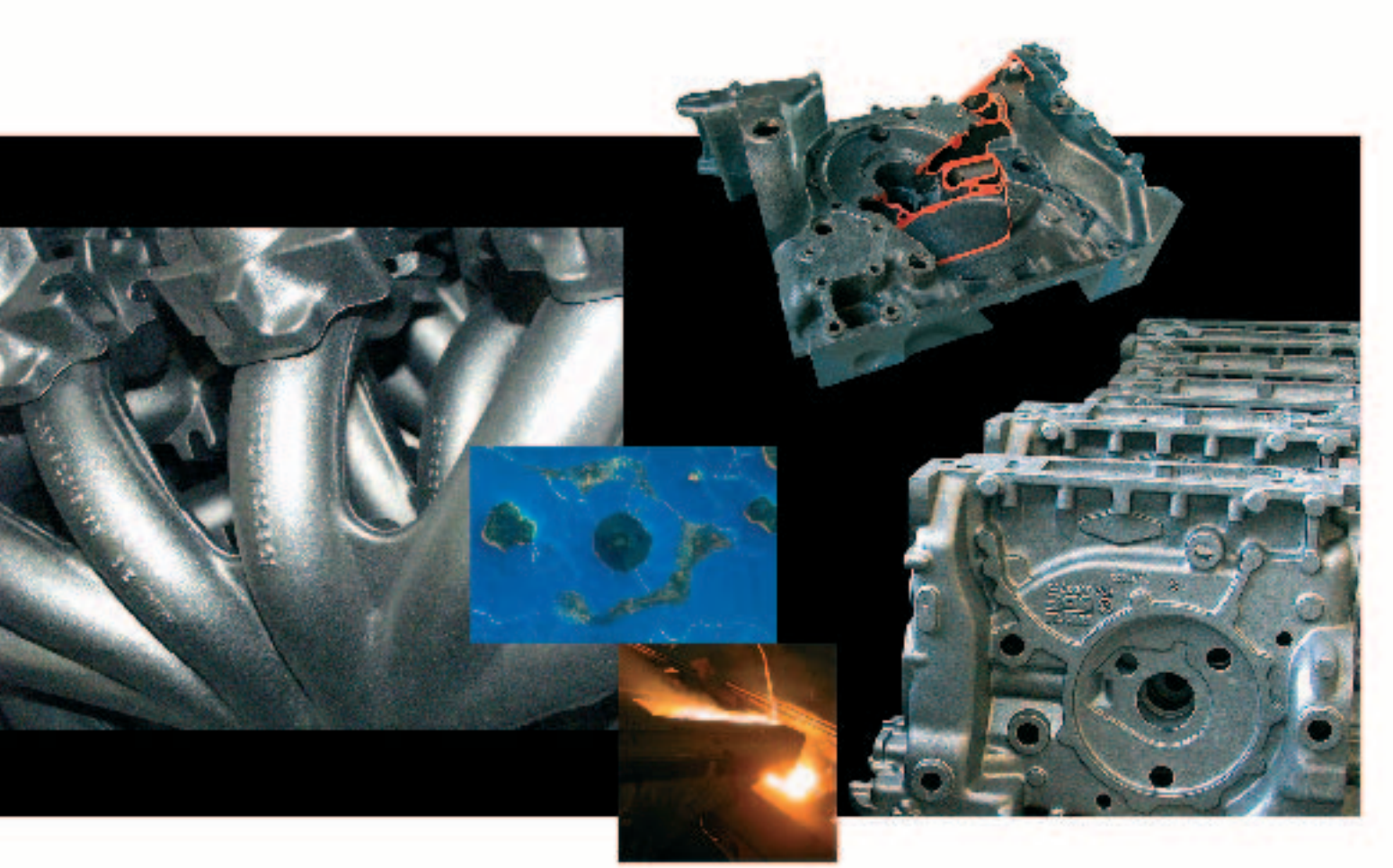
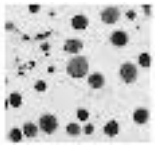
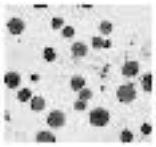
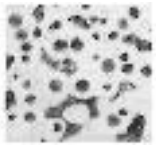
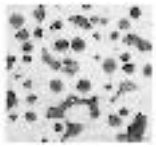
vonRoll casting



Cast iron

Contents

Cast iron with nodular graphite[1)]

