</b>            | <b>DUREZZA<br/>Hardness Rockwell</b>                |
|---|---|--------------------------------------|---|
| Pinza emostatica<br>Forceps   | X15Cr13<br>X20Cr13<br>X5CrN 189<br>XSCrNMO 1810           | 1.4024<br>1.4021<br>1.4301<br>1.4401 | 40-48 HRC<br>42-50 HRC<br>>=185 HV10<br>>= 185 HV10 |
| Forbici<br>Scissors   | X38CrMO V 15<br>X45CMo V 15<br>X20Cr13<br>X5CrNMO 1810    | 1.4117<br>1.4116<br>1.4021<br>1.4401 | 50-58 HRC<br>50-58 HRC<br>42-50 HRC<br>>=250 HV 10  |
| Portaghi<br>Needle holders  | X15Cr13<br>X20Cr13<br>X5CrNMO 1810                        | 1.4024<br>1.4021<br>1.4401           | 40-48 HRC<br>42-50 HRC<br>>=250 HV10                |
| Pinze/forbici per ossa<br>Bone forceps and bone scissors                  | X40 Cr 13<br>X35 CrMoV 15<br>X45 CrMoV 15                 | 1.4034<br>1.4117<br>1.4116           | 50-58 HRC<br>50-58 HRC<br>50-58 HRC                 |
| Bisturi<br>Scalpel handles  | Inox steel  | S                                    | 50-58 HRC   |
| Divaricatori<br>Retractors  | X5CrNMO 1810<br>X15Cr13<br>X15Cr 13                       | 1.4401<br>1.4024<br>1.4021           | >=185 HV10<br>40-48 HRC<br>42-50 HRC                |
| Pinze per dissezione<br>Ligature Conductors                               | X 12CrNS 18 8<br>X15Cr 13<br>X20Cr 13                     | 1.4305<br>1.4024<br>1.4021           | >=185 HV10<br>40-48 HRC<br>42-50 HRC                |
| Curette/Curette per ossa<br>tagliente<br>Curettes / bone curettes cutting | G-X35 CrMo 17<br>X40 Cr13<br>X38 CrMoV 15<br>X45 CrMoV 15 | 1.4122<br>1.4034<br>1.4117<br>1.4116 | 50-58 HRC<br>50-58 HRC<br>50-58 HRC<br>50-58 HRC    |
| Pinze per estrazione<br>Extraction forceps                                | X20 Cr13  | 1.4021                               | 42-50 HRC   |
| Leva per ossa<br>Bone levers  | X40 Cr13<br>X38 CrMoV 15<br>X45 CrMoV 15                  | 1.4034<br>1.4117<br>1.4116           | 50-58 HRC<br>50-58 HRC<br>50-58 HRC                 |



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**Grades**

The standard gives each steel grade a 'Reference Letter', with only cross references to ISO 4957 and ISO 683-13 standard grades. There are 11 martensitic steels, 1 ferritic steel and 4 austenitic steels in Table 2 of the standard. Most instrument manufacturers regard these stainless steel grades as generic and tend to also refer to European or national standards.

The compositions are summarized below.

Long service lives should be expected from martensitic stainless steel dental and surgical instruments, properly manufactured and subjected to appropriate cleaning procedures. For example, dental extraction forceps usually have an average service life of 15 years. There are some examples where such instruments have given 30 years service life. Other more delicate instruments and those with cutting edges may be expected to have a much shorter service lives, but they should not be expected to suffer corrosion damage.

**Corrosion resistance**

Corrosion problems associated with martensitic stainless steels tend to be related to either process deficiencies or substances encountered in clinical practice. Process deficiencies include incorrect heat treatment (usually apparent from the distribution of carbides in the microstructure), iron contamination from grinding/finishing operations, over-heating during grinding operations or selection of an inappropriate grade.

**Corrosion testing**

Most of the ISO product standards for dental and surgical instruments refer to ISO 13402, which specifies corrosion tests based on the methods of sterilisation commonly encountered by these products. Martensitic stainless steels should meet the requirement of ISO product standards with ease (ie resistance to autoclaving, corrosion and thermal exposure).

**Sterilization practice**

Corrosion problems associated with clinical practice tend to be associated with contact with aggressive substances (eg chloride-containing disinfectants) and/or inappropriate exposure times to such substances. For example, steam sterilisers (autoclaves) should use distilled, de-ionised or sterile water and not tap water for sterilisation or there is a risk of corrosion.

Prior to sterilisation, contaminated instruments may be soaked in a disinfectant. On one occasion, neat Milton solution (approx. 16% sodium chloride) was used and the instruments were soaked over a weekend. Extensive corrosion occurred in this case.

**Tabelle 4 — Nichtrostender Stahl**

| Referenzbuchstabe nach Tabelle 1 | Werkstoffnummer nach EN 10088-1:2014 | Werkstoffkurzbezeichnung nach EN 10088-1:2014 | Härte in Rockwell (HRC) ISO 6508-1 | Härte in Vickers HV5/HV10 <sup>a</sup> ISO 6507-1 | Stahlsorte           |
|----------------------------------|--------------------------------------|---|------------------------------------|---|----------------------|
| <i>b</i>                         | 1.4006                               | X12Cr13                                       | 35                                 | 360   | martensitisch        |
| <i>e</i>                         | 1.4016                               | X6Cr17  | N.A.                               | N.A.  | ferritisch           |
| <i>a</i>                         | 1.4021                               | X20Cr13                                       | 42 - 50                            | 420 - 530   | martensitisch        |
| <i>b</i>                         | 1.4024                               | X15Cr13                                       | 40 - 48                            | 400 - 500   | martensitisch        |
| <i>g</i>                         | 1.4028                               | X30Cr13                                       | 49 - 55                            | 510 - 620   | martensitisch        |
| <i>c</i>                         | 1.4034                               | X46Cr13                                       | 50 - 58                            | 530 - 675   | martensitisch        |
| <i>m</i>                         | 1.4037                               | X65Cr13                                       | 57 - 61                            | 650 - 750   | martensitisch        |
| <i>d</i>                         | 1.4057                               | X20CrNi16-2                                   | 40 - 48                            | 400 - 500   | martensitisch        |
| <i>e</i>                         | 1.4104                               | X14CrMoS17                                    | 30                                 | 310   | martensitisch        |
| <i>e</i>                         | 1.4105                               | X6CrMoS17                                     | N.A.                               | N.A.  | ferritisch           |
| <i>q</i>                         | (1.4108) <sup>b</sup>                | X30CrMoN15-1                                  | 54 - 59                            | 590 - 700   | martensitisch        |
| <i>p</i>                         | 1.4109                               | X70CrMo15                                     | 55 - 60                            | 610 - 720   | martensitisch        |
| <i>f</i>                         | 1.4112                               | X90CrMoV18                                    | 52 - 60                            | 545 - 720   | martensitisch        |
| <i>g</i>                         | 1.4116                               | X50CrMoV15                                    | 50 - 58                            | 530 - 675   | martensitisch        |
| <i>h</i>                         | 1.4117 <sup>b</sup>                  | X38CrMoV15                                    | 50 - 58                            | 530 - 675   | martensitisch        |
| <i>f</i>                         | (1.4121) <sup>b</sup>                | X22CrMoNiS13-1                                | 48 - 54                            | 500 - 600   | martensitisch        |
| <i>c</i>                         | 1.4122                               | X39CrMo17-1                                   | 50 - 58                            | 530 - 675   | martensitisch        |
| <i>f</i>                         | 1.4123                               | X40CrMoVN16-2                                 | 52 - 57                            | 560 - 660   | martensitisch        |
| —                                | 1.4125                               | X105CrMo17                                    | 54 - 60                            | 590 - 720   | martensitisch        |
| <i>f</i>                         | 1.4197 <sup>c</sup>                  | X22CrMoNiS13-1                                | 48 - 54                            | 500 - 600   | martensitisch        |
| <i>i</i>                         | 1.4301                               | X5CrNi18-10                                   | N.A.                               | N.A.  | austenitisch         |
| <i>j</i>                         | 1.4305                               | X8CrNiS18-9                                   | N.A.                               | N.A.  | austenitisch         |
| <i>k</i>                         | 1.4310                               | X10CrNi18-8                                   | N.A.                               | N.A.  | austenitisch         |
| <i>l</i>                         | 1.4401                               | X5CrNiMo17-12-2                               | N.A.                               | N.A.  | austenitisch         |
| <i>m</i>                         | 1.4441                               | X2CrNiMo18-15-3                               | N.A.                               | N.A.  | austenitisch         |
| <i>o</i>                         | 1.4542                               | X5CrNiCuNb 16-4                               | wählbar                            | wählbar   | ausscheidungshärtend |
| <i>p</i>                         | 1.4543                               | X3CrNiTiNb 12-9                               | wählbar                            | wählbar   | ausscheidungshärtend |

<sup>a</sup> Die Umwandlung von Rockwellhärte in Vickershärte erfolgt wie in ISO 18265:2003, Tabelle A.1, angegeben. Zum berechneten HV5/HV10-Wert wird 1 HRC (Wert beruht auf Erfahrungen mit nichtrostendem Stahl) addiert.

