

Materials Services  
Materials Processing Europe

# Delivery Program



thyssenkrupp

Products + Processing + Individual services



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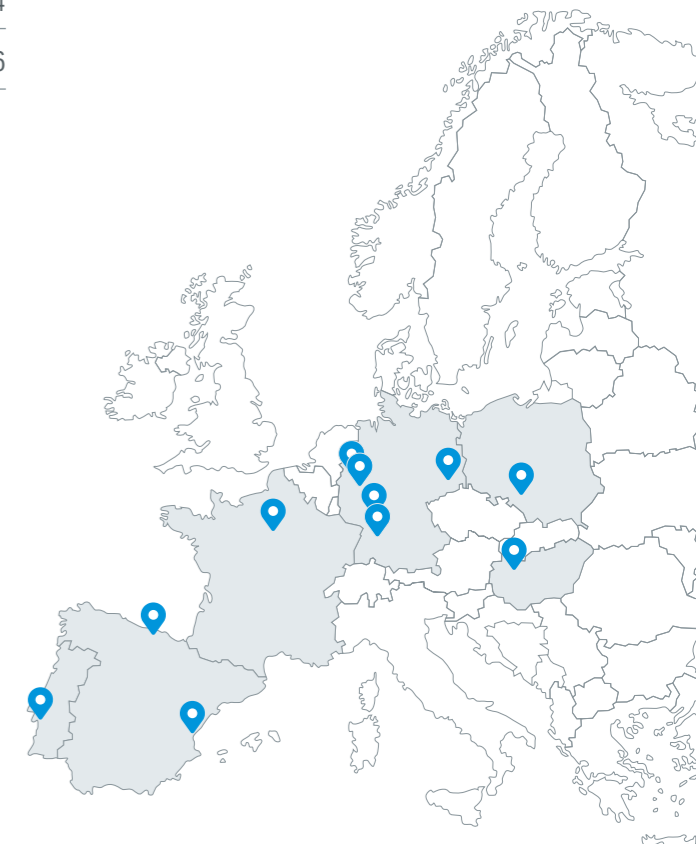
## Products

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### Focus on your success. Europe-wide.

As the leading multi-metal network in Europe, we want to be the preferred value-adding partner for the automotive and other manufacturing industries.

In addition to tailor-made services for carbon steel, stainless steel and aluminum, we stand for effective abbreviations on the way to your desired material. Our extensive network from Portugal to Hungary enables you to pursue expansion strategies with a trusted processing partner at your side.



# Quality and diversity

Our strategic partnership with thyssenkrupp Steel Europe and close relations with other quality suppliers worldwide support you in meeting your various material requirements. Thanks to access to numerous sources of supply, we can also provide you with additional quantities for short-term project business.



# Numerous opportunities for your material

> Slitting

> Cutting to length

> Precision blanks

> Narrow strip center

> Annealing and cold rolling

> Job processing, e.g. electrical steel strip

> Recoiling

> Cleaning and oiling

> Laser cutting

> Film coating

> Testing/roughness

> Quality assurance

Our materials serve many and varied purposes and applications in your company. Our customized services make sure the products you get are optimally processed and perfectly matched to your requirements – whether carbon steel, stainless steel and aluminum.



# First-class processing

## > Precisely aligned

Our most modern slitting and cut-to-length lines at our many locations offer impressive processing options. We supply slit strip and blanks that precisely meet your requirements.

### Carbon and stainless steel

#### Blanks

Thickness:	0.4–16.0 mm
Width min.:	35 mm <sup>1)</sup>
Width max.:	2,100 mm
Length min.:	200 mm
Length max.:	12,000 mm
Shearing angle max.:	± 35° (± 1.5°) <sup>2)</sup>
Tensile strength max.:	1,200 N/mm <sup>2</sup>
Entry weight max.:	36 t
Exit weight max.:	10 t

#### Slit strip

Thickness:	0.3–16.0 mm
Entry width:	1,850 mm
Slit width min.:	7 mm
Slit width max.:	1,850 mm
Exit coil ID:	400/508/610 mm
Exit coil OD:	2,300 mm
Tensile strength max.:	1,400 N/mm <sup>2</sup>

#### Jumbo coiling

Thickness:	0.3–3.0 mm
Entry width:	600 mm <sup>3)</sup>
Slit width min.:	7 mm
Slit width max.:	60 mm
Exit coil ID:	400/500 mm <sup>4)</sup>
Exit coil OD:	1,520 mm
Entry weight:	5 t
Exit weight:	5 t

1) Width < 80 mm can be ordered from a length of 300 mm; 2) On request;  
3) Slit coil; 4) Optionally also with cardboard or steel sleeves

### Aluminum<sup>5)</sup>

#### Blanks

Thickness:	0.3–6.0 mm
Width min.:	300 mm
Width max.:	2,100 mm
Length min.:	300 mm
Length max.:	10,500 mm

#### Slit strip

Thickness:	0.1–5.0 mm
Slit width min.:	5.5 mm
Slit width max.:	1,800 mm

5) Custom blanks – laser processing with certified partners



# Individual services



## Technical customer service | Individual product development

Our technological know-how accompanies you from product development to series production.



## Supply chain control

Our solutions help you coordinate your supply flows to reduce your transaction and storage costs.



## Digital solutions

Sophisticated digital solutions such as customised EDI connections and 2D barcodes provide optimal support for your supply chain.



## Sustainable services and recycling

We support you in the disposal of your scrap and contribute to a closed recycling loop with our pallet return service.



## Europe-wide key account management

Our key account teams are always close to you as system partners with a holistic approach – throughout Europe.



## Innovation dialogue

By exchanging information with our experts, we jointly develop needs-based innovations and process optimisations.



# Highest demands

The certification according to IATF is an important element for us to fulfil your expectations and to continuously develop ourselves further. With us, you can rely on a structured and systematic approach with sustainably effective processes.



Certified according to quality management standard  
**ISO 9001**



Certified according to the environmental management system  
**DIN EN ISO 14001**



Certified according to occupational health and safety management system  
**DIN ISO 45001**



Certified according to the international automotive standard  
**IATF 16949**



Certified according to the environmental management system  
**ISO 50001**

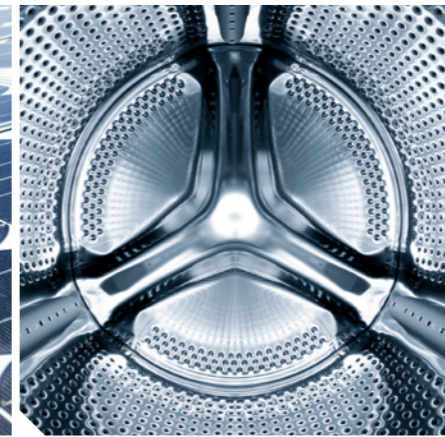


# Impressive results

Impressive results

Our products turn  
into yours.

And there are quite  
a lot of them.





# Hot strip


Thanks to its outstanding properties, hot-rolled strip meets even the most stringent requirements in terms of technological characteristics, surface condition, and dimensional accuracy. These properties make hot strip ideal for downstream processing and numerous end products such as stampings and drawn parts, tubes, car wheels or even agricultural implements and shelf systems.

Surface finishes  
pickled/unpickled

Surface treatments  
oiled/unoiled

Edge finishes  
mill edge  
cut edge

Tolerances  
Dimensional and shape tolerances  
to DIN EN 10 051. Closer tolerances  
by arrangement.

Selected grades also available with closer thickness  
tolerances in the form of scalur® (see page 19) or from the  
Basque Mungia as  in accordance with DIN EN 10 140.

## Mild non-alloy steel for cold forming · DIN EN 10 111

Steel type			Mechanical properties, transverse						Chemical composition, heat analysis				
Short designation	VDA239-100	Material number	Lower yield strength $R_{eL}$ <sup>1)</sup> MPa		Tensile strength $R_m$ MPa max.	Elongation at fracture $A_{80}$ % min.			Elongation at fracture $A_5$ % min.	Percentage by weight % max.			
			1.0 mm ≤ e < 2 mm	2 mm ≤ e < 11 mm		1.0 mm ≤ e < 1.5 mm	1.5 mm ≤ e < 2 mm	2 mm ≤ e < 3 mm		3 mm ≤ e < 11 mm	C	Mn	P
DD11	–	1.0332	170–360	170–340	440	22	23	24	28	0.12	0.60	0.045	0.045
DD12	–	1.0398	170–340	170–320	420	24	25	26	30	0.10	0.45	0.035	0.035
DD13	–	1.0335	170–330	170–310	400	27	28	29	33	0.08	0.40	0.030	0.030
DD14	HR2	1.0389	170–310	170–290	380	30	31	32	36	0.08	0.35	0.025	0.025

1) Where the upper yield strength is not defined,  $R_{eH}$  shall be applicable instead of  $R_{eL}$ .

Also available with closer thickness tolerances in the form of scalur® (see page 19) or from the Basque Mungia as  in accordance with DIN EN 10 140.

## Non-alloy/general structural steel · DIN EN 10 025-2

Steel type			Mechanical properties, transverse <sup>1)</sup>								
Short designation	VDA239-100	Material number	Upper yield strength $R_{eH}$ MPa min.	Tensile strength $R_m$ MPa	Elongation at fracture $A_{80}$ % min.					Elongation at fracture $A_5$ % min.	
					e ≤ 16 mm	e < 3 mm	3 mm ≤ e ≤ 16 mm	e ≤ 1 mm	1 mm < e ≤ 1.5 mm		1.5 mm < e ≤ 2 mm
S235JR	–	1.0038	235	360–510	360–510	15	16	17	18	19	24
S235J0	–	1.0114	235	360–510	360–510	15	16	17	18	19	24
S235J2	–	1.0117	235	360–510	360–510	15	16	17	18	19	24
S275JR	–	1.0044	275	430–580	410–560	13	14	15	16	17	21
S275J0	–	1.0143	275	430–580	410–560	13	14	15	16	17	21
S275J2	–	1.0145	275	430–580	410–560	13	14	15	16	17	21
S355JR	–	1.0045	355	510–680	470–630	12	13	14	15	16	20
S355J0	–	1.0553	355	510–680	470–630	12	13	14	15	16	20
S355J2	–	1.0577	355	510–680	470–630	12	13	14	15	16	20
S355K2	–	1.0596	355	510–680	470–630	12	13	14	15	16	20

## Steel type

Steel type			Chemical composition, heat analysis						
Short designation	VDA239-100	Material number	Percentage by weight % max.						
			C	Si	Mn	P	S	N	Cu
S235JR	–	1.0038	0.17	–	1.40	0.035	0.035	0.012	0.55
S235J0	–	1.0114	0.17	–	1.40	0.030	0.030	0.012	0.55
S235J2	–	1.0117	0.17	–	1.40	0.025	0.025	–	0.55
S275JR	–	1.0044	0.21	–	1.50	0.035	0.035	0.012	0.55
S275J0	–	1.0143	0.18	–	1.50	0.030	0.030	0.012	0.55
S275J2	–	1.0145	0.18	–	1.50	0.025	0.025	–	0.55
S355JR	–	1.0045	0.24	0.55	1.60	0.035	0.035	0.012	0.55
S355J0	–	1.0553	0.20	0.55	1.60	0.030	0.030	0.012	0.55
S355J2	–	1.0577	0.20	0.55	1.60	0.025	0.025	–	0.55
S355K2	–	1.0596	0.20	0.55	1.60	0.025	0.025	–	0.55

1) As rolling widths ≥ 600 mm are primarily used, transverse values generally apply, refer to DIN EN 10 025-2.

\* Comparative grade, therefore minor deviations from DIN EN values possible

## Thermomechanically rolled steel for cold working · DIN EN 10 149-2

Steel type		Mechanical properties, longitudinal					Chemical composition, heat analysis										
Short designation	VDA239-100	Material number	Upper yield strength $R_{eH}^{1)}$ MPa min.	Tensile strength $R_m$ MPa	Elongation at fracture $A_{80}$ % min.	Elongation at fracture $A_5$ % min.	Percentage by weight % max.										
							C	Mn	Si	P	S	Al <sub>total</sub> min.	Nb	V	Ti	Mo	B
S315MC	HR300LA	1.0972	315	390–510	20	24	0.12	1.30	0.50	0.025	0.020	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S355MC	HR340LA	1.0976	355	430–550	19	23	0.12	1.50	0.50	0.025	0.020	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S420MC	HR420LA	1.0980	420	480–620	16	19	0.12	1.60	0.50	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S460MC	HR460LA	1.0982	460	520–670	14	17	0.12	1.60	0.50	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S500MC	HR500LA	1.0984	500	550–700	12	14	0.12	1.70	0.50	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S550MC	HR550LA	1.0986	550	600–760	12	14	0.12	1.80	0.50	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.15 <sup>2)</sup>	–	–
S600MC	–	1.8969	600	650–820	11	13	0.12	1.90	0.50	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.22 <sup>2)</sup>	0.50	0.005
S650MC	–	1.8976	650	700–880	10	12	0.12	2.00	0.60	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.22 <sup>2)</sup>	0.50	0.005
S700MC	HR700LA	1.8974	700	750–950	10	12	0.12	2.10	0.60	0.025	0.015	0.015	0.09 <sup>2)</sup>	0.20 <sup>2)</sup>	0.22 <sup>2)</sup>	0.50	0.005

1) For thicknesses &gt; 8 mm the yield strength values may be 20 MPa lower.

