



STEELGRADES AND DELIVERY CONDITIONS

COLD DRAWN / HARD

(+C acc. EN 10305 / BK acc. DIN 2391)

No heat treatment after final cold drawing.

COLD DRAWN / SOFT

(+LC acc. EN 10305 / BKW acc. DIN 2391)

The final heat treatment is followed by a suitable drawing pass (limited reduction of area).

STRESS RELIEVED

(+SR acc. EN 10305 / BK+S acc. DIN 2391)

After the final cold drawing process, tubes are stress relieved in controlled atmosphere in order to reduce work hardening due to the cold forming process.

ANNEALED

(+A acc. EN 10305 / GBK acc. DIN 2391)

After final cold drawing process, tubes are annealed in controlled atmosphere.

NORMALIZED

(+N acc. EN 10305 / NBK acc. DIN 2391)

After final cold drawing process, tubes are normalized in controlled atmosphere at a temperature exceeding the austenitizing temperature.

Norm	Steel grade	Chemical composition (% on mass)									
		C		Si		Mn		P	S	Al	
		Min.	Max.	Min.	Max.	Min.	Max.	Max.	Max.	Min.	Max.
EN 10305-1 (Seamless tubes)	E215	-	0.10	-	0.05	-	0.70	0.025	0.025	0.025 ¹	-
	E235	-	0.17	-	0.35	-	1.20	0.025	0.025	0.015 ¹	-
	E355*	-	0.22	-	0.55	-	1.60	0.025	0.025	0.020 ¹	-
	E410²	0.16	0.22	0.10	0.50	1.30	1.70	0.030	0.035	0.010	0.060
	P460^{*3}	-	0.20	-	0.60	1.00	1.70	0.025	0.030	0.020	-
EN 10305-2 (Welded tubes)	E155	-	0.11	-	0.35	-	0.70	0.025	0.025	0.015 ¹	-
	E195	-	0.15	-	0.35	-	0.70	0.025	0.025	0.015 ¹	-
	E235	-	0.17	-	0.35	-	1.20	0.025	0.025	0.015 ¹	-
	E275	-	0.21	-	0.35	-	1.40	0.025	0.025	0.015 ¹	-
	E355*	-	0.22	-	0.55	-	1.60	0.025	0.025	0.020 ¹	-
EN 10305-4 (Seamless tubes)	E215	-	0.10	-	0.05	-	0.70	0.025	0.015	0.025	-
	E235*	-	0.17	-	0.35	-	1.20	0.025	0.015	-	-
	E355	-	0.22	-	0.55	-	1.60	0.025	0.015	-	-

* Standard stock.

¹ The aluminium content is no longer ruled when the steel contains an adequate percentage of Nitrogen binding elements, like Niobium, Vanadium or Titanium.

² $0.080 \leq V \leq 0.15$; $Nb \leq 0.070$; $Ti \leq 0.050$; $Nb+V \leq 0.20$ (% on mass).

³ Steel according to manufacturer's specification, not foreseen by any norm. $Cu \leq 0.70$; $Cr \leq 0.30$; $Ni \leq 0.80$; $Mo \leq 0.10$; $V \leq 0.20$; $Ti \leq 0.040$; $N \leq 0.020$; $Nb \leq 0.050$; $Nb+Ti+V \leq 0.22$ (% on mass).