<sup>b</sup> Nicht in EN 10088-1 enthalten. Wenn die Materialnummer in Klammern angegeben ist, war das Material nur in der Stahl-Eisen-Liste enthalten.

<sup>c</sup> Historische Materialnummern, die in verschiedenen Anwendungsbereichen als 1.4121 verwendet werden, sich aber auf das gleiche Material beziehen (als 1.4121). 1.4197 wird für rotierende Instrumente verwendet.



**INSTRUMENTE GMBH**

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**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

|                |                   |                        |                       |
|----------------|-------------------|------------------------|-----------------------|
| <b>Quality</b> | <b>X50CrMoV15</b> | <b>Martensitic</b>     | <i>Technical card</i> |
| Number         | <b>1.4116</b>     | <b>Stainless Steel</b> | <i>Lucefin Group</i>  |

**Chemical composition**

| C%        | Si%         | Mn%         | P%           | S% <sup>a)</sup> | Cr%       | Mo%       | V%        |                  |
|-----------|-------------|-------------|--------------|------------------|-----------|-----------|-----------|------------------|
| 0,45-0,55 | max<br>1,00 | max<br>1,00 | max<br>0,040 | max<br>0,015     | 14,0-15,0 | 0,50-0,80 | 0,10-0,20 | EN 10088-1: 2005 |
| ± 0.02    | + 0.05      | + 0.03      | + 0.005      | + 0.003          | ± 0.15    | ± 0.05    | ± 0.03    |                  |

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                           | Full annealing     | Soft annealing          | MMA welding – AWS electrodes  |
|---|---------------------------------------|--------------------|-------------------------|---|
| 1480-1460   | 1100-900                              | 930-870<br>furnace | 850-750<br>slow cooling | pre-heating<br>260<br>annealing after w.<br>760-740   |
| Isothermal annealing                              | Quenching                             | Tempering          | Stress-relieving        | joint with steel  |
| 910-890 controlled<br>cooling to<br>750, then air | 1030-980<br>oil / polymer<br>(HRC 55) | 500-400<br>air     | 250-150<br>air          | carbon<br>E70 xx<br>CrMo alloyed<br>E8018-B 2<br>stainless<br>E309 – E308<br>cosmetic welding<br>E309 |

Transformation temperature during heating **Ac<sub>1</sub>** ~ 880, **Ac<sub>3</sub>** ~ 920 and during cooling **Ms** ~ 280, **Mf** ~ 120

**Mechanical properties**

Hot-formed EN 10088-3: 2005 in conditions 1C, 1E, 1D, 1X, 1G, 2D

| size | Testing at room temperature |                   |                       |           |                  |     |                                    |
|------|-----------------------------|-------------------|-----------------------|-----------|------------------|-----|------------------------------------|
| mm   | R                           | Rp 0.2            | A%                    | Kv +20 °C | HB <sup>a)</sup> |     | <sup>a)</sup> for information only |
| from | to                          | N/mm <sup>2</sup> | N/mm <sup>2</sup> min | min       | J min            | max |                                    |
|      |                             | 900 max           |                       |           |                  | 280 | +A annealed material               |

Table of tempering values at room temperature after quenching at 990 °C in oil

|              |            |            |            |            |            |            |            |            |            |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| HB           | 543        | 518        | 512        | 518        | 512        | 525        | 496        | 381        | 301        |
| HRC          | 54         | 52,5       | 52         | 52,5       | 52         | 53         | 51         | 41         | 32         |
| Tempering °C | <b>200</b> | <b>250</b> | <b>300</b> | <b>350</b> | <b>400</b> | <b>450</b> | <b>500</b> | <b>550</b> | <b>600</b> |

|                                |                                    |                             |             |            |            |            |            |            |            |
|--------------------------------|------------------------------------|-----------------------------|-------------|------------|------------|------------|------------|------------|------------|
| Thermal expansion              | 10 <sup>-6</sup> · K <sup>-1</sup> | ▶                           | 10.5        | 11.0       | 11.0       | 11.5       |            |            |            |
| Modulus of elasticity          | longitudinal                       | GPa                         | 215         | 212        | 205        | 200        | 190        |            |            |
| Poisson number                 |                                    | ν                           | 0,27-0,30 ~ |            |            |            |            |            |            |
| Electrical resistivity         |                                    | Ω · mm <sup>2</sup> /m      | 0.65        |            |            |            |            |            |            |
| Electrical conductivity        |                                    | Siemens · m/mm <sup>2</sup> | 1.54        |            |            |            |            |            |            |
| Specific heat                  |                                    | J/(Kg · K)                  | 460         |            |            |            |            |            |            |
| Density                        |                                    | Kg/dm <sup>3</sup>          | 7.70        |            |            |            |            |            |            |
| Thermal conductivity           |                                    | W/(m · K)                   | 30          |            |            |            |            |            |            |
| Relative magnetic permeability |                                    | μ <sub>r</sub>              | 700 ~       |            |            |            |            |            |            |
| Temperature                    |                                    | °C                          | <b>20</b>   | <b>100</b> | <b>200</b> | <b>300</b> | <b>400</b> | <b>600</b> | <b>800</b> |

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

| Corrosion resistance | Atmospheric                     | Chemical                                       |  |
|----------------------|---------------------------------|--|--|
| Fresh water          | <i>industrial</i> <i>marine</i> | <i>medium</i> <i>oxidizing</i> <i>reducing</i> | x steam, petroleum, gasoline, alcohol, ammonia, organic material |
| <b>x</b>             |                                 | <b>x</b>                                       |  |

|                            |              |
|----------------------------|--------------|
| Magnetic                   | yes          |
| Machinability              | mean         |
| Hardening                  | by quenching |
| Service temperature in air | up to 760 °C |

| Europe     | USA | USA  | China   | Russia   | Japan      | India | Republic of Korea |
|------------|-----|------|---------|----------|------------|-------|-------------------|
| EN         | UNS | ASTM | GB      | GOST     | JIS        | IS    | KS                |
| X50CrMoV15 |     |      | (7Cr17) | 50Ch14MF | (SUS 440A) |       |                   |





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|                |                |  |  |  |  |                        |
|----------------|----------------|--|--|--|--|------------------------|
| <b>Quality</b> | <b>X46Cr13</b> |  |  |  |  | <b>Martensitic</b>     |
| <b>Number</b>  | <b>1.4034</b>  |  |  |  |  | <b>Stainless Steel</b> |

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GRUPPO  
 LUCEFIN  
 Luvini Steel

**Chemical composition**

| C%        | Si%    | Mn%    | P%      | S% <sup>a)</sup> | Cr%       |                  |
|-----------|--------|--------|---------|------------------|-----------|------------------|
| 0,43-0,50 | 1,00   | 1,00   | 0,040   | 0,015            | 12,5-14,5 | EN 10088-1: 2014 |
| ± 0.02    | + 0.05 | + 0.03 | + 0.005 | + 0.003          | ± 0.15    |                  |

