DIN SPECIFICATION FOR QUENCHED AND TEMPERED SPECIAL STEELS

(DIN 10083 – 1:2006)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]								
Name	**Number**	**C[D]**	**Si max**	**Mn**	**P max**	**S**	**Cr**	**Mo**	**Ni**	**Cr+Mo+Ni[D,E]**
C22E	**1.1151**	0.17/0.24	0.40	0.40/0.70	0.035	0.035 max	0.40	0.10	0.40	0.63
C22R	**1.1149**					0.020/0.040	max	max	max	
C25E	**1.1158**	0.22/0.29	0.40	0.40/0.70	0.035	0.035 max	0.40	0.10	0.40	0.63
C25R	**1.1163**					0.020/0.040	max	max	max	
C30E	**1.1178**	0.27/0.34	0.40	0.50/0.80	0.035	0.035 max	0.40	0.10	0.40	0.63
C30R	**1.1179**					0.020/0.040	max	max	max	
C35E	**1.1181**	0.32/0.39	0.40	0.50/0.80	0.035	0.035 max	0.40	0.10	0.40	0.63
C35R	**1.1180**					0.020/0.040	max	max	max	
C40E	**1.1186**	0.37/0.44	0.40	0.50/0.80	0.035	0.035 max	0.40	0.10	0.40	0.63
C40R	**1.1189**					0.020/0.040	max	max	max	
C45E	**1.1191**	0.42/0.80	0.40	0.50/0.80	0.035	0.035 max	0.40	0.10	0.40	0.63
C45R	**1.1201**					0.020/0.040	max	max	max	
C50E	**1.1206**	0.47/0.55	0.40	0.60/0.90	0.035	0.035 max	0.40	0.10	0.40	0.63
C50R	**1.1241**					0.020/0.040	max	max	max	
C55E	**1.1203**	0.52/0.60	0.40	0.60/0.90	0.035	0.035 max	0.40	0.10	0.40	0.63
C55R	**1.1209**					0.020/0.040	max	max	max	
C60E	**1.221**	0.57/0.65	0.40	0.60/0.90	.035	0.035 max	0.40	.10	0.40	0.63
C60R	**1.223**					0.020/0.040				

DIN SPECIFICATION FOR QUENCHED AND TEMPERED SPECIAL STEELS

(DIN 10083 – 1:2006)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]								
Name	**Number**	**C[D]**	**Si**	**Mn**	**P**	**S**	**Cr**	**Mo**	**Ni**	**Cr+Mo+Ni[D,E]**
28Mn6	**1.1170**	0.25/0.32	0.40	1.30/1.65	.035	0.035 max	0.40	.10	0.40	0.63
38Cr2	**1.7003**	0.35/0.42	0.40	0.50/0.80	.035	0.035 max	0.40/0.60	…	…	…
38CrS2	**1.7023**					0.020/0.040				
46Cr2	**1.7006**	0.42/0.50	0.40	0.50/0.80	.035	0.035 max	0.40/0.60	…	…	…
46CrS2	**1.7025**					0.020/0.040				
34Cr4	**1.7033**	0.30/0.37	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	…	…	…
34CrS4	**1.7037**					0.020/0.040				
37Cr4	**1.7034**	0.34/0.41	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	…	…	…
37CrS4	**1.7038**					0.020/0.040				
41Cr4	**1.7035**	0.38.45	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	…	…	…
41CrS4	**1.7039**					0.020/0.040				
25CrMo4	**1.7218**	0.22/0.29	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	.15/.30	…	…
25CrMoS4	**1.7213**					0.020/0.040				
34CrMo4	**1.7220**	0.30/0.37	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	.15/.30	…	…
34CrMoS4	**1.7226**					0.020/0.040				
42CrMo4	**1.7225**	0.38/0.45	0.40	0.60/0.90	.035	0.035 max	0.90/1.20	.15/.30	…	…
42CrMoS4	**1.7227**					0.020/0.040				