2) The combined content of Nb, V and Ti must not exceed 0.22 %.

Also available with closer thickness tolerances in the form of scalur® (see page 19) or from the Basque Mungia as  in accordance with DIN EN 10 140.

## Multiphase steel · DIN EN 10 338

Steel type		Mechanical properties, longitudinal					Chemical composition, heat analysis										
Short designation	VDA239-100	Material number	Proof stress $R_{p0.2}$ MPa	Tensile strength $R_m$ MPa min.	Elongation at fracture $A_{80}$ % min.	Elongation at fracture $A_5$ % min.	Percentage by weight % max.										
							C	Si	Mn	P	S	Al <sub>total</sub> (span)	Cr+Mo	Nb+Ti	V	B	
<b>Ferrite-bainite-phase steel</b>																	
HDT450F	HR300Y450T-FB	1.0961	300–420	450	24	27	0.18	0.50	2.00	0.050	0.010	0.015–2.0	1.00	0.15	0.15	0.005	
HDT580F	HR440Y580T-FB	1.0994	460–620	580	15	17	0.18	0.50	2.00	0.050	0.010	0.015–2.0	1.00	0.15	0.15	0.010	
<b>Dual-phase steel</b>																	
HDT580X	HR330Y580T-DP	1.0936	330–450	580	19	23	0.14	1.00	2.20	0.085	0.015	0.015–0.1	1.40	0.15	0.20	0.005	
<b>Complex-phase steel</b>																	
HDT760C	HR660Y760T-CP	1.0998	660–830	760	10	12	0.18	1.00	2.50	0.080	0.015	0.015–2.0	1.00	0.25	0.20	0.005	
CP-W®1000 <sup>1)</sup> (transverse)		1.0954	720–920	950	9	12	0.23	0.80	2.20	0.080	0.015	≤ 2	1.20	0.15	0.20	0.005	
<b>Martensitic steel</b>																	
HDT1180G1	HR900Y1180T-MS	1.0960	900–1,200	1,180	4	5	0.25	0.80	2.50	0.060	0.015	0.015–2.0	1.20	0.25	0.22	0.005	

1) Special mill grade

Where particularly close thickness tolerances of up to ± 0.05 mm are required, we recommend our product scalur®. Other grades on request.

scalur®

scalur® from thyssenkrupp is a pickled hot strip with extremely tight thickness tolerances down to ± 0.05 mm over its entire length and width. It also possesses particularly uniform properties and a homogeneous microstructure, ensuring excellent processing characteristics and consistently high product quality. Depending on strength, scalur® is available in thicknesses of 1.20 to 9.00 mm and widths of 900 to 1,600 mm. It is particularly suitable for stampings as used in seat belt retractor housings, seat belt buckles, profiles and parts for car seats.

## scalur® – pickled hot strip with very close thickness tolerances

Low-carbon steel · DIN EN 10 111				Structural steel · DIN EN 10 025-2				Thermomechanically treated steel · DIN EN 10 149-2			
Short designation	Standard designation	VDA239-100	Material number	Short designation	Standard designation	VDA239-100	Material number	Short designation	Standard designation	VDA239-100	Material number
scalur®DD11	DD11	–	1.0332	scalur®S235JR	S235JR <sup>1)</sup>	–	1.0038	scalur®S315MC	S315MC	HR300LA	1.0972
scalur®DD12	DD12	–	1.0398	scalur®S235J0	S235J0 <sup>1)</sup>	–	1.0114	scalur®S355MC	S355MC	HR340LA	1.0976
scalur®DD13	DD13	–	1.0335	scalur®S235J2	S235J2 <sup>1)</sup>	–	1.0117	scalur®S420MC	S420MC	HR420LA	1.0980
scalur®DD14	DD14	HR2	1.0389					scalur®S460MC	S460MC	HR460LA	1.0982
								scalur®S500MC	S500MC	HR500LA	1.0984
								scalur®S550MC	S550MC	HR550LA	1.0986
								scalur®S600MC	S600MC	–	1.8969
								scalur®S650MC	S650MC	–	1.8976
								scalur®S700MC	S700MC	HR700LA	1.8974

1) Supplied in the as-rolled condition (+AR, "as rolled")

All chemical and mechanical properties of the grades mentioned are analog to the properties described for hot strip.

# Cold-rolled sheet

Cold-rolled strip is superior to hot strip in terms of surface condition and formability. It also features closer tolerances and is available in smaller thicknesses. Cold-rolled flat products are extremely versatile and come in a host of varieties for a wide range of applications: in the automotive industry, enamelling operations, the manufacture of tubes and tube sections, drums and barrels, or in the construction industry and the sanitary sector.

#### Surface types to DIN EN 10 130

- A normal surface
- B improved surface

#### Surface finishes and center roughness values

- b extra smooth  $R_a \leq 0.4 \mu\text{m}$
- g smooth  $R_a \leq 0.9 \mu\text{m}$
- m matt  $0.6 \mu\text{m} < R_a \leq 1.9 \mu\text{m}$
- r rough  $R_a > 1.6 \mu\text{m}$

#### Surface treatments


- O oiled
- U uncoiled

#### Surface types to VDA 239-100

- E Exposed parts
- U Non exposed parts

#### Tolerances

Dimensional and shape tolerances to DIN EN 10 131. Closer tolerances on request.

-  Grades marked with this symbol are available with closer thickness tolerances according to DIN EN 10 140 from the Basque Mungia.

### Mild low-carbon steel for cold forming - DIN EN 10 130

Steel type		Mechanical properties, transverse						Chemical composition, heat analysis				
Short designation	VDA239-100* Material number	Yield strength $R_e^{(1)}$ MPa max.	Tensile strength $R_m$ MPa	Elongation at fracture $A_{80}^{(2)}$ % min.	Anisotropy $r_{90}^{(3)(4)}$ min.	Strain hardening exponent $n_{90}^{(3)}$ min.	Percentage by weight % max.					
							C	P	S	Mn	Ti	
DC01	CR1	1.0330	280	270-410	28	–	0.12	0.045	0.045	0.60	–	
DC03	CR2	1.0347	240	270-370	34	1.3	0.10	0.035	0.035	0.45	–	
DC04	CR3	1.0338	210	270-350	38	1.6	0.08	0.030	0.030	0.40	–	
DC05	CR4	1.0312	180	270-330	40	1.9	0.06	0.025	0.025	0.35	–	
DC06	CR5	1.0873	170	270-330	41	2.1	0.02	0.020	0.020	0.25	0.3	
DC07	–	1.0898	150	250-310	44	2.5	0.01	0.020	0.020	0.20	0.2	

1) Where no yield strength is defined, the respective values shall apply to the 0.2 % proof stress ( $R_{p0.2}$ ) or to the lower yield strength ( $R_{eL}$ ). For thicknesses  $\leq 0.7$  mm but  $> 0.5$  mm, the maximum yield strength values may be 20 MPa higher. In case of thicknesses  $\leq 0.5$  mm, the maximum yield limits may be 40 MPa higher.

2) For thicknesses  $\leq 0.7$  mm but  $> 0.5$  mm, the minimum elongation at fracture may be 2 units lower. For thicknesses  $\leq 0.5$  mm, the minimum elongation at fracture may be 4 units lower.

3) The  $r_{90}$  and  $n_{90}$  values apply to product thicknesses  $> 0.5$  mm only.

4) For thicknesses  $> 2$  mm, the  $r_{90}$ -value is reduced by 0.2.

### Mild low carbon steel for cold forming from Basque Mungia - DIN EN 10 139

Steel type		Mechanical properties, transverse					Chemical composition, heat analysis				
Short designation	VDA239-100* Material number	Yield strength $R_e^{(1)}$ MPa max.	Tensile strength $R_m$ MPa	Elongation at fracture $A_{80}$ %	Elongation at fracture $A_5$ %	Elongation at fracture Hardness HV	Percentage by weight % max.				
							C	Mn	P	S	
DC01 LC	CR1	1.0330	$\leq 280$	270-410	$\geq 28$	$\geq 30$	$\leq 115$	0.12	0.6	0.045	0.045
DC01 C290	CR1	1.0330	200-380	290-430	$\geq 18$	$\geq 20$	95-125	0.12	0.6	0.045	0.045
DC01 C340	CR1	1.0330	$\geq 250$	340-490	–	–	105-155	0.12	0.6	0.045	0.045
DC01 C390	CR1	1.0330	$\geq 310$	390-540	–	–	117-172	0.12	0.6	0.045	0.045
DC01 C440	CR1	1.0330	$\geq 360$	440-590	–	–	135-185	0.12	0.6	0.045	0.045
DC01 C490	CR1	1.0330	$\geq 420$	490-640	–	–	155-200	0.12	0.6	0.045	0.045
DC01 C590	CR1	1.0330	$\geq 520$	590-740	–	–	185-225	0.12	0.6	0.045	0.045
DC01 C690	CR1	1.0330	$\geq 630$	$\geq 690$	–	–	$\geq 215$	0.12	0.6	0.045	0.045
DC03 LC	CR2	1.0347	$\leq 240$	270-370	$\geq 34$	$\geq 36$	$\leq 110$	0.1	0.45	0.035	0.035
DC03 C290	CR2	1.0347	210-355	290-390	$\geq 22$	$\geq 24$	95-117	0.1	0.45	0.035	0.035
DC03 C340	CR2	1.0347	$\geq 240$	340-440	–	–	105-130	0.1	0.45	0.035	0.035
DC03 C390	CR2	1.0347	$\geq 330$	390-490	–	–	117-155	0.1	0.45	0.035	0.035
DC03 C440	CR2	1.0347	$\geq 380$	440-540	–	–	135-172	0.1	0.45	0.035	0.035
DC03 C490	CR2	1.0347	$\geq 440$	490-590	–	–	155-185	0.1	0.45	0.035	0.035
DC03 C590	CR2	1.0347	$\geq 540$	$\geq 590$	–	–	$\geq 185$	0.1	0.45	0.035	0.035
DC04 LC	CR3	1.0338	$\leq 210$	270-350	$\geq 38$	$\geq 40$	$\leq 105$	0.08	0.4	0.03	0.03
DC04 C290	CR3	1.0338	220-325	290-390	$\geq 24$	$\geq 26$	95-117	0.08	0.4	0.03	0.03
DC04 C340	CR3	1.0338	$\geq 240$	340-440	–	–	105-130	0.08	0.4	0.03	0.03
DC04 C390	CR3	1.0338	$\geq 350$	390-490	–	–	117-155	0.08	0.4	0.03	0.03
DC04 C440	CR3	1.0338	$\geq 440$	440-540	–	–	135-172	0.08	0.4	0.03	0.03
DC04 C490	CR3	1.0338	$\geq 490$	490-590	–	–	155-185	0.08	0.4	0.03	0.03
DC04 C590	CR3	1.0338	$\geq 590$	590-690	–	–	185-215	0.08	0.4	0.03	0.03
DC05 LC	CR4	1.0312	$\leq 180$	270-330	$\geq 40$	$\geq 42$	$\leq 100$	0.06	0.35	0.025	0.025

Surface appearance MA and MB  
Dimensional tolerances EN 10140


\* Comparative grade, therefore minor deviations from DIN EN values possible


## Mild low-carbon steel for vitreous enamelling · DIN EN 10 209

Steel type		Mechanical properties, transverse				Chemical composition, heat analysis				
Short designation	VDA239-100* Material number	Yield strength R <sub>e</sub> <sup>1)</sup> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>2)</sup> % min.	Anisotropy r <sub>90</sub> <sup>3)</sup> min.	Percentage by weight % max.				
						C	Ti	Mn	P	S
DC01EK	–	1.0390	270	270–390	30	–	–	0.60	0.045	0.050
DC04EK	–	1.0392	220	270–350	36	–	–	0.50	0.030	0.050
DC05EK	–	1.0386	220	270–350	36	1.5	–	0.50	0.025	0.050
DC06EK	–	1.0869	190	270–350	38	1.6	–	0.50	0.020	0.050
DC03ED	–	1.0399	240	270–370	34	–	–	0.40	0.035	0.050
DC04ED	–	1.0394	210 <sup>4)</sup>	270–350	38	–	–	0.40	0.030	0.050
DC06ED	–	1.0872	190	270–350	38	1.6	–	0.35	0.020	0.050

- 1) Where no yield strength is defined, the respective values shall apply to the 0.2 % proof stress (R<sub>p0.2</sub>) or to the lower yield strength (R<sub>eL</sub>). For thicknesses ≤ 0.7 mm but > 0.5 mm, the maximum yield strength values may be 20 MPa higher. In case of thicknesses ≤ 0.5 mm, the maximum yield limits may be 40 MPa higher.  
2) For thicknesses ≤ 0.7 mm but > 0.5 mm, the minimum elongation at fracture may be 2 units lower. For thicknesses ≤ 0.5 mm, the minimum elongation at fracture may be 4 units lower.  
3) The r values apply to product thicknesses ≥ 0.5 mm only. For thicknesses > 2 mm, the r value is reduced by 0.2.  
4) For thicknesses ≥ 1.5 mm, the maximum permissible yield strength is 225 MPa.  
5) Steel types DC03ED and DC04ED can be subjected to a decarburization treatment in the solid or liquid phase. The maximum permissible carbon content by check analysis is 0.004 %.