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    | Recrystallization +RA         | Soft annealing +A                     | MMA welding – AWS electrodes  |
|-------------------------------------|----------------|-------------------------------|---------------------------------------|---|
| 1480-1470                           | 1180-930       | not suitable                  | 850-750 slow cooling to 600, then air | pre-heating<br>250-200<br>annealing after w.<br>750                                     |
| Quenching +Q                        | Tempering +T   | Stress-relieving +SR          | Stress-relieving +SR after +C         | joint with steel  |
| 1050-950<br>oil / air<br>(HRC 50 ~) | 700-650<br>air | 200<br>fast cooling<br>in air | 650-600<br>furnace cooling            | carbon CrMo alloyed stainless<br>E70 xx E8016-B 2 E309-E308<br>cosmetic welding<br>E420 |

Transformation temperature during heating **Ac1** ~ 805, **Ac3** ~ 870 and during cooling **Ms** ~ 280, **Mf** ~ 130

**Chemical treatment** • Pickling (20 - 50% HNO<sub>3</sub>) hot or 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%  | Kv +20 °C | HB <sup>a)</sup> | <sup>a)</sup> for information only |
| from to | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min | J min     | max              |                                    |
|         | 800 max                     |                       |     |           | 245              | +A annealed material               |
| 160     | 850-1000                    | 650                   | 10  | 12        |                  | +QT850 quenched and tempered       |

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

| size    | Testing at room temperature |                  |                   |                       |     |           |    |
|---------|-----------------------------|------------------|-------------------|-----------------------|-----|-----------|----|
| mm      | R                           | HB <sup>a)</sup> | R                 | Rp 0.2                | A%  | Kv +20 °C |    |
| from to | N/mm <sup>2</sup> max       | max              | N/mm <sup>2</sup> | N/mm <sup>2</sup> min | min | J min     |    |
|         | 10 <sup>b)</sup>            | 950              | 305               | 900-1150              | 700 | 7         |    |
| 10      | 16                          | 950              | 305               | 900-1150              | 700 | 7         |    |
| 16      | 40                          | 900              | 280               | 850-1100              | 650 | 8         | 12 |
| 40      | 63                          | 840              | 260               | 850-1000              | 650 | 8         | 12 |
| 63      | 160                         | 800              | 245               | 850-1000              | 650 | 10        | 12 |

<sup>a)</sup> for information only  
<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

**Table of tempering** values at room temperature after quenching at 990 °C in oil

| HB           | 543 | 518  | 512 | 518  | 512 | 525 | 496 | 381 | 301 |
|--------------|-----|------|-----|------|-----|-----|-----|-----|-----|
| HRC          | 54  | 52,5 | 52  | 52,5 | 52  | 53  | 51  | 41  | 32  |
| Tempering °C | 200 | 250  | 300 | 350  | 400 | 450 | 500 | 550 | 600 |

**Magnetic** yes  
**Machinability** good after annealing  
**Hardening** by quenching  
**Service temperature in air** continuous service up to 650 °C; intermittent service up to 750 °C

| Europe  | USA      | USA   | China | Russia  | Japan | India | Republic of Korea |
|---------|----------|-------|-------|---------|-------|-------|-------------------|
| EN      | UNS      | ASTM  | GB    | GOST    | JIS   | IS    | KS                |
| X46Cr13 | (S42000) | (420) |       | (4Ch13) |       |       |                   |




INSTRUMENTE GMBH

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

|                |                |                        |
|----------------|----------------|------------------------|
| <b>Quality</b> | <b>X20Cr13</b> | <b>Martensitic</b>     |
| <b>Number</b>  | <b>1.4021</b>  | <b>Stainless Steel</b> |

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**Chemical composition**

| C%        | Si%         | Mn%         | P%           | S% <sup>a)</sup> | Cr%       |                  |
|-----------|-------------|-------------|--------------|------------------|-----------|------------------|
| 0,16-0,25 | max<br>1,00 | max<br>1,50 | max<br>0,040 | max<br>0,015     | 12,0-14,0 | EN 10088-1: 2014 |
| ± 0.01    | + 0.05      | + 0.04      | + 0.005      | + 0.003          | ± 0.15    |                  |

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                               | Subcritical annealing             | Soft annealing +A    | Full annealing                                 | MMA welding – AWS electrodes   |
|--|---|-----------------------------------|----------------------|--|--|
| 1510-1460                                      | 1200-930                                  | 790-730<br>air                    | 825-745<br>air       | 900-870 cooling<br>15 °C/h to 590,<br>then air | pre-heating annealing after w.<br>250-200 750                              |
| Isothermal annealing +I                        | Quenching +Q                              | Tempering +T                      | Stress-relieving +SR |  | joint with steel<br>carbon CrMo alloyed stainless<br>E60 xx E8018-B 2 E309 |
| 885-830 cooling<br>30 °C/h to 705,<br>then air | 1050-950<br>oil/polymer/air<br>(HRC 46 ~) | 700-650<br>fast cooling<br>in air | 250-150<br>air       |  | cosmetic welding<br>E420 – E410  |

Transformation temperature during heating **Ac1** ~ 790, **Ac3** ~ 850 and during cooling **Ms** ~ 240, **Mf** ~ 90

**Chemical treatment** • Pickling (20 - 50% HNO<sub>3</sub>) hot or 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%  | Kv +20 °C | HB <sup>a)</sup> | <sup>a)</sup> for information only |
| from | to      | N/mm <sup>2</sup>           | N/mm <sup>2</sup> min | min | J min     | max              |                                    |
|      |         | 760 max                     |                       |     |           | 230              | +A annealed                        |
| 160  | 700-850 | 500                         | 13                    | 25  |           |                  | +QT700 quenched and tempered       |
| 160  | 800-950 | 600                         | 12                    | 20  |           |                  | +QT800 quenched and tempered       |

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

| size |                  | Testing at room temperature |                  |                                       |                       |     |           |
|------|------------------|-----------------------------|------------------|---------------------------------------|-----------------------|-----|-----------|
| mm   |                  | R                           | HB <sup>a)</sup> | R                                     | Rp 0.2                | A%  | Kv +20 °C |
| from | to               | N/mm <sup>2</sup>           | max              | N/mm <sup>2</sup>                     | N/mm <sup>2</sup> min | min | J min     |
| 10   | 10 <sup>b)</sup> | 910                         | 290              | 750-1000                              | 600                   | 8   |           |
| 10   | 16               | 910                         | 290              | 750-1000                              | 550                   | 8   |           |
| 16   | 40               | 850                         | 260              | 700-950                               | 500                   | 10  | 25        |
| 40   | 63               | 800                         | 230              | 700-900                               | 500                   | 12  | 25        |
| 63   | 160              | 760                         | 220              | 700-850                               | 500                   | 13  | 25        |
|      |                  | +A annealed material        |                  | +QT700 quenched and tempered material |                       |     |           |

<sup>a)</sup> for information only

<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

| Corrosion resistance | Atmospheric |                   | Chemical |           |          | x aggressive atmosphere lacking chlorine-derived substances |
|----------------------|-------------|-------------------|----------|-----------|----------|---|
|                      | Fresh water | industrial marine | medium   | oxidizing | reducing |   |
| x                    |             |                   |          |           |          |   |

|                                   |  |
|-----------------------------------|--|
| <b>Magnetic</b>                   | yes  |
| <b>Machinability</b>              | good   |
| <b>Hardening</b>                  | by quenching   |
| <b>Service temperature in air</b> | continuous service up to 650 °C; intermittent service up to 750 °C |


| Europe  | USA      | USA   | China | Russia | Japan     | India | Republic of Korea |
|---------|----------|-------|-------|--------|-----------|-------|-------------------|
| EN      | UNS      | ASTM  | GB    | GOST   | JIS       | IS    | KS                |
| X20Cr13 | (S42000) | (420) | 2Cr13 | 20Ch13 | SUS 420J1 |       | STS 420J1         |