DIN SPECIFICATION FOR QUENCHED AND TEMPERED SPECIAL STEELS

(DIN 10083 – 1:2006)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]								
Name	Number	C[D]	Si	Mn	P	S	Cr	Mo	Ni	Cr+Mo+Ni[D,E]
50CrMo4	**1.7228**	0.46/0.54	0.40	0.50/0.80	.035	0.035 max	0.90/1.20	.15/.30	…	…
36CrNiMo4	**1.6511**	0.32/0.40	0.40	0.50/0.80	.035	0.035 max	0.90/1.20	.15/.30	0.90/1.20	…
34CrNiMo6	**1.6582**	0.30/0.38	0.40	0.50/0.80	.035	0.035 max	1.30/1.70	.15/.30	1.30/1.70	…
30CrNiMo8	**1.6580**	0.26/0.34	0.40	0.30/0.60	.035	0.035 max	1.80/2.20	.30/.50	1.80/2.20	…
36NiCrMo16	**1.6773**	0.32/0.39	0.40	0.30/0.60	.030	0.025 max	1.60/2.00	.25/.45	3.60/4.10	…
51CrV4[F]	**1.8159**	0.47/0.55	0.40	0.70/1.10	.035	0.035 max	0.90/1.20	…	…	…

[A] Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition of such elements which affect the hardenability, mechanical properties, and applicability.

[B] Where requirements are made on hardenability of special steels, slight deviations from the limits for the cast analysis are permissible, except for the elements C (see footnote D), P, and S; the deviations shall not exceed those specified.

[C] Steels with improved machinability as a result of the addition of higher S contents up to around 0.10% S (including resulfurized steels with controlled inclusion contents, i.e. Ca treated) may be supplied upon request. In this case, the upper limit for Mn content may be increased by 0.15%.

[D] If special steels are ordered without hardenability requirements (symbols +H, +HH, +HL) or without mechanical property requirements in the quenched and tempered or normalized condition, a restriction in the C range to 0.05% and/or the total sum of the elements Cr, Mo, and Ni to ≤ 0.45% may be agreed upon at the time of ordering.

[E] The individual limits for residual elements are as follows: Cr 0.40%, Mo 0.10%, and Ni 0.40%.

[F] Requires V range of 0.10/0.25

DIN SPECIFICATION FOR QUENCHED AND TEMPERED UNALLOYED QUALITY STEELS

(DIN 10083 – 2:2006)

Steel Designation		Chemical Ranges and Limits, Percent[A,B]								
Name	Number	C[C]	Si	Mn	P	S	Cr	Mo	Ni	Cr+Mo+Ni[C]
C22	1.0402	0.17/0.24	0.40	0.40/0.70	0.045	0.045	0.40	0.10	0.40	0.63
C25[4]	1.0406[4]	0.22/0.29	0.40	0.40/0.70	0.045	0.045	0.40	0.10	0.40	0.63
C30[4]	1.0528[4]	0.27/0.34	0.40	0.50/0.80	0.045	0.045	0.40	0.10	0.40	0.63
C35	1.0501	0.32/0.39	0.40	0.50/0.80	0.045	0.045	0.40	0.10	0.40	0.63
C40[4]	1.0511[4]	0.37/0.44	0.40	0.50/0.80	0.045	0.045	0.40	0.10	0.40	0.63
C45	1.0503	0.42/0.50	0.40	0.50/0.80	0.045	0.045	0.40	0.10	0.40	0.63
C50[D]	1.0540[D]	0.47/0.55	0.40	0.60/0.90	0.045	0.045	0.40	0.10	0.40	0.63
C55[D]	1.0535[D]	0.52/0.60	0.40	0.60/0.90	0.045	0.045	0.40	0.10	0.40	0.63
C60	1.0501	0.57/0.65	0.40	0.60/0.90	0.045	0.045	0.40	0.10	0.40	0.63

[A] Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable measures should be taken to prevent the addition of such elements which affect the hardenability, mechanical properties and applicability.