## High and higher strength steel for cold forming · DIN EN 10 268

Steel type		Mechanical properties, transverse						
Short designation	VDA239-100* Material number	Proof stress R <sub>p0.2</sub> <sup>1)</sup> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>2)</sup> % min.	Anisotropy r <sub>90</sub> <sup>3)</sup> min.	Strain hardening exponent n <sub>90</sub> <sup>3)</sup> min.	Bake hardening index BH <sub>2</sub> <sup>5)</sup> min.	
<b>High-strength IF steel</b>					min.			
HC180Y	CR180IF	1.0922	180–230	330–400	35	1.7	0.19	
HC220Y	CR210IF	1.0925	220–270	340–420	33	1.6	0.18	
HC260Y	CR240IF	1.0928	260–320	380–440	31	1.4	0.17	
<b>Isotropic steel</b>					max.			
HC220I	–	1.0346	220–270	300–380	34	1.4	0.18	
HC260I	–	1.0349	260–310	320–400	32	1.4	0.17	
HC300I	–	1.0447	300–350	340–440	30	1.4	0.16	
<b>Bake hardening steel</b>					min.			
HC180B	CR180BH	1.0395	180–230	290–360	34	1.6	0.17	
HC220B	CR210BH	1.0396	220–270	320–400	32	1.5	0.16	
HC260B	CR240BH	1.0400	260–320	360–440	29	–	–	
HC300B	–	1.0444	300–360	390–480	26	–	–	
<b>Micro-alloyed steel</b>  Our specialist for narrower thickness tolerances in the Basque Mungia offers you this material on request also with narrower tolerances according to DIN EN 10 140.								
HC260LA	CR240LA	1.0480	260–330	350–430	26	–	–	
HC300LA	CR270LA	1.0489	300–380	380–480	23	–	–	
HC340LA	CR300LA	1.0548	340–420	410–510	21	–	–	
HC380LA	CR340LA	1.0550	380–480	440–580	19	–	–	
HC420LA	CR380LA	1.0556	420–520	470–600	17	–	–	
HC460LA	CR420LA	1.0574	460–580	510–660	13	–	–	
HC500LA	–	1.0573	500–620	550–710	12	–	–	

Steel type		Chemical composition, heat analysis								
Short designation	VDA239-100* Material number	Percentage by weight % max.								
		C	Si	Mn	P	S	Al min.	Ti <sup>6)</sup>	Nb <sup>6)</sup>	
<b>High-strength IF steel</b>										
HC180Y	CR180IF	1.0922	0.01	0.3	0.7	0.06	0.025	0.01	0.12	0.09
HC220Y	CR210IF	1.0925	0.01	0.3	0.9	0.08	0.025	0.01	0.12	0.09
HC260Y	CR240IF	1.0928	0.01	0.3	1.6	0.1	0.025	0.01	0.12	0.09
<b>Isotropic steel</b>										
HC220I	–	1.0346	0.07	0.5	0.6	0.05	0.025	0.015	0.05	–
HC260I	–	1.0349	0.07	0.5	1.2	0.05	0.025	0.015	0.05	–
HC300I	–	1.0447	0.08	0.5	0.7	0.08	0.025	0.015	0.05	–
<b>Bake hardening steel</b>										
HC180B	CR180BH	1.0395	0.06	0.5	0.7	0.06	0.030	0.015	–	–
HC220B	CR210BH	1.0396	0.08	0.5	0.7	0.085	0.030	0.015	–	–
HC260B	CR240BH	1.0400	0.1	0.5	1.0	0.1	0.030	0.015	–	–
HC300B	–	1.0444	0.1	0.5	1.0	0.12	0.030	0.015	–	–
<b>Micro-alloyed steel</b>  Our specialist for narrower thickness tolerances in the Basque Mungia offers you this material on request also with narrower tolerances according to DIN EN 10 140.										
HC260LA	CR240LA	1.0480	0.1	0.5	1.0	0.03	0.025	0.015	0.15	0.09
HC300LA	CR270LA	1.0489	0.12	0.5	1.4	0.03	0.025	0.015	0.15	0.09
HC340LA	CR300LA	1.0548	0.12	0.5	1.5	0.03	0.025	0.015	0.15	0.09
HC380LA	CR340LA	1.0550	0.12	0.5	1.6	0.03	0.025	0.015	0.15	0.09
HC420LA	CR380LA	1.0556	0.14	0.5	1.6	0.03	0.025	0.015	0.15	0.09
HC460LA	CR420LA	1.0574	0.14	0.6	1.8	0.03	0.025	0.015	0.15	0.09
HC500LA	–	1.0573	0.14	0.6	1.8	0.03	0.025	0.015	0.15	0.09

- 1) Where no yield strength is defined, the respective values shall apply to the lower yield strength (R<sub>eL</sub>).  
2) For thicknesses ≤ 0.7 mm but > 0.5 mm, the minimum elongation at fracture may be 2 units lower. For thicknesses ≤ 0.5 mm, the minimum elongation at fracture may be 4 units lower.  
3) The r<sub>90</sub> and n<sub>90</sub> minimum values apply to product thicknesses ≥ 0.5 mm only.  
4) For thicknesses > 2 mm, the r<sub>90</sub> value is reduced by 0.2.  
5) For thicknesses > 1.2 mm, special arrangements are required.  
6) Additions of vanadium and boron are also permissible. The total content of all four elements must not exceed 0.22 %.

### Multiphase steel · DIN EN 10 338

Steel type		Mechanical properties, longitudinal					
Short designation	VDA239-100*	Material number	Proof stress R <sub>p0.2</sub> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>1)</sup> % min.	Strain hardening exponent n <sub>n10-UE</sub> min.	Bake hardening index BH <sub>2</sub> min.
<b>Dual-phase steel</b>							
HCT450X	–	1.0937	260–340	450	27	0.16	30
HCT490X	CR290Y490T-DP	1.0939	290–380	490	24	0.15	30
HCT590X	CR330Y590T-DP	1.0941	330–430	590	20	0.14	30
HCT780X	CR440Y780T-DP	1.0943	440–550	780	14	–	30
HCT980X	CR590Y980T-DP	1.0944	590–740	980	10	–	30
HCT980XG	CR700Y980T-DP	1.0997	700–850	980	8	–	30
<b>Retained-austenite steel (TRIP steel)</b>							
HCT690T	CR400Y690T-TR	1.0947	400–520	690	23	0.19	40
HCT780T	CR450Y780T-TR	1.0948	450–570	780	21	0.16	40
<b>Complex-phase steel</b>							
HCT600C	–	1.0953	350–500	600	16	–	30
HCT780C	CR570Y780T-CP	1.0954	570–720	780	10	–	30
HCT980C	CR780Y980T-CP	1.0955	780–950	980	6	–	30
<b>Multiphase steel</b>							
HCT1180G2	–	1.0969	900–1,150	1,180	4	–	30

Steel type		Chemical composition, heat analysis											
Short designation	VDA239-100*	Material number	Percentage by weight % max.										
			C	Si	Mn	P	S	Al <sub>total</sub> (spinn)	Cr + Mo	Nb + Ti	V	B	
<b>Dual-phase steel</b>													
HCT450X	–	1.0937	0.14	0.75	2.00	0.080	0.015	0.015–1.0	1.00	0.15	0.20	0.005	
HCT490X	CR290Y490T-DP	1.0939	0.14	0.75	2.00	0.080	0.015	0.015–1.0	1.00	0.15	0.20	0.005	
HCT590X	CR330Y590T-DP	1.0941	0.15	0.75	2.50	0.040	0.015	0.015–1.5	1.40	0.15	0.20	0.005	
HCT780X	CR440Y780T-DP	1.0943	0.18	0.80	2.50	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005	
HCT980X	CR590Y980T-DP	1.0944	0.20	1.00	2.90	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005	
HCT980XG	CR700Y980T-DP	1.0997	0.23	1.00	2.90	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005	
<b>Retained-austenite steel (TRIP steel)</b>													
HCT690T	CR400Y690T-TR	1.0947	0.24	2.00	2.20	0.080	0.015	0.015–2.0	0.60	0.20	0.20	0.005	
HCT780T	CR450Y780T-TR	1.0948	0.25	2.20	2.50	0.080	0.015	0.015–2.0	0.60	0.20	0.20	0.005	
<b>Complex-phase steel</b>													
HCT600C	–	1.0953	0.18	0.80	2.20	0.080	0.015	0.015–2.0	1.00	0.15	0.20	0.005	
HCT780C	CR570Y780T-CP	1.0954	0.18	1.00	2.50	0.080	0.015	0.015–2.0	1.00	0.15	0.20	0.005	
HCT980C	CR780Y980T-CP	1.0955	0.23	1.00	2.70	0.080	0.015	0.015–2.0	1.00	0.15	0.22	0.005	
<b>Multiphase steel</b>													
HCT1180G2	–	1.0969	0.23	1.20	2.90	0.080	0.015	0.015–1.4	1.20	0.15	0.20	0.005	

1) Reduced minimum values of elongation at fracture apply to product thicknesses t < 0.60 mm (minus 2 units).

\* Comparative grade, therefore minor deviations from DIN EN values possible

The cold-rolled sheet with closer thickness tolerances listed here is available from the Basque Mungia.

### Case-hardened steel · DIN EN 10 132-2

Steel type		Mechanical properties, longitudinal				Chemical composition, heat analysis						
Short designation	Material number	Delivery condition	Yield strength R <sub>e</sub> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> % min.	Hardness HV max.	Percentage by weight % max.					
							C	Si max.	Mn	Cr	P max.	S max.
C10E	1.1121	A or LC	345	430	26	135	0.07–0.13	0.40	0.30–0.60	0.40 max.	0.035	0.035
		CR	–	830	–	250						
C15E	1.1141	A or LC	360	450	25	140	0.12–0.18	0.40	0.30–0.60	0.40 max.	0.035	0.035
		CR	–	870	–	260						
16MnCr5	1.7131	A or LC	420	550	21	170	0.14–0.19	0.40	1.00–1.30	0.80–1.10	0.035	0.035
		CR	–	–	–	–						

### Tempering steel · DIN EN 10 132-3

Steel type		Mechanical properties, longitudinal				Chemical composition, heat analysis								
Short designation	Material number	Delivery condition	Yield strength R <sub>e</sub> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> % min.	Hardness HV max.	Percentage by weight % max.							
							C	Si max.	Mn	P max.	S max.	Cr	Mo	Ni max.
C22E	1.1151	A or LC	400	500	22	155	0.17–0.24	0.40	0.40–0.70	0.035	0.035	0.40 max.	0.1 max.	0.40
		CR	–	900	–	265								
C35E	1.1181	A or LC	430	540	20	170	0.32–0.39	0.40	0.50–0.80	0.035	0.035	0.40 max.	0.1 max.	0.40
		CR	–	930	–	275								
C45E	1.1191	A or LC	455	570	18	180	0.42–0.50	0.40	0.50–0.80	0.035	0.035	0.40 max.	0.1 max.	0.40
		CR	–	1,020	–	290								
C55E	1.1203	A or LC	480	600	17	185	0.52–0.60	0.40	0.60–0.90	0.035	0.035	0.40 max.	0.1 max.	0.40
		CR	–	1,070	–	300								
C60E	1.1221	A or LC	495	620	17	195	0.57–0.65	0.40	0.60–0.90	0.035	0.035	0.40 max.	0.1 max.	0.40
		CR	–	1,100	–	305								
42CrMo4	1.7225	A or LC	480	620	15	195	0.38–0.45	0.40	0.60–0.90	0.035	0.035	0.90–1.20	0.15–0.30	–
		CR	–	–	–	–								
27MnCrB5 <sup>1)</sup>	1.7182	A or LC	–	–	–	–	0.24–0.30	0.40	1.10–1.40	0.025	0.035	0.30–0.60	–	–
		CR	–	–	–	–								

1) Mechanical properties can be agreed (DIN EN 10 083-3).