AISI 420 steel - T.T.T. diagram (Transformation – Time – Temperature)



**INSTRUMENTE GMBH**


**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

|  |                                   |  |  |  |  |  |                          |
|--|-----------------------------------|--|--|--|--|--|--------------------------|
| <b>Quality</b>   | <b>X46CrS13</b>                   |  | <b>Martensitic</b>                       |  | <br><small>TECHNICAL CARD<br/>         GRUPPO LUCEFIN<br/>         REVISION 2015<br/>         ALL RIGHTS RESERVED</small> |  |                          |
| <b>Number</b>  | <b>1.4035</b>                     |  | <b>Stainless Steel</b>                   |  |  |  |                          |
| <b>Chemical composition</b>  |                                   |  |  |  |  |  |                          |
| <b>C%</b>  | <b>Si%</b>                        | <b>Mn%</b>   | <b>P%</b>                                | <b>S%</b>  | <b>Cr%</b>   | EN 10088-1: 2014   |                          |
| 0,43-0,50  | max<br>1,00                       | max<br>2,00  | max<br>0,040                             | 0,15-0,35  | 12,5-14,0  |  |                          |
| ± 0.02   | + 0.05                            | + 0.04   | + 0.005                                  | ± 0.02   | ± 0.15   |  |                          |
| Product deviations are allowed   |                                   |  |  |  |  |  |                          |
| <b>Temperature °C</b>  |                                   |  |  |  |  |  |                          |
| <b>Melting range</b>   | <b>Hot-forming</b>                | <b>Recrystallization<br/>+RA</b>                                   | <b>Soft annealing<br/>+A</b>             | <b>MMA welding – AWS electrodes</b>                    |  |  |                          |
| 1480-1460  | 1100-930                          | not suitable   | 850-750 slow cooling<br>to 600, then air | pre-heating      annealing after w.<br>not recommended |  |  |                          |
| <b>Quenching<br/>+Q</b>  | <b>Tempering<br/>+T</b>           | <b>Stress-relieving<br/>+SR</b>                                    | <b>joint with steel</b>                  |  |  |  |                          |
| 1050-950<br>oil / air  | 675-625<br>fast cooling<br>in air | 200<br>air   | carbon      CrMo alloyed      stainless  |  |  |  |                          |
| Transformation temperature during heating <b>Ac<sub>1</sub></b> ~ 805, <b>Ac<sub>3</sub></b> ~ 870 and during cooling <b>Ms</b> ~ 280, <b>Mf</b> ~ 130   |                                   |  |  |  |  |  |                          |
| <b>Chemical treatment</b> • Pickling (20 - 50% HNO <sub>3</sub> ) hot or cold  |                                   |  |  |  |  |  |                          |
| <b>Mechanical properties</b>   |                                   |  |  |  |  |  |                          |
| <b>Heat-treated material</b> EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D   |                                   |  |  |  |  |  |                          |
| size   | Testing at room temperature       |  |  |  |  |  |                          |
| mm   | <b>R</b>                          | <b>Rp 0.2</b>  | <b>A%</b>                                | <b>Kv +20 °C</b>                                       | <b>HB<sup>a)</sup></b>   | <sup>a)</sup> for information only                             |                          |
| from    to   | N/mm <sup>2</sup>                 | N/mm <sup>2</sup> min  | min                                      | J min  | max  |  |                          |
| 63   | 800 max                           |  |  |  | 245  | +A annealed material   |                          |
| <b>Bright bars of heat-treated material</b> EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P  |                                   |  |  |  |  |  |                          |
| size   | Testing at room temperature       |  |  |  |  |  |                          |
| mm   | <b>R</b>                          | <b>Rp 0.2</b>  | <b>A%</b>                                | <b>Kv +20 °C</b>                                       |  |  |                          |
| from    to   | N/mm <sup>2</sup> max             | N/mm <sup>2</sup> min  | min                                      | J min  |  |  |                          |
| 10 <sup>b)</sup>   | 880                               | 280  |  |  |  |  |                          |
| 10   | 880                               | 280  |  |  |  |  |                          |
| 16   | 800                               | 250  |  |  |  |  |                          |
| 40   | 760                               | 230  |  |  |  |  |                          |
| +A annealed material   |                                   |  |  |  |  |  |                          |
| <sup>a)</sup> for information only   |                                   |  |  |  |  |  |                          |
| <sup>b)</sup> in the range 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 |                                   |  |  |  |  |  |                          |
| <b>Corrosion resistance</b>  |                                   | Atmospheric  |  | Chemical   |  | x weak acid, steam,<br>ammonia, petroleum,<br>organic material |                          |
| Fresh water  |                                   | industrial   | marine                                   | medium   | oxidizing    reducing  |  |                          |
| x  |                                   |  |  |  |  |  |                          |
| <b>Magnetic</b>  |                                   | yes  |  |  |  |  |                          |
| <b>Machinability</b>   |                                   | high   |  |  |  |  |                          |
| <b>Hardening</b>   |                                   | by quenching   |  |  |  |  |                          |
| <b>Service temperature in air</b>  |                                   | continuous service up to 600 °C; intermittent service up to 700 °C |  |  |  |  |                          |
| <b>Europe</b>  | <b>USA</b>                        | <b>USA</b>   | <b>China</b>                             | <b>Russia</b>  | <b>Japan</b>   | <b>India</b>   | <b>Republic of Korea</b> |
| EN   | UNS                               | ASTM   | GB                                       | GOST   | JIS  | IS   | KS                       |
| X46CrS13   |                                   |  |  |  |  |  |                          |