[B] Steels with improved machinability as a result of the addition of lead or higher sulfur contents up to around 0.100% S (including controlled sulfide and oxide formation (e.g. Ca treatment)) may be supplied on request.

[C] If the steels are ordered without mechanical property requirements in the quenched and tempered or normalized condition, a restriction in the carbon range to 0.05% and/or of the total sum of the elements Cr, Mo and Ni to <= 0.45% may be agreed at the time of ordering.

[D] These steel grades have been included in this European Standard for the first time; they are not available from stock in all countries.

DIN SPECIFICATION FOR QUENCHED AND TEMPERED BORON STEELS

(DIN 10083 – 3:2006)

Steel Designation		Chemical Ranges and Limits, Percent						
Name	**Number**	**C**	**Si**	**Mn**	**P**	**S**	**Cr**	**B**
20MnB5	**1.5530**	0.17/0.23	0.40	1.10/1.40	0.035	0.040	…	0.0008/0.0050
30MnB5	**1.5531**	0.27/0.33	0.40	1.15/1.45	0.035	0.040	…	0.0008/0.0050
38MnB5	**1.5532**	0.36/0.42	0.40	1.15/1.45	0.035	0.040	…	0.0008/0.0050
27MnCrB5-2	**1.7182**	0.24/0.30	0.40	1.10/1.40	0.035	0.040	0.30/0.60	0.0008/0.0050
33MnCrB5-2	**1.7185**	0.30/0.36	0.40	1.20/1.50	0.035	0.040	0.30/0.60	0.0008/0.0050
39MnCrB6-2	**1.7189**	0.36/0.42	0.40	1.40/1.70	0.035	0.040	0.30/0.60	0.0008/0.0050

[A] Elements not listed in this table should not be intentionally added to the steel without the agreement of the purchaser other than for the purpose of finishing the cast and For boron to have its effect on the hardenability. All reasonable precautions shall be taken to prevent the addition of such elements which affect the hardenability, Mechanical properties and applicability.

[B] When requirements are made on hardenability or on the mechanical properties in the quenched and tempered condition, slight deviations from the limits on the cast Analysis are permissible except for the elements carbon, phosphorous and sulfur; the deviations shall not exceed the values given in DIN 10083.

DIN SPECIFICATION FOR CASE HARDENING STEELS

(EN 10084 – 1998)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]							
Name	Number	C	Mn	Si	P	S	Cr	Mo	Ni
C10E	1.1121	0.07/0.13	0.30/0.60	0.40	0.035	0.035 max	...	...	...
C10R	1.1207					0.020/0.040			
C15E	1.1141	0.12/0.18	0.30/0.60	0.40	0.035	0.035 max	...	...	...
C15R	1.1140					0.020/0.040			
C16E	1.1148	0.12/0.18	0.60/0.90	0.40	0.035	0.035 max	...	...	...
C16R	1.1208					0.020/0.040			
17Cr3	1.7016	0.14/0.20	0.60/0.90	0.40	0.035	0.035 max	0.70/1.00	...	...
17CrS3	1.7014					0.020/0.040			
28Cr4	1.7030	0.24/0.31	0.60/0.90	0.40	0.035	0.035 max	0.90/1.20	...	...
28CrS4	1.7036					0.020/0.040			
16MnCr5	1.7131	0.14/0.19	1.00/1.30	0.40	0.035	0.035 max	0.80/1.10	...	...
16MnCrS5	1.7139					0.020/0.040			
16MnCrB5[D]	1.7160	0.14/0.19	1.00/1.30	0.40	0.035	0.035 max	0.80/1.10	...	...
20MnCr5	1.7147	0.17/0.22	1.10/1.40	0.40	0.035	0.035 max	1.00/1.30	...	...
20MnCrS5	1.7149					0.020/0.040			
18CrMo4	1.7243	0.15/0.21	0.60/0.90	0.40	0.035	0.035 max	0.90/1.20	.15/.25	...
18CrMoS4	1.7244					0.020/0.040			