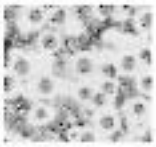
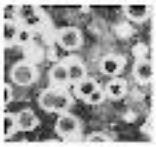
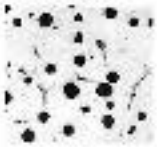
Designation to DIN EN 1563			**EN-GJS-350-22-LT**	**EN-GJS-400-18-LT**	**EN-GJS-400-15**	**EN-GJS-450-10**
Nominal analysis[2)]	C		3,50–3,70	3,50–3,70	3,50–3,70	3,50–3,70
for medium wall thicknesses	Si		1,80–2,00	2,30–2,60	2,30–2.60	2,80–3,30
	Mn		max. 0,2	max. 0,25	max. 0,25	max. 0,40
	Mo		–	–	–	–
	Ni		–	–	–	–
Structure			 Ferrite 1:100	 Ferrite 1:100	 Ferrite and pearlite 1:100	 Ferrite and pearlite 1:100
Mechanical properties[1)]						
Tensile strength	R_m	N/mm²	350–400	400–450	400–550	450–600
0,2 yeld point	$R_{p0,2}$	N/mm²	220–280	250–300	250–350	310–410
Breaking elongation	A_5	%	30–22	27–18	27–15	20–10
Breaking constriction	Z	%	35–20	32–17	30–15	20–10
Modulus of elasticy	E	kN/mm²	160–185	160–185	160–185	160–185
Notched-bar impact test[3)]	to +20 °C (RT)	Joule	17–25	14–18	–	–
	to –20 °C (LT)	Joule	–	12	–	–
	to –40 °C (LT)	Joule	12	–	–	–
Brinell hardness	HB 30		110–150	120–165	135–185	160–210
Reversed bending strength[2)]	δ_{bw}	N/mm²	180	200	200	220
Alternating tensile-compr. strength[2)]	δ_{zdw}	±N/mm²	120	140	140	125
Technical properties						
Heat resistance			–	–	–	–
Thermal stability			–	–	–	–
Machinability			very good	very good	very good	good
Wear resistance			low	low	low	low
Inductive or flame-hardening capacity			low	low	low	low
Nitride hardening capacity			good	good	good	good
Weldability			partially weldable with special electrodes			
Physical properties						
Density	ρ	kg/dm³	7,10–7-30	7,10–7-30	7,10–7-30	7,10–7-30
Thermal conductivity	λ to 300 °C	W/(K·m)	36	36	36	36

[1)] The mechanical properties of cast iron with spheroidal graphite in separately cast specimen

[2)] Reference values

[3)] Averages from three ISO V specimens (DIN 50115)

Cast iron with nodular graphite[1)]

EN-GJS-500-7	EN-GJS-600-3	EN-GJS-700-2	EN-GJS-800-2	EN-GJS-1000-5[4)]	EN-GJS-X SiMo4-0.5	EN-GJS-X SiMo5-1[5)]	EN-GJSA-X NiSiCr35 5 2
3,50–3,70	3,50–3,70	3,50–3,70	3,50–3,70	3,50–3,70	3,00–3,40	3,00–3,40	max. 2,00
2,30–2,60	2,30–2,60	2,30–2,60	2,30–2,60	2,30–2,60	3,60–4,40	4,00–5,00	4,00–6,00
max. 0,40	max. 0,40	max. 0,40	max. 0,40	max. 0,40	max. 0,30	max. 0,30	0,50–1,50
–	–	–	–	–	0,40–0,60	0,80–1,20	–
–	–	–	–	–	–	–	34,0–36.0
							
Ferrite and pearlite 1:100	Pearlite and ferrite 1:100	Pearlite and ferrite 1:500	Pearlite 1:500	Bainite and austenite 1:500	Ferrite 1:500	Ferrite 1:500	Austenite 1:100
500–650	600–750	700–850	800–1000	1000–1200[6)]	500–630	500–630	370–500
320–420	370–480	420–600	480–750	700–800[6)]	400–520	400–520	200–290
18–7	8–3	6–2	4–2	15–5[6)]	16–8	13–4	20–10
20–7	8–3	6–2	4–2	–	–	–	–
160–185	160–185	160–185	160–185	155–170[6)]	160–175	160–175	110–145
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
170–220	200–250	235–285	270–335	300–360[6)]	200–250	200–250	130–170
240	270	300	320	–	–	–	–
160	180	200	220	380	–	–	–
–	–	–	–	–	very good	very good	very good
–	–	–	–	–	good	very good	very good
good	good	moderate	moderate	moderate	moderate	moderate	good
good	good	very good	very good	very good	good	good	moderate
low	good	very good	very good	–	–	–	– –
good	good	very good	very good	–	–	–	–
		partially weldable with special electrodes					
7,10–7-30	7,10–7-30	7,10–7-30	7,10–7-30	7,10–7-30	7,10–7-30	7,10–7-30	7,45
35	33	31	31	22	28	28	13

[4)] to DIN EN 1564
[5)] also corresponds to quality EN-GJS-XSiMo4-1

[6)] mechanical properties after annealing

special materials on request

Cast iron with lamellar graphite[1)]