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

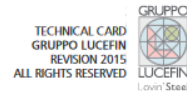
| Quality   | X14CrMoS17   |                                  | Martensitic Stainless Steel                         |  |                         |                                    |                          |
|---|--|----------------------------------|---|--|-------------------------|------------------------------------|--------------------------|
| Number  | 1.4104   |                                  |   |  |                         |                                    |                          |
| TECHNICAL CARD<br>GRUPPO LUCEFIN<br>REVISION 2015<br>ALL RIGHTS RESERVED  |  |                                  |   |  |                         |                                    |                          |
|    |  |                                  |   |  |                         |                                    |                          |
| <b>Chemical composition</b>   |  |                                  |   |  |                         |                                    |                          |
| C%  | Si%<br>max   | Mn%<br>max                       | P%<br>max   | S%   | Cr%                     | Mo%                                |                          |
| 0,10-0,17   | 1,00   | 1,50                             | 0,040   | 0,15-0,35  | 15,5-17,5               | 0,20-0,60                          |                          |
| ± 0.01  | + 0.05   | + 0.04                           | + 0.005   | ± 0.02   | ± 0.2                   | + 0.03                             |                          |
| Product deviations are allowed  |  |                                  |   |  |                         |                                    |                          |
| <b>Temperature °C</b>   |  |                                  |   |  |                         |                                    |                          |
| <b>Melting range</b>  | <b>Hot-forming</b>   | <b>Recrystallization +RA</b>     | <b>Soft annealing +A</b>                            | <b>MMA welding – AWS electrodes</b>  |                         |                                    |                          |
| 1510-1430   | 1100-930   | 790-710 cooling to 300, then air | 850-750 air   | pre-heating annealing after w. difficult; address qualified electrodes producers |                         |                                    |                          |
| <b>Isothermal annealing +I</b>  | <b>Quenching +Q</b>  | <b>Tempering +T</b>              | <b>joint with steel</b>                             |  |                         |                                    |                          |
| not suitable  | 1060-980 air/oil/ /polymer   | 650-550 fast cooling in air      | carbon CrMo alloyed stainless E309 E309 E309 – E308 |  |                         |                                    |                          |
| <b>cosmetic welding</b><br>E309   |  |                                  |   |  |                         |                                    |                          |
| <b>Chemical treatment</b> • Pickling (20 - 50% HNO <sub>3</sub> ) + (2 - 6% Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O) hot or cold  |  |                                  |   |  |                         |                                    |                          |
| <b>Mechanical properties</b>  |  |                                  |   |  |                         |                                    |                          |
| <b>Heat-treated material</b> EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D  |  |                                  |   |  |                         |                                    |                          |
| size  | Testing at room temperature  |                                  |   |  |                         |                                    |                          |
| mm  | <b>R</b>   | <b>Rp 0.2</b>                    | <b>A%</b>   | <b>Kv +20 °C</b>   | <b>HB <sup>a)</sup></b> | <sup>a)</sup> for information only |                          |
| from to   | N/mm <sup>2</sup>  | N/mm <sup>2</sup> min            | min   | J min  | max                     |                                    |                          |
|   | 730 max  |                                  |   |  | 220                     | +A annealed material               |                          |
| 60  | 650-850  | 500                              | 12  |  |                         | +QT650 quenched and tempered       |                          |
| 60 160  | 650-850  | 500                              | 10  |  |                         | +QT650 quenched and tempered       |                          |
| <b>Bright bars of heat-treated material</b> EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P   |  |                                  |   |  |                         |                                    |                          |
| size  | Testing at room temperature  |                                  |   |  |                         |                                    |                          |
| mm  | <b>R</b>   | <b>HB <sup>a)</sup></b>          | <b>R</b>  | <b>Rp 0.2</b>  | <b>A%</b>               | <b>Kv +20 °C</b>                   |                          |
| from to   | N/mm <sup>2</sup> max  | max                              | N/mm <sup>2</sup>                                   | N/mm <sup>2</sup> min  | min                     | J min                              |                          |
| 10 <sup>b)</sup>  | 880  | 280                              | 700-980   | 580  | 7                       |                                    |                          |
| 10 16   | 880  | 280                              | 700-980   | 530  | 7                       |                                    |                          |
| 16 40   | 800  | 250                              | 650-930   | 500  | 9                       |                                    |                          |
| 40 63   | 760  | 230                              | 650-880   | 500  | 10                      |                                    |                          |
| 63 100  | 730  | 220                              | 650-850   | 500  | 10                      |                                    |                          |
| +A annealed material  |  |                                  | +QT650 quenched and tempered                        |  |                         |                                    |                          |
| <sup>a)</sup> for information only  |  |                                  |   |  |                         |                                    |                          |
| <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 |  |                                  |   |  |                         |                                    |                          |
| <b>Magnetic</b>   | yes  |                                  |   |  |                         |                                    |                          |
| <b>Machinability</b>  | high   |                                  |   |  |                         |                                    |                          |
| <b>Hardening</b>  | by quenching, cold-drawn and and other cold plastic deformations   |                                  |   |  |                         |                                    |                          |
| <b>Service temperature in air</b>   | continuous service up to 740 °C; intermittent service up to 820 °C |                                  |   |  |                         |                                    |                          |
| <b>Europe</b>   | <b>USA</b>   | <b>USA</b>                       | <b>China</b>  | <b>Russia</b>  | <b>Japan</b>            | <b>India</b>                       | <b>Republic of Korea</b> |
| EN  | UNS  | ASTM                             | GB  | GOST   | JIS                     | IS                                 | KS                       |
| X14CrMoS17  |  |                                  | Y10Cr17   |  | SUS 430F                |                                    | STS 430F                 |



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

|                |                    |                        |
|----------------|--------------------|------------------------|
| <b>Quality</b> | <b>X5CrNi18-10</b> | <b>Austenitic</b>      |
| <b>Number</b>  | <b>1.4301</b>      | <b>Stainless Steel</b> |



**Chemical composition**

| C%     | Si%    | Mn%    | P%      | S% <sup>a)</sup> | Cr%       | Ni%      | N%     |
|--------|--------|--------|---------|------------------|-----------|----------|--------|
| max    | max    | max    | max     | max              |           |          | max    |
| 0,07   | 1,00   | 2,00   | 0,045   | 0,015            | 17,5-19,5 | 8,0-10,5 | 0,11   |
| ± 0.01 | + 0.05 | ± 0.04 | + 0.005 | + 0.003          | ± 0.2     | ± 0.1    | ± 0.01 |

EN 10088-1: 2014

Product deviations are allowed

<sup>a)</sup> for 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 - electrodes AWS  |
|-----------------|--------------|---|----------------------|-------------------|---|
| 1460-1400       | 1800-950     | 1120-1000 water                         | not necessary        | not suitable      | pre-heating post welding not necessary slow cooling                 |
| Sensitization   | Quenching +Q | Tempering +T                            | Stress-relieving +SR |                   | joint with steel  |
| not recommended | not suitable | not suitable                            | 430-350 air          |                   | carbon CrMo alloyed stainless E309-E308 E309-E308 E308 E308 - E308L |

**Chemical treatment** • Pickling (6 - 25% HNO<sub>3</sub>) + (0.5 - 8% HF) hot • Passivation 20 - 50% HNO<sub>3</sub> hot

**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 <sub>0.2</sub>     | A%      | A%      | Kv +20 °C | Kv +20 °C | HB <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              |                    |
| 160 250 | 500-700                     | 190                   | 45      |         | 100       |           | 215              | +AT solubilization |
| 160 250 | 500-700                     | 190                   |         | 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 <sub>0.2</sub>     | A%      | A%      | Kv +20 °C | Kv +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 16   | 600-950                     | 400                   | 25      |         |           |           |  | +AT solubilization |
| 16 40   | 600-850                     | 190                   | 30      |         | 100       |           |  |                    |
| 40 63   | 580-850                     | 190                   | 30      |         | 100       |           |  |                    |
| 63 160  | 500-700                     | 190                   | 45      |         | 100       |           |  |                    |
| 160 250 | 500-700                     | 190                   |         | 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


| <b>Corrosion resistance</b>       |  | Atmospheric |              | Chemical      |              |              | x nitric acid, weak organic acids, rural and urban atmospheres |
|-----------------------------------|--|-------------|--------------|---------------|--------------|--------------|--|
| Fresh water                       |  | industrial  | marine       | medium        | oxidizing    | reducing     |  |
| x                                 |  | x           |              | x             | x            |              |  |
| <b>Magnetic</b>                   | not  |             |              |               |              |              |  |
| <b>Machinability</b>              | high   |             |              |               |              |              |  |
| <b>Hardening</b>                  | cold-drawn and other cold plastic deformations                     |             |              |               |              |              |  |
| <b>Service temperature in air</b> | continuous service up to 850 °C; intermittent service up to 800 °C |             |              |               |              |              |  |
| <b>Europe</b>                     | <b>USA</b>   | <b>USA</b>  | <b>China</b> | <b>Russia</b> | <b>Japan</b> | <b>India</b> | <b>Republic of Korea</b>                                       |
| EN                                | UNS  | ASTM        | GB           | GOST          | JIS          | IS           | KS   |
| X5CrNi18-10                       | S30400   | (304)       | 0Cr18Ni9     | 07Ch18N10     |              | X04Cr19Ni9   |  |