DIN SPECIFICATION FOR CASE HARDENING STEELS

(EN 10084 – 1998)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]							
Name	**Number**	**C**	**Mn**	**Si**	**P**	**S**	**Cr**	**Mo**	**Ni**
22CrMoS3-5	**1.7333**	0.19/0.24	0.70/1.00	0.040	0.035	0.020/0.040	0.70/1.00	.40/.50	…
20MoCr3	**1.7320**	0.17/0.23	0.60/0.90	0.40	0.035	0.035 max	0.40/0.70	.30/.40	…
20MoCrS3	**1.7319**					0.020/0.040			
20MoCr4	**1.7321**	0.17/0.23	0.70/1.00	0.40	0.035	0.035 max	0.30/0.60	.40/.50	…
20MoCrS4	**1.7323**					0.020/0.040			
16NiCr4	**1.5714**	0.13/0.19	0.70/1.00	0.40	0.035	0.035 max	0.60/1.00	…	0.80/1.10
16NiCrS4	**1.5715**					0.020/0.040			
10NiCr5-4	**1.5805**	0.07/0.12	0.60/0.90	0.40	0.035	0.035 max	0.90/1.20	…	1.20/1.50
18NiCr5-4	**1.5810**	0.16/0.21	0.60/0.90	0.40	0.035	0.035 max	0.90/1.20	…	1.20/1.50
17CrNi6-6	**1.5918**	0.14/0.20	0.50/0.90	0.40	0.035	0.035 max	1.40/1.70	…	1.40/1.70
15NiCr13	**1.5752**	0.14/0.20	0.40/0.70	0.40	0.035	0.035 max	0.60/0.90	…	3.00/3.50
20NiCrMo2-2	**1.6523**	0.17/0.23	0.65/0.95	0.40	0.035	0.035 max	0.35/0.70	.15/.25	0.40/0.70
20NiCrMoS2-2	**1.6526**					0.020/0.040			
17NiCrMo6-4	**1.6566**	0.14/0.20	0.60/0.90	0.40	0.035	0.035 max	0.80/1.10	.15/.25	1.20/1.50
17NiCrMoS6-4	**1.6569**					0.020/0.040			

DIN SPECIFICATION FOR CASE HARDENING STEELS

(EN 10084 – 1998)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]							
Name	**Number**	**C**	**Mn**	**Si**	**P**	**S**	**Cr**	**Mo**	**Ni**
20NiCrMoS6-4	**1.6571**	0.16/0.23	0.50/0.90	0.40	0.035	0.020/0.040	0.60/0.90	.25/.35	1.40/1.70
18CrNiMo7-6	**1.6587**	0.15/0.21	0.50/0.90	0.40	0.035	0.035 max	1.50/1.80	.25/.35	1.40/1.70
14NiCrMo13-4	**1.6657**	0.11/0.17	0.30/0.60	0.40	0.035	0.035 max	0.80/1.10	.10/.25	3.00/3.50

[A] Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions should be taken to prevent the addition of such elements which affect the hardenability, mechanical properties, and applicability.

[B] Where requirements are made on hardenability, slight deviations from the limits for the cast analysis are permitted, except for P and S; these deviations shall, however, not exceed in the case of carbon +/- 0.01% and in all other cases the values according to DIN 10084.

[C] Steels with improved machinability as a result of the addition of Pb or higher S contents, depending on the manufacturing process up to around 0.100% S (including controlled sulfide and oxide formation, e.g. Ca treatment), may be supplied on request. In this case, the upper limit of the Mn content may be increased by 0.15%.

[D] Requires B addition of 0.0008/0.0050. B is added not for an increase in hardenability, but to improve the toughness of the case hardened zone.