### Spring steel · DIN EN 10 132-4

Steel type		Mechanical properties, longitudinal				Chemical composition, heat analysis									
Short designation	Material number	Delivery condition	Yield strength R <sub>e</sub> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> % min.	Hardness HV max.	Percentage by weight % max.								
							C	Si	Mn	P max.	S max.	Cr	Mo	V	Ni max.
C55S	1.1204	A or LC	480	600	17	185	0.52–0.60	0.15–0.35	0.60–0.90	0.025	0.025	0.40 max.	0.10	–	0.40
		CR	–	1,070	–	300									
C60S	1.1211	A or LC	495	620	17	195	0.57–0.65	0.15–0.35	0.60–0.90	0.025	0.025	0.40 max.	0.10	–	0.40
		CR	–	1,100	–	305									
C67S	1.1231	A or LC	510	640	16	200	0.65–0.73	0.15–0.35	0.60–0.90	0.025	0.025	0.40 max.	0.10	–	0.40
		CR	–	1,140	–	315									
C75S	1.1248	A or LC	510	640	15	200	0.70–0.80	0.15–0.35	0.60–0.90	0.025	0.025	0.40 max.	0.10	–	0.40
		CR	–	1,170	–	320									
51CrV4	1.8159	A or LC	550	700	13	220	0.47–0.55	0.40 max.	0.70–1.10	0.025	0.025	0.90–1.20	0.10	0.10–0.25	0.40
		CR	–	–	–	–									

# Hot-dip coated sheet

Depending on the application, different surface finishes are used for the hot-dip coating of sheet. The main priority for Z/GI, ZF, ZA, ZM, AZ coatings is the outstanding oxidation resistance based on zinc as well as the high-quality appearance combined with the strength of steel. The addition of aluminum to the coating (ZA, AZ, AS) increases its resistance to both corrosion and heat. A subsequent heat treatment causes a partial transformation of the zinc coating into a zinc-iron alloy layer, making it particularly suitable for welding and enamelling. ZM coatings belong to a new generation of economic coatings, which offer improved corrosion resistance.

Hot-dip coated sheet is used in the manufacture of a wide range of components including the automotive, machinery and plant construction, as well as the construction and household appliance industries.

## Surface types to DIN EN 10 346

A	normal surface
B	improved surface
C	best surface
N	normal spangle (only with +Z)
M	minimized spangle (only with +Z)

## Surface treatments

C	chemically passivated
O	oiled
CO	chemically passivated and oiled
P	phosphated
PO	phosphated and oiled
S	sealed
U	untreated

## Surface types to VDA 239-100

E	Exposed parts
U	Non exposed parts

## Coating variants

+Z/GI	zinc (99 % Zn)
+ZF	zinc-iron alloy (Galvannealed)
+ZM	zinc-magnesium (1–2 % Mg + 1–2 % Al + Zn)
+ZA	zinc-aluminum (galfan®, Zn + 5 % Al)
+AZ	aluminum-zinc (55 % Al + 1.6 % Si + Zn)
+AS	aluminum-silicon (11 % Si + Al)

## Surface finishes

### Hot-dip coated sheet

	Z/GI		ZF/GA		ZM		ZA		AZ	AS	AS
	DIN EN	VDA239-100*	DIN EN	VDA239-100*	DIN EN	VDA239-100*	DIN EN	DIN EN	DIN EN	DIN EN	VDA239-100*
	–	–	–	–	70	30/30	–	–	–	–	–
	–	–	–	–	80	–	–	–	–	–	–
	100	40/40	100	40/40	100	40/40	95	–	–	–	–
	–	–	120	50/50	120	50/50	–	70	–	–	–
	–	–	–	–	130	–	–	–	50	–	–
	140	60/60	–	–	140	–	130	80	60	–	–
	–	–	–	–	150	–	–	–	–	–	–
	–	–	–	–	185	–	–	–	–	–	–
Coating weight <sup>1)</sup> in g/m <sup>2</sup>	200	85/85	–	–	200	–	185	100	80	30/30	–
	–	–	–	–	–	–	200	130	–	–	–
	225	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	100	–	–
	275	–	–	–	275	–	255	150	120	45/45	–
	–	–	–	–	–	–	300	165	–	–	–
	–	–	–	–	300	–	–	–	–	–	–
	350	–	–	–	350 <sup>1)</sup>	–	–	185	150	–	–
	450 <sup>1)</sup>	–	–	–	–	–	–	–	200	–	–
	600 <sup>1)</sup>	–	–	–	–	–	–	–	250	–	–

<sup>1)</sup> DIN EN specifies the triple spot tests and VDA239-100 the single spot test.

In variance from the standards, a triple spot test or single spot test can be ordered according to DIN EN or VDA239-100.

Tolerances: Dimensional and shape tolerances to DIN EN 10 143 (closer tolerances by arrangement).

## Low-carbon steel for cold forming · DIN EN 10 346

Steel type			Mechanical properties, transverse					
Short designation	VDA239-100* Surface finish	Material number	Yield strength R <sub>e</sub> <sup>1)</sup> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>2)</sup> % min.	Anisotropy r <sub>90</sub> min.	Strain hardening exponent n <sub>90</sub> min.	
DX51D	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0917	–	270–500	22	–	–
DX52D	CR1	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0918	140–300 <sup>3)</sup>	270–420	26	–	–
DX53D	CR2	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0951	140–260	270–380	30	–	–
DX54D	CR3	+Z,+ZA	1.0952	120–220	260–350	36	1.6 <sup>4)</sup>	0.18
DX54D	CR3	+ZF,+ZM	1.0952	120–220	260–350	34	1.4 <sup>4)</sup>	0.18
DX54D	–	+AZ	1.0952	120–220	260–350	36	–	–
DX54D	CR3	+AS	1.0952	120–220	260–350	34	1.4 <sup>4)5)</sup>	0.18 <sup>5)</sup>
DX55D	–	+AS	1.0962	140–240	270–370	30	–	–
DX56D	CR4	+Z,+ZA	1.0963	120–180	260–350	39	1.9 <sup>4)</sup>	0.21
DX56D	CR4	+ZF,+ZM	1.0963	120–180	260–350	37	1.7 <sup>4)5)</sup>	0.20 <sup>5)</sup>
DX56D	CR4	+AZ,+AS	1.0963	120–180	260–350	39	1.7 <sup>4)5)</sup>	0.20 <sup>5)</sup>
DX57D	CR5	+Z,+ZA	1.0853	120–170	260–350	41	2.1 <sup>4)</sup>	0.22
DX57D	CR5	+ZF,+ZM	1.0853	120–170	260–350	39	1.9 <sup>4)5)</sup>	0.21 <sup>5)</sup>
DX57D	CR5	+AS	1.0853	120–170	260–350	41	1.9 <sup>4)5)</sup>	0.21 <sup>5)</sup>

Steel type			Chemical composition, heat analysis						
Short designation	VDA239-100*	Material number	Percentage by weight % max.						
			C	Si	Mn	P	S	Ti	
DX51D	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0917	0.18	0.50	1.20	0.12	0.045	0.30
DX52D	CR1	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0918	0.12	0.50	0.60	0.10	0.045	0.30
DX53D	CR2	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0951	0.12	0.50	0.60	0.10	0.045	0.30
DX54D	CR3	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0952	0.12	0.50	0.60	0.10	0.045	0.30
DX55D	–	+AS	1.0962	0.12	0.50	0.60	0.10	0.045	0.30
DX56D	CR4	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0963	0.12	0.50	0.60	0.10	0.045	0.30
DX57D	CR5	+Z,+ZF,+ZA,+ZM,+AS	1.0853	0.12	0.50	0.60	0.10	0.045	0.30

- 1) Where no yield strength is defined, the respective values shall apply to the 0.2 % proof stress R<sub>p0.2</sub>, otherwise for the lower yield strength (R<sub>e</sub>).  
2) Reduced minimum values of elongation at fracture apply to product thicknesses 0.50 mm < t < 0.70 mm (minus 2 units), 0.35 mm < t < 0.50 mm (minus 4 units), and t < 0.35 mm (minus 7 units).  
3) The maximum yield strength for surface class A is R<sub>e</sub> = 360 MPa.  
4) For product thicknesses of 1.5 mm < t < 2 mm, the minimum r<sub>90</sub> value is reduced by 0.2, and for t ≥ 2 mm by 0.4.  
5) Depending on the product thickness, the minimum n<sub>90</sub> value is reduced as follows: 0.50 mm < t < 0.70 mm by 0.2; 0.35 mm < t < 0.50 mm by 0.4, and t < 0.35 mm by 0.6.  
Also depending on the product thickness, the minimum n<sub>90</sub> value is reduced as follows: 0.50 mm < t < 0.70 mm by 0.01; 0.35 mm < t < 0.50 mm by 0.03, and t < 0.35 mm by 0.04.

## Structural steel · DIN EN 10 346

Steel type			Mechanical properties, longitudinal			Chemical composition, heat analysis				
Short designation	Surface finish	Material number	Proof stress R <sub>p0.2</sub> <sup>1)</sup> MPa min.	Tensile strength R <sub>m</sub> <sup>2)</sup> MPa min.	Elongation at fracture A <sub>80</sub> <sup>3)</sup> % min.	Percentage by weight % max.				
						C	Si	Mn	P	S
S220GD	+Z,+ZF,+ZA,+ZM,+AZ	1.0241	220	300	20	0.20	0.60	1.70	0.10	0.045
S250GD	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0242	250	330	19	0.20	0.60	1.70	0.10	0.045
S280GD	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0244	280	360	18	0.20	0.60	1.70	0.10	0.045
S320GD	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0250	320	390	17	0.20	0.60	1.70	0.10	0.045
S350GD	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0529	350	420	16	0.20	0.60	1.70	0.10	0.045
S390GD	+Z,+ZF,+ZA,+ZM,+AZ	1.0238	390	460	16	0.20	0.60	1.70	0.10	0.045
S420GD	+Z,+ZF,+ZA,+ZM,+AZ	1.0239	420	480	15	0.20	0.60	1.70	0.10	0.045
S450GD	+Z,+ZF,+ZA,+ZM,+AZ	1.0233	450	510	14	0.20	0.60	1.70	0.10	0.045
S550GD	+Z,+ZF,+ZA,+ZM,+AZ	1.0531	550	560	–	0.20	0.60	1.70	0.10	0.045

- 1) Where yield strength is defined, the values apply to the upper yield strength R<sub>m</sub>.  
2) For all steel types, with the exception of S550GD, a span of 140 MPa can be expected for the tensile strength.  
3) Depending on the product thickness, the minimum values of elongation at fracture are reduced as follows:  
0.50 mm < t < 0.70 mm (minus 2 units), 0.35 mm < t < 0.50 mm (minus 4 units), and t < 0.35 mm (minus 7 units).

\* Comparative grade, therefore minor deviations from DIN EN values possible

## High and higher strength steel for cold forming · DIN EN 10 346

Steel type			Mechanical properties, transverse						
Short designation	VDA239-100* Surface finish	Material number	Proof stress R <sub>p0.2</sub> <sup>1)</sup> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>2)3)</sup> % min.	Anisotropy r <sub>90</sub> <sup>3)4)5)</sup> min.	Strain hardening exponent n <sub>90</sub> <sup>5)</sup> min.	Bake hardening index BH <sub>2</sub> min.	
<b>High-strength IF steel</b>									
HX180YD	CR180IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0921	180–240	330–390	34	1.7	0.18	–
HX220YD	CR210IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0923	220–280	340–420	32	1.5	0.17	–
HX260YD	CR240IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0926	260–320	380–440	30	1.4	0.16	–
HX300YD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0927	300–360	390–470	27	1.3	0.15	–

## Bake hardening steel

HX180BD	CR180BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0914	180–240	290–360	34	1.5	0.16	30
HX220BD	CR210BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0919	220–280	320–400	32	1.2	0.15	30
HX260BD	CR240BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0924	260–320	360–440	28	–	–	30
HX300BD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0930	300–360	400–480	26	–	–	30
HX340BD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0945	340–400	440–520	24	–	–	30

## Micro-alloyed steel

HX260LAD	CR240LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0929	260–330	350–430	26	–	–	–
HX300LAD	CR270LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0932	300–380	380–480	23	–	–	–
HX340LAD	CR300LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0933	340–420	410–510	21	–	–	–
HX380LAD	CR340LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0934	380–480	440–560	19	–	–	–
HX420LAD	CR380LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0935	420–520	470–590	17	–	–	–
HX460LAD	CR420LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0990	460–560	500–640	15	–	–	–
HX500LAD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0991	500–620	530–690	13	–	–	–

Steel type			Chemical composition, heat analysis							
Short designation	VDA239-100*	Surface finish	Material number	Percentage by weight % max.						
				C	Si	Mn	P	S	Al min.	Nb