Carbon - Chromium correlation



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

|  |                        |  |                        |                             |                          |                  |  |   |                  |
|--|------------------------|--|------------------------|-----------------------------|--------------------------|------------------|--|---|------------------|
| <b>Quality</b>   | <b>X5CrNiMo17-12-2</b> |  | <b>Austenitic</b>      |                             |                          |                  |  |   |                  |
| <b>Number</b>  | <b>1.4401</b>          |  | <b>Stainless Steel</b> |                             |                          |                  |  | TECHNICAL CARD<br>GRUPPO LUCEFIN<br>REVISION 2015<br>ALL RIGHTS RESERVED<br> |                  |
| <b>Chemical composition</b>  |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>C%</b>  | <b>Si%</b>             | <b>Mn%</b>                                     | <b>P%</b>              | <b>S% a)</b>                | <b>Cr%</b>               | <b>Ni%</b>       | <b>N%</b>  | <b>Mo%</b>  |                  |
| max  | max                    | max  | max                    | max                         |                          |                  | max  |   |                  |
| 0,07   | 1,00                   | 2,00   | 0,045                  | 0,015                       | 16,5-18,5                | 10,0-13,0        | 0,11   | 2,0-2,5   | EN 10088-1: 2014 |
| ± 0.01   | + 0.05                 | + 0.04   | + 0.005                | + 0.003                     | ± 0.2                    | ± 0.15           | ± 0.01   | ± 0.1   |                  |
| Product deviation are allowed  |                        |  |                        |                             |                          |                  |  |   |                  |
| a) 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 %              |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Temperature °C</b>  |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Melting range</b>   | <b>Hot-forming</b>     | <b>Solution annealing (Solubilization) +AT</b> |                        | <b>Stabilizing</b>          | <b>Soft annealing +A</b> |                  | <b>MMA welding – AWS electrodes</b>                            |   |                  |
| 1400-1380  | 1200-900               | 1100-1050<br>water                             |                        | unnecessary                 | not suitable             |                  | pre-heating post welding<br>not necessary slow cooling         |   |                  |
| <b>Sensitization</b>   | <b>Quenching +Q</b>    | <b>Tempering +T</b>                            |                        | <b>Stress relieving +SR</b> |                          |                  | joint with steel   |   |                  |
| sensitization test at 800-450  | not suitable           | not suitable                                   |                        | 450-200 furnace             |                          |                  | carbon   | CrMo alloyed  | stainless        |
|  |                        |  |                        |                             |                          |                  | E309-E308  | E309-E308   | E308             |
|  |                        |  |                        |                             |                          |                  | cosmetic welding   |   |                  |
|  |                        |  |                        |                             |                          |                  | E 316 or E 16-8-2  |   |                  |
| <b>Chemical treatment</b> • Pickling (6 - 25% HNO <sub>3</sub> ) + (0.5 - 8% HF) hot • Passivation 20 - 50% HNO <sub>3</sub> hot   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Mechanical properties</b>   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Heat-treated material</b> EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D   |                        |  |                        |                             |                          |                  |  |   |                  |
| size Testing at room temperature   |                        |  |                        |                             |                          |                  |  |   |                  |
| mm   | <b>R</b>               | <b>Rp 0.2</b>                                  | <b>A%</b>              | <b>A%</b>                   | <b>Kv +20 °C</b>         | <b>Kv +20 °C</b> | <b>HB a)</b>   |   |                  |
| 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 to 250   | 500-700                | 200  | 40                     | 30                          | 100                      | 60               | 215 +AT  |   |                  |
|  | 500-700                | 200  |                        |                             |                          |                  | 215 solubilization   |   |                  |
| a) for information only (L) = longitudinal (T) = transversal   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Bright bars of heat-treated material</b> EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P  |                        |  |                        |                             |                          |                  |  |   |                  |
| size Testing at room temperature   |                        |  |                        |                             |                          |                  |  |   |                  |
| mm   | <b>R</b>               | <b>Rp 0.2</b>                                  | <b>A%</b>              | <b>A%</b>                   | <b>Kv +20 °C</b>         | <b>Kv +20 °C</b> |  |   |                  |
| from to  | N/mm <sup>2</sup>      | N/mm <sup>2</sup> min                          | min (L)                | min (T)                     | J min (L)                | J min (T)        |  |   |                  |
| 10 to 16   | 600-950                | 400  | 25                     |                             |                          |                  |  |   |                  |
| 16 to 40   | 580-950                | 380  | 25                     |                             |                          |                  | +AT  |   |                  |
| 40 to 63   | 500-850                | 200  | 30                     |                             | 100                      |                  | solubilization   |   |                  |
| 63 to 160  | 500-850                | 200  | 30                     |                             | 100                      |                  |  |   |                  |
| 160 to 250   | 500-700                | 200  | 40                     |                             | 100                      |                  |  |   |                  |
|  | 500-700                | 200  |                        | 30                          |                          | 60               |  |   |                  |
| b) 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   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Corrosion resistance</b>  |                        |  |                        |                             |                          |                  |  |   |                  |
|  |                        | Atmospheric                                    |                        | Chemical                    |                          |                  | x halides, sulfuric acid, phosphoric, organic and formic acids |   |                  |
| Fresh water  |                        | industrial                                     | marine                 | medium                      | oxidizing                | reducing         |  |   |                  |
| x  |                        | x  | x                      | x                           | x                        | x                |  |   |                  |
| <b>Magnetic</b> no   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Machinability</b> low   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Hardening</b> cold-drawn and other cold plastic deformations  |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Service temperature in air</b> continuous service up to 850 °C; intermittent service up to 800 °C   |                        |  |                        |                             |                          |                  |  |   |                  |
| <b>Europe</b>  | <b>USA</b>             | <b>USA</b>                                     | <b>China</b>           | <b>Russia</b>               | <b>Japan</b>             | <b>India</b>     | <b>Rep. of Korea</b>   |   |                  |
| EN   | UNS                    | ASTM   | GB                     | GOST                        | JIS                      | IS               | KS   |   |                  |
| X5CrNiMo17-12-2  | S31600                 | 316  | 0Cr17Ni12Mo2           | 08Ch17N13M2                 | SUS 316                  | X04Cr17Ni12Mo2   | STS 316  |   |                  |