DIN SPECIFICATION FOR NITRIDING STEELS

(EN 10085 – 2001)

Steel Designation		Chemical Ranges and Limits, Percent[A,B]							
Name	**Number**	**C**	**Mn**	**Si**	**Al**	**Cr**	**Mo**	**Ni**	**V**
24CrMo13-6	**1.8516**	0.20/0.27	0.40/0.70	0.40	…	3.00/3.50	0.50/0.70	…	…
31CrMo12	**1.8515**	0.28/0.35	0.40/0.70	0.40	…	2.80/3.30	0.30/0.50	…	…
32CrAlMo7-10	**1.8505**	0.28/0.35	0.40/0.70	0.40	0.80/1.20	1.50/1.80	0.20/0.40	…	…
31CrMoV9	**1.8519**	0.27/0.34	0.40/0.70	0.40	…	2.30/2.70	0.15/0.25	…	.10/.20
33CrMoV12-9	**1.8522**	0.29/0.36	0.40/0.70	0.40	…	2.80/3.30	0.70/1.00	…	.15/.25
34CrAlNi7-10	**1.8550**	0.30/0.37	0.40/0.70	0.40	0.80/1.20	1.50/1.80	0.15/0.25	.85/1.15	…
41CrAlMo7-10	**1.8509**	0.38/0.45	0.40/0.70	0.40	0.80/1.20	1.50/1.80	0.20/0.35	…	…
40CrMoV13-9	**1.8523**	0.36/0.43	0.40/0.70	0.40	…	3.00/3.50	0.80/1.10	…	.15/.25
34CrAlMo5-10	**1.8507**	0.30/0.37	0.40/0.70	0.40	0.80/1.20	1.00/1.30	0.15/0.25	…	…

[A] Elements not quoted shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition of such elements which affect the mechanical properties and applicability.

[B] All grades require 0.025 max P and 0.035 max S. The steel may be ordered with an upper limit of sulfur less than 0.035% if agreed upon by purchaser and manufacturer.

DIN SPECIFICATION FOR QUENCHED AND TEMPERED SPRINGS

(EN 10089 – 2002)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]								
Name	**Number**	**C**	**Mn**	**Si**	**P**	**S**	**Cr**	**Ni**	**Mo**	**V**
38Si7	**1.5023**	0.35/0.42	0.50/0.80	1.50/1.80	.025	.025	...	...	...	...
46Si7	**1.5024**	0.42/0.50	0.50/0.80	1.50/2.00	.025	.025	...	...	...	...
56Si7	**1.5026**	0.52/0.60	0.60/0.90	1.60/2.00	.025	.025	...	...	...	...
55Cr3	**1.7176**	0.52/0.59	0.70/1.00	0.40 max	.025	.025	0.70/1.00	...	...	...
60Cr3	**1.7177**	0.55/0.65	0.70/1.00	0.40 max	.025	.025	0.60/0.90	...	...	...
54SiCr6	**1.7102**	0.51/0.59	0.50/0.80	1.20/1.60	.025	.025	0.50/0.80	...	...	...
56SiCr7	**1.7106**	0.52/0.60	0.70/1.00	1.60/2.00	.025	.025	0.20/0.45	...	...	...
61SiCr7	**1.7108**	0.57/0.65	0.70/1.00	1.60/2.00	.025	.025	0.20/0.45	...	...	...
51CrV4	**1.8159**	0.47/0.55	0.70/1.00	0.40 max	.025	.025	0.90/1.20	...	...	0.10/0.25
45SiCrV6-2	**1.8151**	0.40/0.50	0.60/0.90	1.30/1.70	.025	.025	0.40/0.80	...	...	0.10/0.20
54SiCrV6	**1.8152**	0.51/0.59	0.50/0.80	1.20/1.60	.025	.025	0.50/0.80	...	...	0.10/0.20
60SiCrV7	**1.8153**	0.56/0.64	0.70/1.00	1.50/2.00	.025	.025	0.20/0.40	...	...	0.10/0.20
46SiCrMo6	**1.8062**	0.42/0.50	0.50/0.80	1.30/1.70	.025	.025	0.50/0.80	...	.20/.30	...
50SiCrMo6	**1.8063**	0.46/0.54	0.70/1.00	1.40/1.80	.025	.025	0.80/1.10	...	.20/.35	...
52SiCrNi5	**1.7117**	0.49/0.56	0.70/1.00	1.20/1.50	.025	.025	0.70/1.00	.50/.70	...	...