## High-strength IF steel

HX180YD	CR180IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0921	0.01	0.30	0.70	0.060	0.025	0.010	0.09	0.12
HX220YD	CR210IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0923	0.01	0.30	0.90	0.080	0.025	0.010	0.09	0.12
HX260YD	CR240IF	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0926	0.01	0.30	1.60	0.10	0.025	0.010	0.09	0.12
HX300YD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0927	0.015	0.30	1.60	0.10	0.025	0.010	0.09	0.12

## Bake hardening steel

HX180BD	CR180BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0914	0.06	0.50	0.70	0.060	0.025	0.015	0.09	0.12
HX220BD	CR210BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0919	0.08	0.50	0.70	0.085	0.025	0.015	0.09	0.12
HX260BD	CR240BH	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0924	0.10	0.50	1.00	0.10	0.030	0.010	0.09	0.12
HX300BD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0930	0.11	0.50	0.80	0.12	0.025	0.010	0.09	0.12
HX340BD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0945	0.11	0.50	0.80	0.12	0.025	0.010	0.09	0.12

## Micro-alloyed steel

HX260LAD	CR240LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0929	0.11	0.50	1.0	0.030	0.025	0.015	0.09	0.15
HX300LAD	CR270LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0932	0.12	0.50	1.4	0.030	0.025	0.015	0.09	0.15
HX340LAD	CR300LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0933	0.12	0.50	1.4	0.030	0.025	0.015	0.10	0.15
HX380LAD	CR340LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0934	0.12	0.50	1.5	0.030	0.025	0.015	0.10	0.15
HX420LAD	CR380LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0935	0.12	0.50	1.6	0.030	0.025	0.015	0.10	0.15
HX460LAD	CR420LA	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0990	0.15	0.50	1.7	0.030	0.025	0.015	0.10	0.15
HX500LAD	–	+Z,+ZF,+ZA,+ZM,+AZ,+AS	1.0991	0.15	0.50	1.7	0.030	0.025	0.015	0.10	0.15

- 1) Where the yield strength is defined, the respective values shall apply to the lower yield strength (R<sub>e</sub>).  
2) Depending on the product thickness, the minimum values of elongation at fracture are reduced as follows: 0.50 mm < t < 0.70 mm (minus 2 units), 0.35 mm < t < 0.50 mm (minus 4 units), and t < 0.35 mm (minus 7 units).  
3) For AS, AZ, ZF and ZM coatings, the minimum A<sub>80</sub> value is reduced by 2 units and the minimum r<sub>90</sub> value by 0.2.  
4) For product thicknesses of 1.5 mm < t < 2 mm, the minimum r<sub>90</sub> value is reduced by 0.2, and for t ≥ 2 mm by 0.4.  
5) Depending on the product thickness, the minimum n<sub>90</sub> value is reduced as follows: 0.50 mm < t < 0.70 mm by 0.2; 0.35 mm < t < 0.50 mm by 0.4, and t < 0.35 mm by 0.6.  
Also depending on the product thickness, the minimum n<sub>90</sub> value is reduced as follows: 0.50 mm < t < 0.70 mm by 0.01; 0.35 mm < t < 0.50 mm by 0.03, and t < 0.35 mm by 0.04.

\* Comparative grade, therefore minor deviations from DIN EN values possible

## Multiphase steel · DIN EN 10 346

Steel type, cold rolled				Mechanical properties, longitudinal				
Short designation	VDA239-100*	Surface finish	Material number	Proof stress R <sub>90,2</sub> MPa	Tensile strength R <sub>m</sub> MPa min.	Elongation at fracture A <sub>80</sub> <sup>1)2)</sup> % min.	Strain hardening exponent n <sub>10-UE</sub> min.	Bake hardening index BH <sub>2</sub> min.
<b>Dual-phase steel</b>								
HCT450X	–	+Z, +ZF, +ZA, +ZM	1.0937	260–340	450	27	0.16	30
HCT490X	CR290Y490T-DP	+Z, +ZF, +ZA, +ZM	1.0995	290–380	490	24	0.15	30
HCT590X	CR330Y590T-DP	+Z, +ZF, +ZA, +ZM	1.0996	330–430	590	20	0.14	30
HCT780X	CR440Y780T-DP	+Z, +ZF, +ZA, +ZM	1.0943	440–550	780	14	–	30
HCT980X	CR590Y980T-DP	+Z, +ZF, +ZA, +ZM	1.0944	590–740	980	10	–	30
HCT980XG	CR700Y980T-DP	+Z, +ZF, +ZA, +ZM	1.0997	700–850	980	8	–	30
<b>Retained-austenite steel (TRIP steel)</b>								
HCT690T	CR400Y690T-TR	+Z, +ZF, +ZA, +ZM	1.0947	400–520	690	23	0.19	40
HCT780T	CR450Y780T-TR	+Z, +ZF, +ZA, +ZM	1.0948	450–570	780	21	0.16	40
<b>Complex-phase steel</b>								
HCT600C	–	+Z, +ZF, +ZA, +ZM	1.0953	350–500	600	16	–	30
HCT780C	CR570Y780T-CP	+Z, +ZF, +ZA, +ZM	1.0954	570–720	780	10	–	30
HCT980C	CR780Y980T-CP	+Z, +ZF, +ZA, +ZM	1.0955	780–950	980	6	–	30
Steel type, hot rolled				Mechanical properties, longitudinal				
Short designation	VDA239-100	Surface finish	Material number	Proof stress R <sub>90,2</sub> MPa	Tensile strength R <sub>m</sub> MPa min.	Elongation at fracture A <sub>80</sub> % min.	Strain hardening exponent n <sub>10-UE</sub> min.	
<b>Ferrite-bainite-phase steel</b>								
HDT450F	HR300Y450T-FB	+Z, +ZF, +ZM	1.0961	300–420	450	24	–	
HDT580F	HR440Y580T-FB	+Z, +ZF, +ZM	1.0994	460–620	580	15	–	
<b>Dual-phase steel</b>								
HDT580X	HR330Y580T-DP	+Z, +ZF, +ZM	1.0936	330–450	580	19	0.13	
<b>Complex-phase steel</b>								
HDT750C	–	+Z, +ZF, +ZM	1.0956	620–760	750	10	–	
HDT760C	HR660Y760T-CP	+Z, +ZF, +ZM	1.0998	660–830	760	10	–	
HDT950C	–	+Z, +ZF, +ZM	1.0958	720–950	950	9	–	

1) Reduced minimum values of elongation at rupture apply to product thicknesses t < 0.60 mm (minus 2 units).  
2) For ZF-coated products, the minimum values of elongation at fracture are reduced by 2 units.  
For ZF-coated products in thicknesses t < 0.60 mm, the minimum elongation at rupture is reduced by 4 units.

Where particularly close thickness tolerances of up to ± 0.06 mm are required for hot-dip galvanized hot strip, we recommend our product scalur®+Z.

## Multiphase steel · DIN EN 10 346

Steel type				Chemical composition, heat analysis									
Short designation	VDA239-100*	Surface finish	Material number	Percentage by weight % max.									
				C	Si	Mn	P	S	Al <sub>total</sub> (span)	Cr+Mo	Nb+Ti	V	B
<b>Ferrite-bainite-phase steel</b>													
HDT450F	HR300Y450T-FB	+Z, +ZF, +ZM	1.0961	0.18	0.50	2.00	0.050	0.010	0.015–2.0	1.00	0.15	0.15	0.005
HDT580F	HR440Y580T-FB	+Z, +ZF, +ZM	1.0994	0.18	0.50	2.00	0.050	0.010	0.015–2.0	1.00	0.15	0.15	0.01
<b>Dual-phase steel</b>													
HCT450X	–	+Z, +ZF, +ZA, +ZM	1.0937	0.14	0.75	2.00	0.080	0.015	0.015–1.0	1.00	0.15	0.20	0.005
HCT490X	CR290Y490T-DP	+Z, +ZF, +ZA, +ZM	1.0995	0.14	0.75	2.00	0.080	0.015	0.015–1.0	1.00	0.15	0.20	0.005
HCT590X	CR330Y590T-DP	+Z, +ZF, +ZA, +ZM	1.0996	0.15	0.75	2.50	0.040	0.015	0.015–1.5	1.40	0.15	0.20	0.005
HCT780X	CR440Y780T-DP	+Z, +ZF, +ZA, +ZM	1.0943	0.18	0.80	2.50	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005
HCT980X	CR590Y980T-DP	+Z, +ZF, +ZA, +ZM	1.0944	0.20	1.00	2.90	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005
HCT980XG	CR700Y980T-DP	+Z, +ZF, +ZA, +ZM	1.0997	0.23	1.00	2.90	0.080	0.015	0.015–2.0	1.40	0.15	0.20	0.005
HDT580X	HR330Y580T-DP	+Z, +ZF, +ZM	1.0936	0.14	1.00	2.20	0.085	0.015	0.015–1.0	1.40	0.15	0.20	0.005
<b>Retained-austenite steel (TRIP steel)</b>													
HCT690T	CR400Y690T-TR	+Z, +ZF, +ZA, +ZM	1.0947	0.24	2.00	2.20	0.080	0.015	0.015–2.0	0.60	0.20	0.20	0.005
HCT780T	CR450Y780T-TR	+Z, +ZF, +ZA, +ZM	1.0948	0.25	2.20	2.50	0.080	0.015	0.015–2.0	0.60	0.20	0.20	0.005
<b>Complex-phase steel</b>													
HCT600C	–	+Z, +ZF, +ZA, +ZM	1.0953	0.18	0.80	2.20	0.080	0.015	0.015–2.0	1.00	0.15	0.20	0.005
HCT780C	CR570Y780T-CP	+Z, +ZF, +ZA, +ZM	1.0954	0.18	1.00	2.50	0.080	0.015	0.015–2.0	1.00	0.15	0.20	0.005
HCT980C	CR780Y980T-CP	+Z, +ZF, +ZA, +ZM	1.0955	0.23	1.00	2.70	0.080	0.015	0.015–2.0	1.00	0.15	0.22	0.005
HDT750C	–	+Z, +ZF, +ZM	1.0956	0.18	0.80	2.20	0.080	0.015	0.015–2.0	1.00	0.15	0.20	0.005
HDT760C	HR660Y760T-CP	+Z, +ZF, +ZM	1.0998	0.18	1.00	2.50	0.080	0.015	0.015–2.0	1.00	0.25	0.20	0.005
HDT950C	–	+Z, +ZF, +ZM	1.0958	0.25	0.80	2.70	0.080	0.015	0.015–2.0	1.20	0.25	0.30	0.005

Where particularly close thickness tolerances of up to ± 0.06 mm are required for hot-dip galvanized hot strip, we recommend our product scalur®+Z.



# scalur<sup>®</sup>+Z

scalur<sup>®</sup>+Z from thyssenkrupp is a hot-dip galvanized flat product with extremely close thickness tolerances down to  $\pm 0.06$  mm over the entire strip length and width. The uniform properties of scalur<sup>®</sup>+Z ensure maximum yield in production, with excellent processing characteristics for consistently high product quality. Depending on the strength grade involved, scalur<sup>®</sup>+Z is available in thicknesses of 1.50 to 4.00 mm and widths of 900 to 1,550 mm. It is particularly suitable for stampings, sections and telescopic rails.

## scalur<sup>®</sup>+Z – hot-dip galvanized flat products with extremely tight thickness tolerances

Low-carbon steel · DIN EN 10 346				Structural steel · DIN EN 10 346			Micro-alloyed steel · DIN EN 10 346			
Short designation	Standard designation	VDA 239-100*	Material number	Short designation	Standard designation	Material number	Short designation	Standard designation	VDA239-100*	Material number
scalur <sup>®</sup> +Z DX51D	DX51D	–	1.0917	scalur <sup>®</sup> +Z S220GD	S220GD	1.0241	scalur <sup>®</sup> +Z HX260LAD	HX260LAD	CR240LA	1.0929
scalur <sup>®</sup> +Z DX52D	DX52D	CR1	1.0918	scalur <sup>®</sup> +Z S250GD	S250GD	1.0242	scalur <sup>®</sup> +Z HX300LAD	HX300LAD	CR270LA	1.0932
				scalur <sup>®</sup> +Z S280GD	S280GD	1.0244	scalur <sup>®</sup> +Z HX340LAD	HX340LAD	CR300LA	1.0933
				scalur <sup>®</sup> +Z S320GD	S320GD	1.0250	scalur <sup>®</sup> +Z HX380LAD	HX380LAD	CR340LA	1.0934
				scalur <sup>®</sup> +Z S350GD	S350GD	1.0529	scalur <sup>®</sup> +Z HX420LAD	HX420LAD	CR380LA	1.0935
							scalur <sup>®</sup> +Z HX460LAD	HX460LAD	CR420LA	1.0990
							scalur <sup>®</sup> +Z HX500LAD	HX500LAD	–	1.0991

All the chemical and mechanical properties of the grades listed are identical to the properties described for hot-dip coated products.