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

| Quality Number   | X90CrMoV18                       |   |              |                      |                             |                                     |                           | Martensitic Stainless Steel                               |           |           |
|--|----------------------------------|---|--------------|----------------------|-----------------------------|-------------------------------------|---------------------------|---|-----------|-----------|
|  | <b>1.4112</b>                    |   |              |                      |                             |                                     |                           |   |           |           |
| TECHNICAL CARD GRUPPO LUCEFIN REVISION 2015 ALL RIGHTS RESERVED<br>GRUPPO LUCEFIN Lovin'Steel  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Chemical composition</b>  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| C%   | Si% max                          | Mn% max   | P% max       | S% <sup>a)</sup> max | Cr%                         | Mo%                                 | V%                        |   |           |           |
| 0,85-0,95  | 1,00                             | 1,00  | 0,040        | 0,015                | 17,0-19,0                   | 0,90-1,30                           | 0,07-0,12                 | EN 10088-1: 2014  |           |           |
| ± 0.03   | + 0.05                           | + 0.03  | + 0.005      | + 0.003              | ± 0.2                       | + 0.05                              | + 0.03                    |   |           |           |
| 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 %     |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Temperature °C</b>  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Melting range</b>   | <b>Hot-forming</b>               | <b>Full annealing</b>   |              |                      | <b>Soft annealing +A</b>    | <b>MMA welding – AWS electrodes</b> |                           |   |           |           |
| 1440-1420  | 1175-930                         | 910-890 cooling 15 °C/h to 590, then air                                    |              |                      | 840-780 slow cooling        | <i>pre-heating</i>                  | <i>annealing after w.</i> |   |           |           |
|  |                                  |   |              |                      |                             | 200-150                             | 750-700                   |   |           |           |
| <b>Isothermal annealing +I</b>   | <b>Quenching +Q</b>              | <b>Tempering +T</b>   |              |                      | <b>Stress-relieving +SR</b> | <i>joint with steel</i>             |                           |   |           |           |
| 900-840 controlled cooling to 690, then air  | 1050-1000 oil / polymer (HRC 58) | 550-450 air   |              |                      | 350-100 air                 | carbon                              | CrMo alloyed              | stainless   |           |           |
|  |                                  |   |              |                      |                             | E70 xx                              | E8018-B 2                 | E309 – E308   |           |           |
|  |                                  |   |              |                      |                             | <i>cosmetic welding</i>             |                           |   |           |           |
|  |                                  |   |              |                      |                             | E309 special                        |                           |   |           |           |
| Transformation temperature during heating <b>Ac1</b> ~ 790, <b>Ac3</b> ~ 870 and during cooling <b>Ms</b> ~ 280, <b>Mf</b> ~ 130   |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Chemical treatment</b> - Pickling (20 - 50% HNO <sub>3</sub> ) hot. Passivation (20 - 25% HNO <sub>3</sub> ) + (2.5% Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O) hot |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Mechanical properties</b>   |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Heat-treated material</b> EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D   |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| size   | Testing at room temperature      |   |              |                      |                             |                                     |                           |   |           |           |
| mm   | <b>R</b>                         | <b>Rp 0.2</b>   | <b>A%</b>    | <b>Kv +20 °C</b>     | <b>HB<sup>a)</sup></b>      | <sup>a)</sup> for information only  |                           |   |           |           |
| from to  | N/mm <sup>2</sup>                | N/mm <sup>2</sup> min   | min          | J min                | max                         |                                     |                           |   |           |           |
|  | 100                              |   |              |                      | 265                         | <b>+A annealed material</b>         |                           |   |           |           |
| Bars, typical values according to UNS S44003 steel 440B  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| size   | Testing at room temperature      |   |              |                      |                             |                                     |                           |   |           |           |
| mm   | <b>R</b>                         | <b>Rp 0.2</b>   | <b>A%</b>    | <b>Z%</b>            | <b>HB</b>                   | <b>R</b>                            | <b>Rp 0.2</b>             | <b>A%</b>   | <b>Z%</b> | <b>HB</b> |
| from to  | N/mm <sup>2</sup>                | N/mm <sup>2</sup>   | min          | min                  | max                         | N/mm <sup>2</sup>                   | N/mm <sup>2</sup>         | min   | min       | max       |
|  | min                              | min   | min          | min                  | max                         | min                                 | min                       | min   | min       | max       |
|  | 738                              | 427   | 18           | 35                   | 269                         | 827                                 | 655                       | 9   | 20        | 285       |
|  | <b>+A hot-rolled annealed</b>    |   |              |                      |                             | <b>+A+C cold-drawn</b>              |                           |   |           |           |
| <b>Forged</b> (ASTM A 473-99 steel ASTM 440B)  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| size   | Testing at room temperature      |   |              |                      |                             |                                     |                           |   |           |           |
| mm   | <b>R</b>                         | <b>Rp 0.2</b>   | <b>A%</b>    | <b>Kv +20 °C</b>     | <b>HB<sup>a)</sup></b>      |                                     |                           |   |           |           |
| from to  | N/mm <sup>2</sup>                | N/mm <sup>2</sup> min   | min          | J min                | max                         |                                     |                           |   |           |           |
|  |                                  |   |              |                      | 269                         | <b>+A annealed material</b>         |                           |   |           |           |
| <sup>a)</sup> Only for guidance  |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Corrosion resistance</b>  |                                  | Atmospheric   |              |                      | Chemical                    |                                     |                           | x steam, petroleum, gasoline, alcohol, food, fruit juices |           |           |
| Fresh water  |                                  | <i>industrial</i>   |              | <i>marine</i>        | <i>medium oxidizing</i>     |                                     | <i>reducing</i>           |   |           |           |
| <b>x</b>   |                                  |   |              |                      |                             |                                     |                           |   |           |           |
| <b>Magnetic</b>  |                                  | yes   |              |                      |                             |                                     |                           |   |           |           |
| <b>Machinability</b>   |                                  | difficult   |              |                      |                             |                                     |                           |   |           |           |
| <b>Hardening</b>   |                                  | by quenching  |              |                      |                             |                                     |                           |   |           |           |
| <b>Service temperature in air</b>  |                                  | max 300 °C for cold plastic deformations and 760 °C for hot-formed products |              |                      |                             |                                     |                           |   |           |           |
| <b>Europe</b>  | <b>USA</b>                       | <b>USA</b>  | <b>China</b> | <b>Russia</b>        | <b>Japan</b>                | <b>India</b>                        | <b>Republic of Korea</b>  |   |           |           |
| EN   | UNS                              | ASTM  | GB           | GOST                 | JIS                         | IS                                  | KS                        |   |           |           |
| X90CrMoV18   | S44003                           | <b>440B</b>   | 90Cr18MoV    |                      | SUS 440B                    |                                     | STS 440B                  |   |           |           |



**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

Tabelle 1 — Anwendungsbereich — Nichtrostender Stahl

| Referenzbuchstabe für Tabelle 4 | Referenzbuchstabe nach ISO 7153-1:1991 (zuletzt geändert) | Chirurgische Instrumente |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                |   |        | Teile       |   |                |                                       |        |                |           |                                 |   |
|---------------------------------|---|--------------------------|---|--|---------|---|----------------|--|------------------|-----------------------|----------------|----------------|------------|------------------|----------------|----------------|---|--------|-------------|---|----------------|---------------------------------------|--------|----------------|-----------|---------------------------------|---|
|                                 |   | Elevatoren/Raspatorien   | Zangen/Pinzetten (Einlagen oder Beschichtung) | Zangen/Pinzetten mit Verschleißschutz (Einlagen oder Beschichtung) | Scheren | Scheren mit Verschleißschutz (Einlagen oder Beschichtung) | Ringzangen     | Ringzangen mit Verschleißschutz (Einlagen oder Beschichtung) | Hohlmeißelzangen | Knochensplitterzangen | Knochenstanzen | Branchenzangen | Konchotome | Skalpelle/Messer | Wundhaken      | Sonden         | Flach- und Hohlmeißel/ Küretten/Knochenlöffel | Hämmer | Nadelhalter | Nadelhalter mit Verschleißschutz (Einlagen oder Beschichtung) | Brustspreizer  | Wundspreizer, -sperrer/ Brustspreizer | Federn | Massive Griffe | Hohlhefte | Schrauben/Nieten/Führungsstifte |   |
| a                               | B   | X                        | X   | X <sup>a</sup>   |         | X <sup>a</sup>  | X              | X <sup>a</sup>   | X                | X                     | X              | X              | X          |                  | X              | X              | X   |        | X           | X <sup>a</sup>  | X <sup>a</sup> | X                                     | X      |                |           |                                 | X |
| b                               | A   |                          | X   | X <sup>a</sup>   |         | X   | X <sup>a</sup> |  |                  |                       | X              |                |            |                  | X              | X              |   |        | X           | X <sup>a</sup>  | X              |                                       |        |                |           |                                 | X |
| c                               | D   | X                        |   |  | X       | X <sup>a</sup>  |                | X  | X                | X                     |                | X              | X          |                  |                |                | X   |        |             |   |                |                                       |        |                |           |                                 |   |
| d                               |   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                |   |        |             |   |                |                                       |        |                |           |                                 |   |
| e                               | L   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                |   | X      |             |   |                |                                       |        |                | X         |                                 | X |
| f                               | R   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                | X   |        |             |   |                |                                       |        |                | X         |                                 |   |
| g                               | I   | X                        |   |  | X       | X <sup>a</sup>  |                | X  | X                | X                     |                | X              | X          |                  |                |                | X   |        |             |   |                |                                       |        |                |           |                                 |   |
| h                               | H   | X                        |   |  | X       | X <sup>a</sup>  |                | X  | X                | X                     |                | X              | X          |                  |                |                | X   |        |             |   |                |                                       |        |                |           |                                 |   |
| i                               | M   |                          | X   |  |         |   |                |  |                  |                       |                |                |            |                  | X              | X              |   |        |             |   |                |                                       |        |                | X         |                                 | X |
| j                               | N   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  | X <sup>b</sup> | X <sup>b</sup> | X <sup>b</sup>                                |        | X           |   |                |                                       |        | X              |           |                                 | X |
| k                               | O   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                |   |        |             |   |                |                                       |        |                |           |                                 |   |
| l                               | P   |                          |   |  |         |   |                |  |                  |                       |                |                |            | X                | X              |                |   |        |             |   |                |                                       |        |                |           |                                 |   |
| m                               |   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                |   |        |             |   |                |                                       |        |                |           |                                 |   |
| o                               |   |                          | X   | X  |         | X   | X              |  |                  |                       |                |                |            |                  |                |                |   |        |             |   |                |                                       |        |                |           |                                 | X |
| p                               | G+S   |                          | X   | X  |         | X   | X              |  |                  |                       |                |                |            |                  |                |                |   |        |             |   |                |                                       |        |                |           |                                 | X |
| q                               |   |                          |   |  |         |   |                |  |                  |                       |                |                |            |                  |                |                | X   |        |             |   |                |                                       |        |                |           |                                 |   |

<sup>a</sup> Für Instrumente mit Verschleißschutz gelten die Härtewerte nur für das Trägermaterial.  
<sup>b</sup> Für biegsame Schäfte.