DIN SPECIFICATION FOR QUENCHED AND TEMPERED SPRINGS

(EN 10089 – 2002)

Steel Designation		Chemical Ranges and Limits, Percent[A,B,C]								
Name	**Number**	**C**	**Mn**	**Si**	**P**	**S**	**Cr**	**Ni**	**Mo**	**V**
52CrMoV4	**1.7701**	0.48/0.56	0.70/1.10	0.40 max	.025	.025	0.90/1.20	...	.15/.30	0.10/0.20
60CrMo3-1	**1.7239**	0.56/0.64	0.70/1.00	0.40 max	.025	.025	0.70/1.00	...	.06/.15	...
60CrMo3-2	**1.7240**	0.56/0.64	0.70/1.00	0.40 max	.025	.025	0.70/1.00	...	.15/.25	...
60CrMo3-3	**1.7241**	0.56/0.64	0.70/1.00	0.40 max	.025	.025	0.70/1.00	...	.25/.35	...

[A] Elements which are not mentioned shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition of elements which could affect the hardenability, mechanical properties and application.

[B] In the case of the grades specified hardenability requirements, except for P and S, insignificant deviations from the limits for cast analysis are permissible. These deviations shall, however, not exceed ± 0.01% in the case of carbon, and the values according to DIN 10089.

[C] All grades require that the sum of Cu + 10 x Sn be less than or equal to 0.60.

DIN SPECIFICATION FOR FERRITIC-PEARLITIC STEELS FOR PRECIPITATION HARDENING FROM HOT-WORKING TEMPERATURES

(EN 10267 – 1998)

Steel Designation		Chemical Ranges and Limits, Percent[A,D]								
Name	Number	C	Mn	Si	P	S[B]	N	Cr	Mo	V[C]
19MnVS6	**1.1301**	0.15/0.22	1.20/1.60	0.15/0.80	0.025	0.020/0.060	0.010/0.020	0.30	0.08	0.08/0.20
30MnVS6	**1.1302**	0.26/0.33	1.20/1.60	0.15/0.80	0.025	0.020/0.060	0.010/0.020	0.30	0.08	0.08/0.20
38MnVS6	**1.1303**	0.34/0.41	1.20/1.60	0.15/0.80	0.025	0.020/0.060	0.010/0.020	0.30	0.08	0.08/0.20
46MnVS6	**1.1304**	0.42/0.49	1.20/1.60	0.15/0.80	0.025	0.020/0.060	0.010/0.020	0.30	0.08	0.08/0.20
46MnVS3	**1.1305**	0.42/0.49	0.15/0.80	0.15/0.80	0.025	0.020/0.060	0.010/0.020	0.30	0.08	0.08/0.20

[A] Elements not quoted should not be intentionally added to the steel without the agreement of the purchaser, other than for purpose of finishing the heat. All reasonable Precautions should be taken to prevent the addition of elements which affect the hardenability, mechanical properties and application.

[B] Other elements may be added to improve machinability (or to control sulfide morphology and oxide formation), subject to agreement. The sulfur range may also be subject to agreement.

[C] Some or all of the vanadium content may be replaced by niobium, subject to agreement. In this case, the lower limit of vanadium shall also be subject to agreement.

[D] Titanium additions shall be subject to agreement.