\* Comparative grade, therefore minor deviations from DIN EN values possible



# Electrolytically zinc-coated sheet

A continuous electrolytic process provides for a high-grade surface finish of cold-rolled sheet. The zinc is applied as an anti-corrosion coating to either one or both surfaces of the steel. In combination with standard surface treatments, the coating acts as an efficient adhesive agent for a layer of paint or film. Applications include exposed automotive components and other parts subject to high requirements on the surface quality, household appliances and electrical industries, packaging and machine casings.

#### Surface types to DIN EN 10152

- A normal surface
- B improved surface

#### Surface finishes

- m matt
- r rough

#### Surface treatments

- U untreated
- P phosphated
- PO phosphated, oiled
- O oiled
- C chemically passivated
- CO chemically passivated, oiled

#### Surface types to VDA 239-100

- E Exposed parts
- U Non exposed parts

#### Surface finishes

	Nominal coating per side		Single spot test		Single spot test	
	Thickness [µm]	Weight [g/m <sup>2</sup> ]	Weight [g/m <sup>2</sup> ]	Thickness [µm]	Weight [g/m <sup>2</sup> ]	
<b>Electrolytically zinc-coated sheet (ZE/EG)</b>						
<b>Location/type</b>	<b>DIN EN</b>				<b>VDA239-100</b>	
Same coating on both sides	ZE25/25	2,5/2,5	18/18	12/12	EG12/12	1,7–4,5 12–32
	–	–	–	–	EG18/18	2,5–5,4 18–38
	ZE50/50	5,0/5,0	36/36	29/29	EG29/29	4,1–6,9 29–49
	ZE75/75	7,5/7,5	54/54	47/47	EG47/47	6,6–8,6 47–61
	–	–	–	–	EG50/50	7,0–9,9 50–70
	–	–	–	–	EG53/53	7,5–10,3 53–73
	–	–	–	–	EG60/60	8,5–11,3 60–80
	ZE100/100	10,0/10,0	72/72	65/65	EG65/65	9,2–12,0 65–85
	–	–	–	–	EG70/70	9,9–12,7 70–90
	Coating on one side only	ZE25/0	2.5/0	18/0	12/0	–
ZE50/0		5.0/0	36/0	29/0	–	–
ZE75/0		7.5/0	54/0	47/0	–	–
ZE100/0		10.0/0	72/0	65/0	–	–
Different coating on both sides	ZE50/25	5.0/2.5	36/18	29/12	–	–
	ZE75/25	7.5/2.5	54/18	47/12	–	–
	ZE75/50	7.5/5.0	54/36	47/29	–	–
	ZE100/50	10.0/5.0	72/36	65/29	–	–
	ZE100/75	10.0/7.5	72/36	65/47	–	–

Tolerances: Dimensional and shape tolerances to DIN EN 10 131 (closer tolerances on arrangement).

#### Mild low-carbon steel for cold forming · DIN EN 10 152

Steel type		Mechanical properties, transverse							Chemical composition, heat analysis				
Short designation	VDA239-100	Surface finish	Material number	Yield strength R <sub>e</sub> <sup>1)</sup> MPa max.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>g0</sub> <sup>2)</sup> %	Anisotropy r <sub>90</sub> <sup>3)</sup> min.	Strain hardening exponent n <sub>90</sub> <sup>3)</sup> min.	Percentage by weight % max.				
									C	P	S	Mn	Ti
DC01	CR1	+ZE	1.0330	280	270–410	28	–	–	0.12	0.045	0.045	0.60	–
DC03	CR2	+ZE	1.0347	240	270–370	34	1.3	–	0.10	0.035	0.035	0.45	–
DC04	CR3	+ZE	1.0338	220	270–350	37	1.6	0.170	0.08	0.030	0.030	0.40	–
DC05	CR4	+ZE	1.0312	200	270–330	39	1.9	0.190	0.06	0.025	0.025	0.35	–
DC06	CR5	+ZE	1.0873	180	270–350	41	2.1	0.210	0.02	0.020	0.020	0.25	0.3
DC07	–	+ZE	1.0898	160	250–310	43	2.5	0.220	0.01	0.020	0.020	0.20	0.2

1) Where no yield strength is defined, the respective values shall apply to the 0.2 % proof stress R<sub>e0.2</sub>, otherwise for the lower yield strength (R<sub>e</sub>). For thicknesses ≤ 0.7 mm, but > 0.5 mm, the maximum yield strength may be 20 MPa higher, and for thicknesses ≤ 0.5 mm 40 MPa.

2) For thicknesses ≤ 0.7 mm but > 0.5 mm, the minimum elongation at fracture may be 2 units lower. For thicknesses ≤ 0.5 mm, the minimum elongation at fracture may be 4 units lower.

3) The r<sub>90</sub> and n<sub>90</sub> values shown apply to product thicknesses ≥ 0.5 mm only.

4) For thicknesses > 2 mm, the r<sub>90</sub> value is reduced by 0.2.

\* Comparative grade, therefore minor deviations from DIN EN values possible

## High and higher strength steel for cold forming · DIN EN 10 268

Steel type			Mechanical properties, transverse						
Short designation	VDA239-100*	Surface finish	Material number	Proof stress R <sub>p0.2</sub> <sup>1)</sup> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>2)</sup> %	Anisotropy r <sub>90</sub> <sup>3)4)</sup>	Strain hardening exponent n <sub>90</sub> <sup>3)</sup>	Bake hardening index BH <sub>2</sub> <sup>5)</sup> min.
<b>High-strength IF steel</b>							min.		
HC180Y	CR180IF	+ZE	1.0922	180–230	330–400	35	1.7	0.19	–
HC220Y	CR210IF	+ZE	1.0925	220–270	340–420	33	1.6	0.18	–
HC260Y	CR240IF	+ZE	1.0928	260–320	380–440	31	1.4	0.17	–
<b>Isotropic steel</b>							max.		
HC220I	–	+ZE	1.0346	220–270	300–380	34	1.4	0.18	–
HC260I	–	+ZE	1.0349	260–310	320–400	32	1.4	0.17	–
HC300I	–	+ZE	1.0447	300–350	340–440	30	1.4	0.16	–
<b>Bake hardening steel</b>							min.		
HC180B	CR180BH	+ZE	1.0395	180–230	290–360	34	1.6	0.17	35
HC220B	CR210BH	+ZE	1.0396	220–270	320–400	32	1.5	0.16	35
HC260B	CR240BH	+ZE	1.0400	260–320	360–440	29	–	–	35
HC300B	–	+ZE	1.0444	300–360	390–480	26	–	–	35
<b>Micro-alloyed steel</b>							–		
HC260LA	CR240LA	+ZE	1.0480	260–330	350–430	26	–	–	–
HC300LA	CR270LA	+ZE	1.0489	300–380	380–480	23	–	–	–
HC340LA	CR300LA	+ZE	1.0548	340–420	410–510	21	–	–	–
HC380LA	CR340LA	+ZE	1.0550	380–480	440–580	19	–	–	–
HC420LA	CR380LA	+ZE	1.0556	420–520	470–600	17	–	–	–
HC460LA	CR420LA	+ZE	1.0574	460–580	510–660	13	–	–	–

Steel type			Chemical composition, heat analysis								
Short designation	VDA239-100*	Surface finish	Material number	Percentage by weight % max.							
				C	Si	Mn	P	S	Al min.	Ti <sup>6)</sup>	Nb <sup>6)</sup>
<b>High-strength IF steel</b>											
HC180Y	CR180IF	+ZE	1.0922	0.01	0.3	0.7	0.06	0.025	0.01	0.12	0.09
HC220Y	CR210IF	+ZE	1.0925	0.01	0.3	0.9	0.08	0.025	0.01	0.12	0.09
HC260Y	CR240IF	+ZE	1.0928	0.01	0.3	1.6	0.1	0.025	0.01	0.12	0.09
<b>Isotropic steel</b>											
HC220I	–	+ZE	1.0346	0.07	0.5	0.6	0.05	0.025	0.015	0.05	–
HC260I	–	+ZE	1.0349	0.07	0.5	1.2	0.05	0.025	0.015	0.05	–
HC300I	–	+ZE	1.0447	0.08	0.5	0.7	0.08	0.025	0.015	0.05	–
<b>Bake hardening steel</b>											
HC180B	CR180BH	+ZE	1.0395	0.06	0.5	0.7	0.06	0.030	0.015	–	–
HC220B	CR210BH	+ZE	1.0396	0.08	0.5	0.7	0.085	0.030	0.015	–	–
HC260B	CR240BH	+ZE	1.0400	0.1	0.5	1.0	0.1	0.030	0.015	–	–
HC300B	–	+ZE	1.0444	0.1	0.5	1.0	0.12	0.030	0.015	–	–
<b>Micro-alloyed steel</b>											
HC260LA	CR240LA	+ZE	1.0480	0.1	0.5	1.0	0.03	0.025	0.015	0.15	0.09
HC300LA	CR270LA	+ZE	1.0489	0.12	0.5	1.4	0.03	0.025	0.015	0.15	0.09
HC340LA	CR300LA	+ZE	1.0548	0.12	0.5	1.5	0.03	0.025	0.015	0.15	0.09
HC380LA	CR340LA	+ZE	1.0550	0.12	0.5	1.6	0.03	0.025	0.015	0.15	0.09
HC420LA	CR380LA	+ZE	1.0556	0.14	0.5	1.6	0.03	0.025	0.015	0.15	0.09
HC460LA	CR420LA	+ZE	1.0574	0.14	0.6	1.8	0.03	0.025	0.015	0.15	0.09

- 1) Where a yield strength is defined, the respective values shall apply to the lower yield strength (R<sub>m</sub>)  
2) For thicknesses ≤ 0.7 mm but > 0.5 mm, the minimum elongation at fracture may be 2 units lower. For thicknesses ≤ 0.5 mm, the minimum elongation at fracture may be 4 units lower.  
3) The r<sub>90</sub> and n<sub>90</sub> minimum values apply to product thicknesses ≥ 0.5 mm only.  
4) For thicknesses > 2 mm, the r<sub>90</sub> value is reduced by 0.2.  
5) For thicknesses > 1.2 mm, special arrangements are required.  
6) Additions of vanadium and boron are also permissible. The total content of all four elements must not exceed 0.22 %.

\* Comparative grade, therefore minor deviations from DIN EN values possible

## Multiphase steel · DIN EN 10 338

Steel type, cold rolled			Mechanical properties, longitudinal					
Short designation	VDA239-100*	Surface finish	Material number	Proof stress R <sub>p0.2</sub> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>3)</sup> %	Strain hardening exponent n <sub>110-UE</sub>	Bake hardening index BH <sub>2</sub> MPa min.
<b>Dual-phase steel</b>								
HCT450X	–	+ZE	1.0937	260–340	450	27	0.16	30
HCT490X	CR290Y490T-DP	+ZE	1.0939	290–380	490	24	0.15	30
HCT590X	CR330Y590T-DP	+ZE	1.0941	330–430	590	20	0.14	30
HCT780X	CR440Y780T-DP	+ZE	1.0943	440–550	780	14	–	30
HCT980X	CR590Y980T-DP	+ZE	1.0944	590–740	980	10	–	30
HCT980XG <sup>1)</sup>	CR700Y980T-DP	+ZE	1.0997	700–850	980	8	–	30
<b>Retained-austenite steel (TRIP steel)</b>								
HCT690T	CR400Y690T-TR	+ZE	1.0947	400–520	690	23	0.19	40
HCT780T	CR450Y780T-TR	+ZE	1.0948	450–570	780	21	0.16	40
<b>Complex-phase steel</b>								
HCT600C	–	+ZE	1.0953	350–500	600	16	–	30
HCT780C	CR570Y780T-CP	+ZE	1.0954	570–720	780	10	–	30
HCT980C	CR780Y980T-CP	+ZE	1.0955	780–950	980	6	–	30
Steel type, hot rolled			Mechanical properties, longitudinal					
Short designation	VDA239-100*	Surface finish	Material number	Proof stress R <sub>p0.2</sub> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> <sup>3)</sup> %	Elongation at fracture A <sub>5</sub> %	
<b>Ferrite-bainite-phase steel</b>								
HDT450F	HR300Y450T-FB	+ZE	1.0961	300–420	450	24	27	
HDT580F	HR440Y580T-FB	+ZE	1.0994	460–620	580	15	17	
<b>Dual-phase steel</b>								
HDT580X	HR330Y580T-DP	+ZE	1.0936	330–450	580	19	23	
<b>Complex-phase steel</b>								
HDT760C	HR660Y760T-CP	+ZE	1.0998	660–830	760	10	12	
CP-W <sup>®</sup> 1000 <sup>2)</sup> (transverse)	–	+ZE	–	720–920	950	9	12	
<b>Martensitic steel</b>								
HDT1180G1	HR900Y1180T-MS	+ZE	1.0960	900–1,200	1,180	4	5	

- 1) XG means dual phase with increased yield strength  
2) Special mill grade  
3) For elongation at fracture, reduced minimum values (minus 2 units) apply in the case of product thicknesses t < 0.60 mm.