Tabelle 2 — Anwendungsbereich — Hartmetalle

| Referenzbuchstabe für Tabelle 6 | Chirurgische Instrumente |   |  |         |   |            |  |                   |                       |                |                |            |                  |           |        |  |        | Teile       |   |               |                                       |        |                |           |                                 |  |  |
|---------------------------------|--------------------------|---|--|---------|---|------------|--|-------------------|-----------------------|----------------|----------------|------------|------------------|-----------|--------|--|--------|-------------|---|---------------|---------------------------------------|--------|----------------|-----------|---------------------------------|--|--|
|                                 | Elevatoren/Raspatorien   | Zangen/Pinzetten (Einlagen oder Beschichtung) | Zangen/Pinzetten mit Verschleißschutz (Einlagen oder Beschichtung) | Scheren | Scheren mit Verschleißschutz (Einlagen oder Beschichtung) | Ringzangen | Ringzangen mit Verschleißschutz (Einlagen oder Beschichtung) | Knochenhohlmeißel | Knochensplitterzangen | Knochenstanzen | Branchenzangen | Konchotome | Skalpelle/Messer | Wundhaken | Sonden | Flach- und Hohlmeißel/ Küretten/ Knochenlöffel | Hämmer | Nadelhalter | Nadelhalter mit Verschleißschutz (Einlagen oder Beschichtung) | Brustspreizer | Wundspreizer, -sperrer/ Brustspreizer | Federn | Massive Griffe | Hohlhefte | Schrauben/Nieten/Führungsstifte |  |  |
| aa                              |                          |   |  |         | X   |            |  |                   |                       |                |                |            |                  |           |        |  |        |             |   |               |                                       |        |                |           |                                 |  |  |
| ab                              |                          | X   |  |         |   |            | X  |                   |                       |                |                |            |                  |           |        |  |        |             |   | X             |                                       |        |                |           |                                 |  |  |
| ac                              |                          | X   |  |         | X   |            | X  |                   |                       |                |                |            |                  |           |        |  |        |             |   | X             |                                       |        |                |           |                                 |  |  |





**INSTRUMENTE GMBH**

**Materialspezifikationen nach DIN 96298-1 und -2 / EN ISO 7153-1**  
**Material Composition according to DIN 96298-1 und -2 / EN ISO 7153-1**  
**Materiale Specifica di DIN 96298-1 und -2 / EN ISO 7153-1**

Tabelle 3 — Anwendungsbereich — Titan

| Referenzbuchstabe für Tabelle 7 | Chirurgische Instrumente |                  |  |         |   |            |  |                  |                        |                |                |            |                  |           | Teile  |                  |                                 |        |             |                                       |   |                |           |                                 |   |  |
|---------------------------------|--------------------------|------------------|--|---------|---|------------|--|------------------|------------------------|----------------|----------------|------------|------------------|-----------|--------|------------------|---------------------------------|--------|-------------|---------------------------------------|---|----------------|-----------|---------------------------------|---|--|
|                                 | Elevatoren/Kaspatorien   | Zangen/Pinzetten | Zangen/Pinzetten mit Verschleißschutz (Einlagen oder Beschichtung) | Scheren | Scheren mit Verschleißschutz (Einlagen oder Beschichtung) | Ringzangen | Ringzangen mit Verschleißschutz (Einlagen oder Beschichtung) | Knochenhohmeißel | Knochen splitterzangen | Knochenstanzen | Branchenzangen | Konchotome | Skalpelle/Messer | Wundhaken | Sonden | Knochentraktoren | Flach- und Hohmeißel/Kürretten/ | Hammer | Nadelhalter | Wundspitzer/-sperrer/<br>Brustspitzer | Nadelhalter mit Verschleißschutz (Einlagen oder Beschichtung) | Massive Griffe | Hohlhefte | Schrauben/Nieten/Führungsstifte |   |  |
| ba                              |                          |                  |  |         |   |            |  |                  |                        |                |                |            |                  | X         | X      |                  |                                 |        |             |                                       |   |                |           |                                 |   |  |
| bb                              |                          |                  |  |         |   |            |  |                  |                        |                |                |            |                  | X         | X      |                  |                                 |        |             |                                       |   |                |           |                                 |   |  |
| bc                              |                          |                  |  |         |   |            |  |                  |                        |                |                |            |                  | X         | X      |                  |                                 |        |             |                                       |   |                |           |                                 |   |  |
| bd                              |                          |                  |  |         |   |            |  |                  |                        |                |                |            |                  | X         | X      |                  |                                 |        |             |                                       |   |                |           |                                 |   |  |
| bf                              |                          | X                | X  | X       |   | X          | X  |                  |                        |                | X              |            |                  | X         | X      |                  |                                 |        | X           | X                                     |   | X              | X         |                                 | X |  |

Tabelle 5 — Korrespondenztabelle zwischen EN 10088-1 und anderen Normen

| Materialnummer nach EN 10088-1:2014 | Referenzbuchstabe nach ISO 7153-1:1991 (zurückgezogen) | Art der Ähnlichkeit <sup>a</sup> mit ISO 7153-1:1991 (zurückgezogen) | AISI-Typ nach ASTM F 899-12b | Art der Ähnlichkeit <sup>a</sup> mit ASTM F 899-12b | UNS-Materialnummer nach ASTM |
|-------------------------------------|--|--|------------------------------|---|------------------------------|
| 1.4006                              | A  | I  | 410                          | I   | S41000                       |
| 1.4016                              | —  | —  | 430                          | W   | S43000                       |
| 1.4021                              | B  | I  | 420 A                        | I   | S42000                       |
| 1.4024                              | A  | N  | 410                          | I   | S41000                       |
| 1.4028                              | C  | I  | 420 B                        | N   | S42000                       |
| 1.4034                              | D  | I  | 420 C                        | N   | S42000                       |
| 1.4037                              | F  | I  | —                            | —   | —                            |
| 1.4057                              | —  | —  | 431                          | W   | S43100                       |
| 1.4104                              | L  | N  | —                            | —   | —                            |
| 1.4105                              | L  | I  | 430 F                        | N   | S43020                       |
| (1.4108)                            | —  | —  | —                            | —   | S42027                       |
| 1.4109                              | G+S  | W  | 440 A                        | W   | S44002                       |
| 1.4112                              | R  | I  | 440 B                        | W   | S44003                       |
| 1.4116                              | I  | N  | —                            | —   | —                            |
| 1.4117                              | H  | I  | 420 Mod                      | W   | S42000                       |
| (1.4121)                            | —  | —  | 420 F Mod                    | N   | —                            |
| 1.4122                              | K  | N  | —                            | —   | —                            |
| 1.4123                              | —  | —  | 420 Mod                      | W   | S42000                       |
| 1.4125                              | —  | —  | 440C                         | I   | S44004                       |
| 1.4197                              | —  | —  | 420 F Mod                    | N   | —                            |
| 1.4301                              | M  | N  | 304 / 304H                   | N   | S30400                       |
| 1.4305                              | N  | N  | 303                          | N   | S30300                       |
| 1.4310                              | O  | I  | ~301 / 302                   | N   | S30100<br>S30200             |
| 1.4401                              | P  | N  | 316                          | N   | S31600                       |
| 1.4441                              | —  | —  | —                            | —   | S31673                       |
| 1.4542                              | —  | —  | 630 (17-4 PH)                | N   | S17400                       |
| 1.4543                              | —  | —  | XM-16                        | I   | S45500                       |

<sup>a</sup> I = identisch; N = sehr ähnlich, aber nicht identisch; W = größere Unterschiede zu EN 10088-1