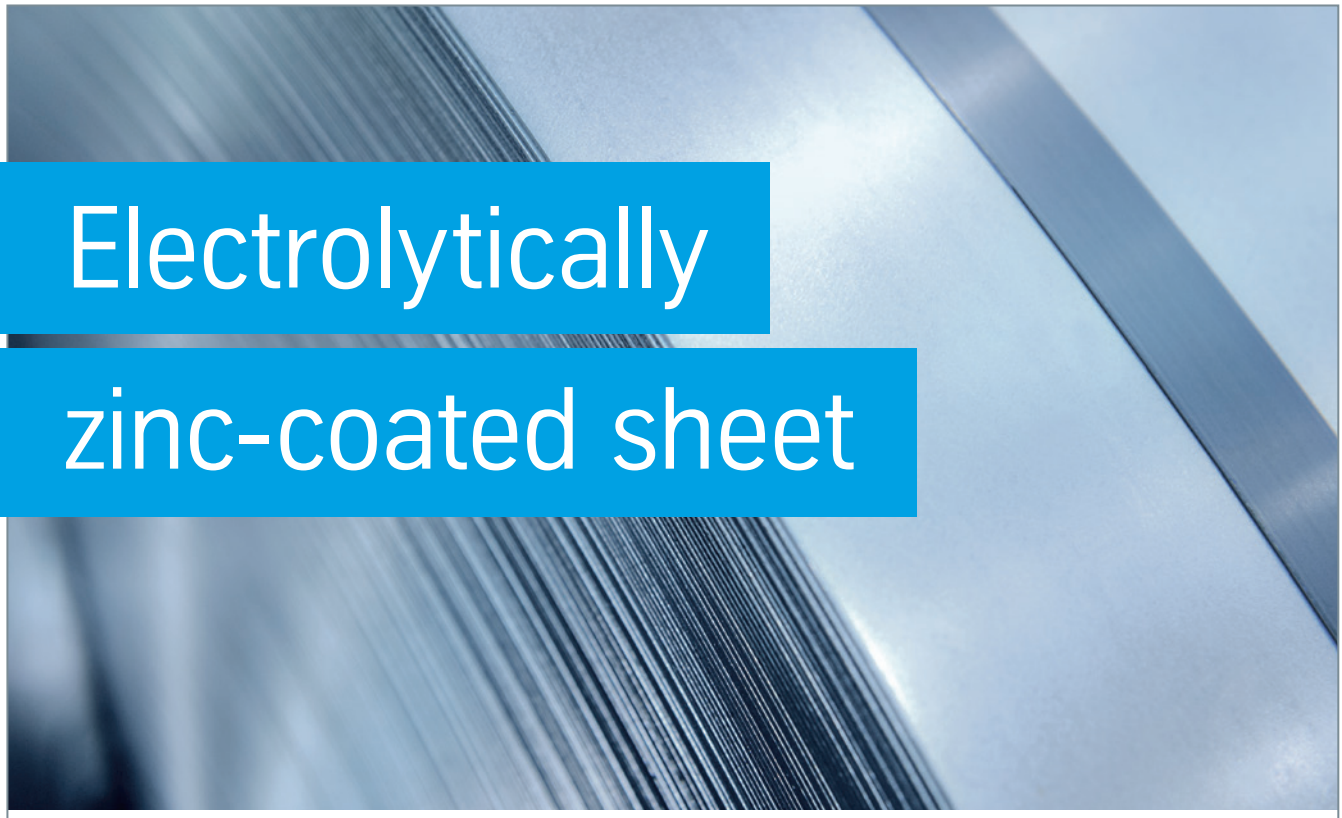
Electrolytically zinc-coated sheet



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/m²]	Weight [g/m²]		Thickness [µm]	Weight [g/m²]
Electrolytically zinc-coated sheet (ZE/EG)							
Location/type	**DIN EN**				**VDA239-100**		
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 designa-tion	VDA239-100	Surface finish	Material number	Yield strength R_e [1] MPa max.	Tensile strength R_m MPa	Elongation at fracture A_{80} [2] %	Anisotropy r_{90} [3)4)] min.	Strain hardening exponent n_{90} [3] 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 $R_{p0.2}$, otherwise for the lower yield strength (R_{eL}). 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_{90} and n_{90} values shown apply to product thicknesses ≥ 0.5 mm only.
4) For thicknesses > 2 mm, the r_{90} 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 $R_{p0,2}$ [1] MPa	Tensile strength R_m MPa	Elongation at fracture A_{80} [2] % min.	Anisotropy r_{90} [3][4]	Strain hardening exponent n_{90} [3] min.	Bake hardening index BH_2 [5] min.
High-strength IF steel							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	–
Isotropic steel							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	–
Bake hardening steel							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
Micro-alloyed steel									
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 [6]	Nb [6]
High-strength IF steel											
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
Isotropic steel											
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	–
Bake hardening steel											
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	–	–
Micro-alloyed steel											
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_{eL})
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_{90} and n_{90} minimum values apply to product thicknesses ≥0.5 mm only.
4) For thicknesses > 2 mm, the r_{90} 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 $R_{p0,2}$ MPa	Tensile strength R_m MPa	Elongation at fracture A_{80}[3] % min.	Strain hardening exponent $n_{n10\text{-}UE}$ min.	Bake hardening index BH_2 MPa min.
Dual-phase steel								
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[1]	CR700Y980T-DP	+ZE	1.0997	700–850	980	8	–	30
Retained-austenite steel (TRIP steel)								
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
Complex-phase steel								
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 $R_{p0,2}$ MPa	Tensile strength R_m MPa	Elongation at fracture A_{80}[3] % min.	Elongation at fracture A_5 %
Ferrite-bainite-phase steel							
HDT450F	HR300Y450T-FB	+ZE	1.0961	300–420	450	24	27
HDT580F	HR440Y580T-FB	+ZE	1.0994	460–620	580	15	17
Dual-phase steel							
HDT580X	HR330Y580T-DP	+ZE	1.0936	330–450	580	19	23
Complex-phase steel							
HDT760C	HR660Y760T-CP	+ZE	1.0998	660–830	760	10	12
CP-W®1000[2] (transverse)		+ZE	–	720–920	950	9	12
Martensitic steel							
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	$Al_{total\ (span)}$	Cr + Mo	Nb + Ti	V	B
Ferrite-bainite-phase steel													
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
Dual-phase steel													
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[1]	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
Retained-austenite steel (TRIP steel)													
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
Complex-phase steel													
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®1000[2]	–	+ZE	–	0.23	0.80	2.20	0.080	0.015	≤ 2	1.20	0.15	0.20	0.005
Martensitic steel													
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