\* Comparative grade, therefore minor deviations from DIN EN values possible

## Multiphase steel · DIN EN 10 338

Steel type				Chemical composition, heat analysis									
Short designation	VDA239-100*	Surface finish	Material number	Percentage by weight % max.									
				C	Si	Mn	P	S	Al <sub>total (span)</sub>	Cr+Mo	Nb+Ti	V	B
<b>Ferrite-bainite-phase steel</b>													
HDT450F	HR300Y450T-FB	+ZE	1.0961	0.18	0.50	2.00	0.050	0.010	0.015-2.0	1.00	0.15	0.15	0.005
HDT580F	HR440Y580T-FB	+ZE	1.0994	0.18	0.50	2.00	0.050	0.010	0.015-2.0	1.00	0.15	0.15	0.010
<b>Dual-phase steel</b>													
HCT450X	–	+ZE	1.0937	0.14	0.75	2.00	0.080	0.015	0.015-1.0	1.00	0.15	0.20	0.005
HCT490X	CR290Y490T-DP	+ZE	1.0939	0.14	0.75	2.00	0.080	0.015	0.015-1.0	1.00	0.15	0.20	0.005
HCT590X	CR330Y590T-DP	+ZE	1.0941	0.15	0.75	2.50	0.040	0.015	0.015-1.5	1.40	0.15	0.20	0.005
HCT780X	CR440Y780T-DP	+ZE	1.0943	0.18	0.80	2.50	0.080	0.015	0.015-2.0	1.40	0.15	0.20	0.005
HCT980X	CR590Y980T-DP	+ZE	1.0944	0.20	1.00	2.90	0.080	0.015	0.015-2.0	1.40	0.15	0.20	0.005
HCT980XG <sup>1)</sup>	CR700Y980T-DP	+ZE	1.0997	0.23	1.00	2.90	0.080	0.015	0.015-2.0	1.40	0.15	0.20	0.005
HDT580X	HR330Y580T-DP	+ZE	1.0936	0.14	1.00	2.20	0.085	0.015	0.015-0.1	1.40	0.15	0.20	0.005
<b>Retained-austenite steel (TRIP steel)</b>													
HCT690T	CR400Y690T-TR	+ZE	1.0947	0.24	2.00	2.20	0.080	0.015	0.015-2.0	0.60	0.20	0.20	0.005
HCT780T	CR450Y780T-TR	+ZE	1.0948	0.25	2.20	2.50	0.080	0.015	0.015-2.0	0.60	0.20	0.20	0.005
<b>Complex-phase steel</b>													
HCT600C	–	+ZE	1.0953	0.18	0.80	2.20	0.080	0.015	0.015-2.0	1.00	0.15	0.20	0.005
HCT780C	CR570Y780T-CP	+ZE	1.0954	0.18	1.00	2.50	0.080	0.015	0.015-2.0	1.00	0.15	0.20	0.005
HCT980C	CR780Y980T-CP	+ZE	1.0955	0.23	1.00	2.70	0.080	0.015	0.015-2.0	1.00	0.15	0.22	0.005
HDT760C	HR660Y760T-CP	+ZE	1.0998	0.18	1.00	2.50	0.080	0.015	0.015-2.0	1.00	0.25	0.20	0.005
CP-W <sup>®</sup> 1000 <sup>2)</sup>	–	+ZE	–	0.23	0.80	2.20	0.080	0.015	≤ 2	1.20	0.15	0.20	0.005
<b>Martensitic steel</b>													
HDT1180G1	HR900Y1180T-MS	+ZE	1.0960	0.25	0.80	2.50	0.060	0.015	0.015-2.0	1.20	0.25	0.22	0.005

1) XG means dual phase with increased yield strength  
2) Special mill grade

\* Comparative grade, therefore minor deviations from DIN EN values possible



# Manganese-boron steel

MBW<sup>®</sup> manganese-boron steel from thyssenkrupp for hot forming offers maximum strength coupled with good formability. A combination of MBW<sup>®</sup> manganese-boron steel with high- and ultra-high-strength steels allows components with extremely complex geometries to be manufactured by hot forming.

In addition, significant weight savings can be achieved. In contrast to cold forming, this hot forming process combines the forming operation and the hardening treatment in a single step. Typical applications for MBW<sup>®</sup> manganese-boron steel are bumper crossbeams, side impact beams, pillars and components for car body reinforcement.

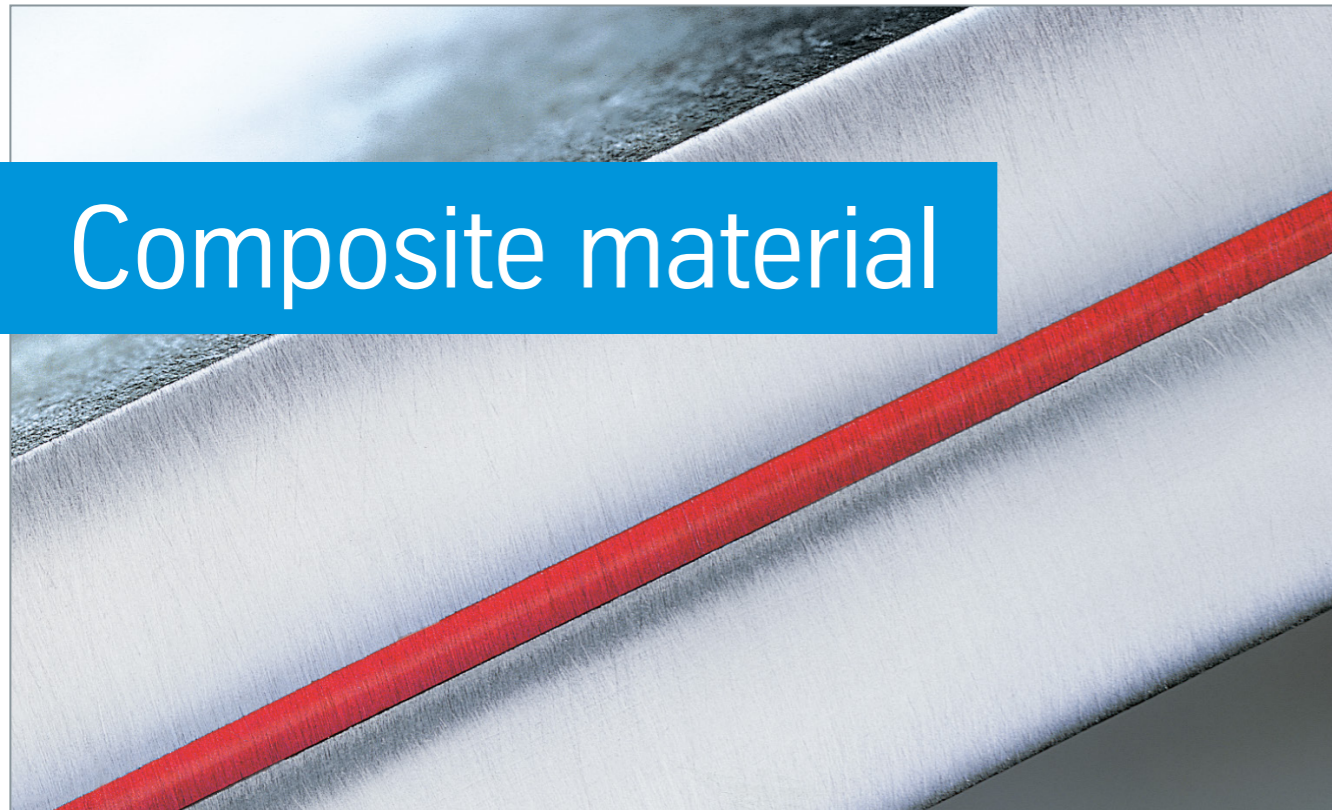
## Manganese-boron steel for hot forming

Steel type		Mechanical properties as-delivered, transverse				Typical mechanical properties after heat treatment, transverse			
Short designation	Surface finish	Proof stress R <sub>p0.2</sub> MPa min.	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> % min.	Elongation at fracture A <sub>5</sub> %	Proof stress R <sub>p0.2</sub> MPa	Tensile strength R <sub>m</sub> MPa	Elongation at fracture A <sub>80</sub> % min.	Elongation at fracture A <sub>5</sub> % min.
MBW-W <sup>®</sup> 1500 <sup>1)</sup>	–	320	500	10	12	1,000	1,500	5	6
MBW <sup>®</sup> 500 <sup>1)</sup>	+AS	300–520	400–600	16	–	400	550	17	–
MBW <sup>®</sup> 600 <sup>1)</sup>	+AS	340–580	520–720	12	–	450	650	16	–
MBW <sup>®</sup> 1500 <sup>1)</sup>	+AS	350–550	500–700	12	–	1,000	1,500	5	–
MBW-K <sup>®</sup> 1500 <sup>1)</sup>	–	250–400	450–600	18	–	1,000	1,500	5	–
MBW-K <sup>®</sup> 1900 <sup>1)</sup>	–	300–500	450–650	16	–	1,200	1,900	4	–

Steel type		Chemical composition, heat analysis									
Short designation	Surface finish	Percentage by weight % max.									
		C	Si	Mn	P	S	Al min.	CR + Mo	Nb	Ti	B
MBW-W <sup>®</sup> 1500 <sup>1)</sup>	–	0.25	0.40	1.40	0.025	0.010	0.015	0.50	–	0.05	0.005
MBW <sup>®</sup> 500 <sup>1)</sup>	+AS	0.10	0.35	1.00	0.030	0.025	0.015	–	0.10	0.15	0.005
MBW <sup>®</sup> 600 <sup>1)</sup>	+AS	0.10	0.50	2.00	0.030	0.025	0.015	–	0.10	0.15	0.005
MBW <sup>®</sup> 1500 <sup>1)</sup>	+AS	0.25	0.40	1.40	0.025	0.010	0.015	0.50	–	0.05	0.005
MBW-K <sup>®</sup> 1500 <sup>1)</sup>	–	0.25	0.40	1.40	0.025	0.010	0.015	0.50	–	0.05	0.005
MBW-K <sup>®</sup> 1900 <sup>1)</sup>	–	0.38	0.40	1.40	0.025	0.010	0.015	0.50	–	0.13	0.005

1) Special mill grade

## Composite material

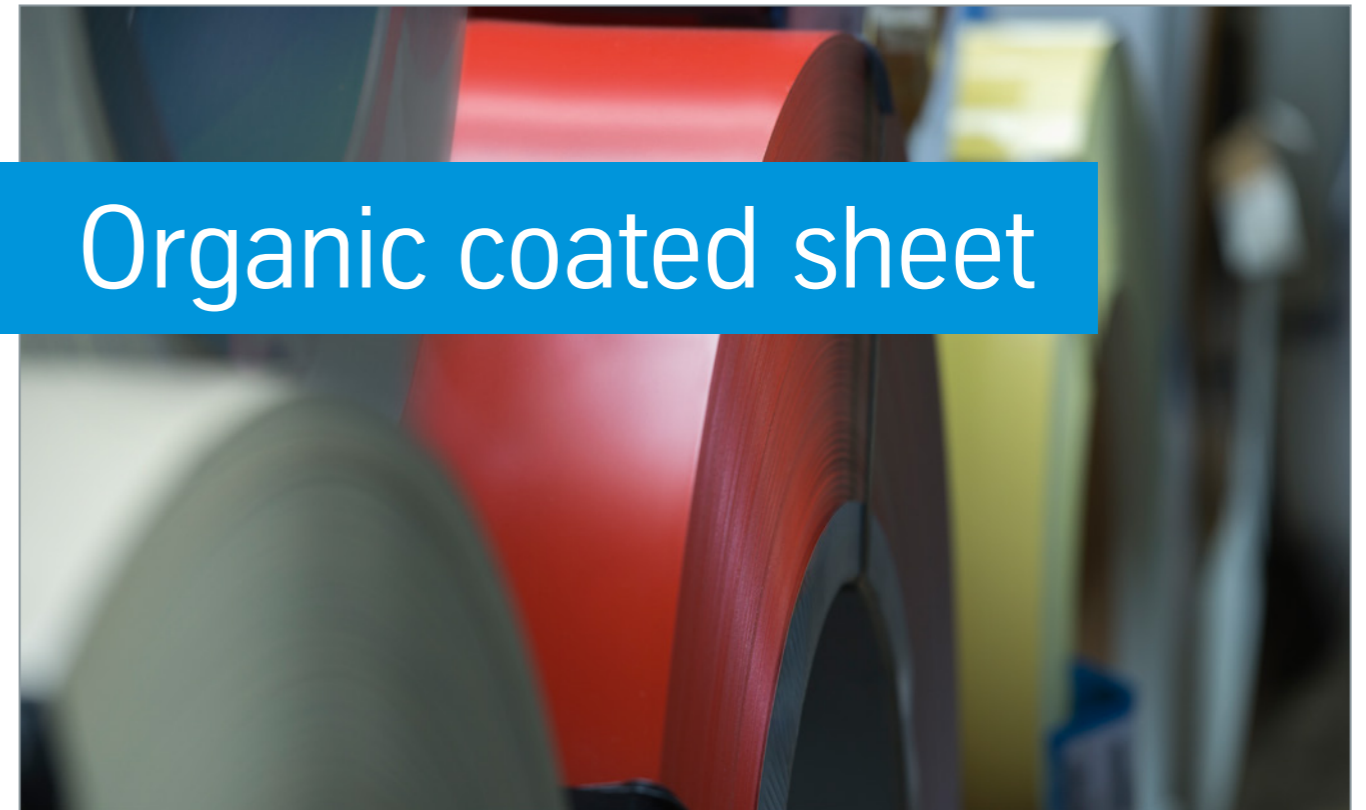


bondal® is a vibration-reducing composite material with a sandwich structure consisting of a viscoelastic plastic core between two steel sheets. bondal® offers high structure-borne sound insulation and good airborne sound damping properties and can be used to great effect wherever steel sheet components are subjected to vibrations resulting in structure-borne sound. bondal® applications include technical insulation (power plant construction), interior fittings for ships, the production of glass containers, rail vehicle construction and the automotive industry.

### Sheet types

Cold-rolled  
Hot-dip galvanized (Z/GI)  
Zinc-aluminum (ZA; galfan®)  
Aluminum-zinc (AZ)  
Aluminum-silicon (AS)  
Elektrolytically zinc-coated (ZE/EG)

## Organic coated sheet



pladur® is another composite comprising a metallic substrate with a colored organic coating. The coating materials consist of specially developed substances that combine high corrosion resistance with an attractive appearance and outstanding formability. Application areas include the construction sector (e.g. technical insulation) and the household appliances industry.

### Coating types

Liquid coatings: Based on different binder systems such as polyester, polyurethane, PVDF, etc. in various colors and gloss levels; PVC plastisol, embossed and plain, coating structure, one- or two-sided

Film coatings: Various decors as well as single-color films in various colors and gloss levels; reverse side protective coating

Surface treatments: Strippable protective film

### Sheet types<sup>1)</sup>

Cold-rolled  
Hot-dip galvanized (Z/GI)  
Zinc-magnesium (ZM)  
Zinc-aluminum (ZA; galfan®)  
Aluminum-zinc (AZ)  
Aluminum-silicon (AS)  
Elektrolytically zinc-coated (ZE/EG)

### Tolerances

Dimensional and shape tolerances to DIN EN 10 143 for hot-dip coated sheet, DIN EN 10 131 for cold-rolled and electrolytically coated sheet.

<sup>1)</sup> Other coatings on special agreement.

# Stainless steel

We offer our customers high-grade stainless, acid-resistant and heat-resistant steels which are used in numerous applications. Their advantages include high corrosion resistance, good processing characteristics (weldability), high thermal resistance, easy maintenance and optimal hygienic properties. In addition, stainless steel offers an attractive appearance, long durability and high economic efficiency. The latter deserves special mention especially with a view to environmental protection projects.

## Surface finishes

- |  |  |
|--|--|
| <p><b>1D</b> Hot-rolled, heat-treated, pickled, de-scaled, rough surface<br/>Customary standard for the majority of steel grades to ensure good corrosion resistance. Also customary finish for processing. Not as smooth as 2D or 2B.</p>           | <p><b>2R</b> Cold-rolled, bright-annealed, also skin-passed if necessary, smooth, clean bright, reflective<br/>Smoother and brighter than 2B. Also as customary finish for processing.</p> |
| <p><b>2B</b> Cold-rolled, heat-treated, pickled, skin passed, smooth, clean surface<br/>Most common finish for the majority of steel grades to ensure good corrosion resistance, smoothness, and evenness. Also customary finish for processing.</p> |  |

Other surface finishes on request.

## Stainless steel

Steel type			Mechanical properties, transverse			Chemical composition, heat analysis							
Short designation	Material number	Aisi/SAE	Proof stress $R_{p0.2}$ MPa min.	Tensile strength $R_m$ MPa	Elongation at fracture $A_{80}$ % min.	Percentage by weight % max.							
						C	Cr	Ni min.	N	Si	Mn	P	S
<b>Ferritic steel · DIN EN 10 088, Part 2</b>													
X2CrTi12	1.4512	409	220	380–560	25	0.030	10.5–12.5	–	–	1.00	1.00	0.040	0.015
X2CrTiNb18	1.4509	441	250	430–630	18	0.030	17.5–18.5	–	–	1.00	1.00	0.040	0.015
X3CrTi17	1.4510	439	240	420–600	23	0.05	16.0–18.0	–	–	1.00	1.00	0.040	0.015
X2CrMoTi17-1	1.4513	436	220	400–550	23	0.025	16.0–18.0	–	0.020	1.00	1.00	0.040	0.015
<b>Austenitic steel · DIN EN 10 088, Part 2</b>													
X5CrNi18-10	1.4301	304	230	540–750	45	0.07	17.5–19.5	8.0–10.5	0.10	1.00	2.00	0.045	0.015
X6CrNiTi18-10	1.4541	321	220	520–720	40	0.08	17.0–19.0	9.0–12.0	–	1.00	2.00	0.045	0.015
<b>Heat-resistant steel · DIN EN 10 095</b>													
X15CrNiSi20-12	1.4828	309	230	550–750	28	0.20	19.0–21.0	11.0–13.0	0.11	1.50–2.50	2	0.045	0.015
X9CrNiSiNc21-11-2	1.4835	253MA	310	650–850	37	0.12	20.0–22.0	10.0–12.0	0.2	1.40–2.50	1	0.045	0.015
X15CrNiSi25-21	1.4841	314	230	550–750	28	0.20	24.0–26.0	19.0–22.0	0.11	1.50–2.50	2	0.045	0.015

Other steel types to mill standards and international standards on request.

## Steel properties

Ferritic chromium (-molybdenum) steel generally features lower elongation and corrosion resistance than austenitic Cr-Ni (-Mo) steel. Its heat resistance is lower than that of austenitic steel. In high-temperature applications, this leads to demonstrably lower tensioning.

In the as-delivered condition, austenitic chromium-nickel (-molybdenum) steel possesses higher elongation and generally also higher corrosion resistance. In addition, unlike ferritic chromium (-molybdenum) steel, it is not magnetizable. However, heavy deformation may cause the formation of martensite which, in turn, may make the material magnetizable.

# Aluminum

After oxygen and silicon, aluminum is the third most common element in the earth's crust, and the most frequently occurring metal. In the aviation and aerospace sector, it has long become indispensable, but it has also become increasingly important in the automotive industry. The strength levels achieved in alloys with magnesium, silicon and other metals are hardly inferior at all to those of steel. At the same time, appreciable weight savings are achieved.

## exsal

Our premium product exsal offers another surface innovation: it is first grinded in samples and then anodized, which gives it a thick protective layer. As an aesthetic and at the same time light material, it is used in interior furnishings and facades.

## SAV2/2

SAV2/2 provides an alternative to the classic protective coating: It is anodized on both sides and is therefore ideal for outdoor use, such as facades, windows, doors and roofing.

## Aluminum

### Aluminum alloys

Alloy designation to EN 485	Chemical designation	Heat-treated condition	Thickness	Width max.
EN AW 1050A	Al99,5	H111	0.8–3.0	1,500
EN AW 1050A	Al99,5	H24	0.8–3.0	1,500
EN AW 1050A	Al99,5	H14	0.8–3.0	1,500
EN AW 5005A	AlMg1 (C)	H24	0.8–4.0	2,000
EN AW 5005A (anodizing quality)	AlMg1 (C)	H14	0.8–4.0	2,000
EN AW 5005A (anodizing quality)	AlMg1 (C)	H24	0.8–4.0	2,000
EN AW 5754	AlMg3	H111	0.5–5.0	2,000
EN AW 5754	AlMg3	H22	0.5–5.0	2,000
EN AW 5049	AlMg2Mn0,8	H22	0.6–1.0	1,000

### Alloys for automotive applications

Alloy designation to EN 485	Chemical designation	Heat-treated condition	Thickness	Width max.
EN AW 5083	AlMg4,5Mn0,7	H111	1.0–3.0	1,600
EN AW 5182	AlMg4,5Mn0,4	H111	0.8–4.0	1,600
EN AW 6016	AlSi1,2Mg0,4	T4	0.8–4.0	2,000
EN AW 6181	AlSi1Mg0,8	T4	0.8–4.0	2,000
EN AW 6082	AlSi1MgMn	T4	1.0–3.0	1,600
EN AW 6082	AlSi1MgMn	T6	1.0–3.0	1,600

### Coated alloys

Designation	Chemical designation	Color	Thickness	Width max.
Anodized E6/EV1 ~ 9–10 µm		Natural finish	1.0–3.0	2,000
Anodized E6/EV1 ~ 10–12 µm		Natural finish	1.0–3.0	2,000
Anodized E6/EV1 ~ 15/20 µm		Natural finish	1.0–3.0	2,000
EN AW 5049	AlMg2Mn0,8	Anodized on both sides	0.6–1.0	1,000
RAL 9006 Powder coating/Wet coating		White aluminum	1.0–2.0	1,500
RAL 9007 Powder coating/Wet coating		Gray aluminum	1.0–2.0	1,500
RAL 9010 Powder coating/Wet coating		Pure white	1.0–2.0	1,500
RAL 9016 Powder coating/Wet coating		Traffic white	1.0–2.0	1,500

Other dimensions and alloys are available on request.

All alloys comply with OEM standards and are available with EDT surfaces, dry lubricants and passivation. Slit strip, sheet and small coils are provided with intermediate paper layers and/or protective film on one or both sides in accordance with the customer's specifications.





**General note**

All information given regarding the properties and use of materials and products is for description purposes only. Guarantees in respect of specific properties or uses are subject to separate written agreement. All data given are subject to the norm valid at printing date.

As at April 2023

Materials Services  
Materials Processing Europe



Germany

thyssenkrupp Materials Processing Europe GmbH  
Krefeld branch  
Heidbergsweg 102  
47809 Krefeld  
T: +49 2151 6168-0  
krefeld.materials-processing@thyssenkrupp-materials.com

thyssenkrupp Materials Processing Europe GmbH  
Mannheim branch  
Antwerpener Straße 20  
68219 Mannheim  
T: +49 621 8032-0  
mannheim.materials-processing@thyssenkrupp-materials.com

thyssenkrupp Materials Processing Europe GmbH  
Radebeul branch  
Kötitzer Straße 110  
01445 Radebeul  
T: +49 351 8366-428  
radebeul.materials-processing@thyssenkrupp-materials.com

thyssenkrupp Materials Processing Europe GmbH  
Stuttgart branch  
Am Mittelkai 50  
70329 Stuttgart  
T: +49 711 3207-0  
stuttgart.materials-processing@thyssenkrupp-materials.com

thyssenkrupp Materials Processing Europe GmbH  
Willich branch  
Hans-Böckler-Straße 36  
47877 Willich  
T: +49 2154 496-0  
willich.materials-processing@thyssenkrupp-materials.com

[www.thyssenkrupp-materials-processing-europe.com](http://www.thyssenkrupp-materials-processing-europe.com)



France

thyssenkrupp Materials France S.A.S.  
From 01.07.2023 change of name to:  
thyssenkrupp Materials Processing Europe (France) S.A.S.  
8, rue de la Ferme Saint Ladre  
95470 Fosses  
T: +33 134 3198-02  
fosses.materials-processing@thyssenkrupp-materials.com



Spain

thyssenkrupp Materials Processing Lamincer S.A.  
Aritz Bidea, 81 Atela Auzotegia  
48100 Mungia  
T: +34 94 6477700  
lamincer@lamincer.com

thyssenkrupp Materials Processing Europe SL  
Ctra. al Mar, s/n  
46540 El Puig (Valencia)  
T: +34 961 472-062  
elpuig.materials-processing@thyssenkrupp-materials.com



Portugal

PALMETAL Armazenagem e Serviços S.A.  
Parque Industrial da Autoeuropa, Quinta da Marquesa  
2950-659 Palmela  
T: +351 21213-4500  
management@palmetal.pt



Poland

thyssenkrupp Materials Processing Europe Sp. z o.o.  
ul. Toruńska 7  
41-300 Dąbrowa Górnicza  
T: +48 32 6395-900  
dg.materials-processing@thyssenkrupp-materials.com



Hungary

thyssenkrupp Materials Hungary ZRt.  
Gerda u. 3  
9011 Győr  
T: +36 96 544-400  
gyoer.materials-processing@thyssenkrupp-materials.com