Designation to DIN EN 1561				EN-GJL-150	EN-GJL-200	EN-GJL-250	EN-GJL-300	
Nominal analysis[2)]	C				3,40–3,60	3,20–3,40	2,90–3,10	2,90–3,10
	Si				2,30–2,60	2,00–2,40	1,80–2,10	1,60–1,90
	Mn				0,60–0,90	0,70–1,00	0,80–1,10	0,80–1,10
Structure					 Pearlite, coarse lamellar 1:100	 Pearlite, coarse lamellar 1:100	 Pearlite, fine lamellar 1:100	 Pearlite, fine lamellar 1:100
Mechanical properties								
Tensile strength[3)]	R_m	N/mm²			150–250	200–300	250–350	300–400
				wall thickness				
Tensile strength[4)]	R_m	N/mm²		10– 20 mm	–	–	–	–
			>	20– 40 mm	120	170	210	250
			>	40– 80 mm	110	150	190	220
			>	80–150 mm	100	140	170	210
			>	150–300 mm	90	130	160	190
Reference values for other mechanical properties								
Yield point	$R_{p0,1}$	N/mm²			98–165	130–195	165–228	195–260
Breaking elongation	A	%			0,8–0,3	0,8–0,3	0,8–0,3	0,8–0,3
Compressive strength	δ_{dB}	N/mm²			600	720	840	960
Bending strength	δ_{bB}	N/mm²			250	290	340	390
Shear strength	δ_{aB}	N/mm²			170	230	290	345
Torsional strength	τ_{tB}	N/mm²			170	230	290	345
Modulus of elasticy	E	kN/mm²			78–103	88–113	103–118	108–137
Poisson's ratio	υ				0,26	0,26	0,26	0,26
Reversed bending strength	δ_{bB}	N/mm²			70	90	120	140
Alternating tensile-compr. strength	δ_{zdW}	N/mm²			40	50	60	75
Fracture toughness	K_{IC}	N/mm$^{3/2}$			320	400	480	560
Physical properties								
Density	ρ	kg/dm³			7,10	7,15	7,20	7,25
Thermical conductivity	λ to 300 °C	W/(K·m)			50	48	47	45

[1)] The mechanical properties in separately cast specimen 30 mm dia. The mechanical properties in the casting depend on the wall thickness

[2)] Reference values, for average wall thicknesses

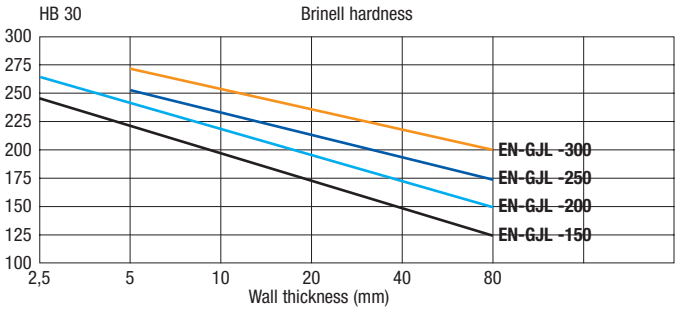
[3)] In separately cast specimen 30 mm dia.

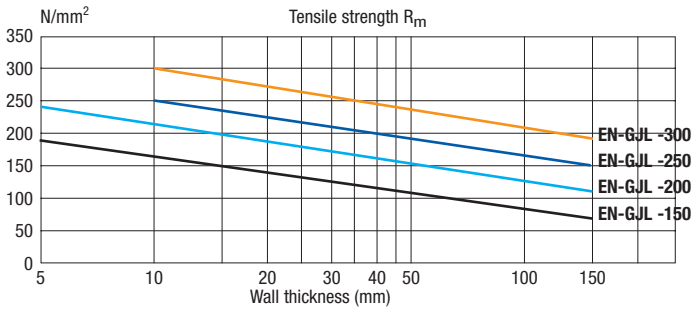
[4)] In integrally cast specimen

Cast iron with lamellar graphite[1)]

Designation to DIN EN 1561		EN-GJL-150	EN-GJL-200	EN-GJL-250	EN-GJL-300
Nominal analysis[2)]	C	3,40–3,60	3,20–3,40	2,90–3,10	2,90–3,10
	Si	2,30–2,60	2,00–2,40	1,80–2,10	1,60–1,90
	Mn	0,60–0,90	0,70–1,00	0,80–1,10	0,80–1,10
Structure		 Pearlite, coarse lamellar 1:500	 Pearlite, coarse lamellar 1:500	 Pearlite, fine lamellar 1:500	 Pearlite, fine lamellar 1:500
Technical properties					
Machinability		very good	very good	very good	very good
Wear-resistance		moderate	good	very good	very good
Inductive or flame-hardening capacity		poor	low	good	very good
Nitride hardening capacity		good	good	good	very good
Quenching		very good	very good	very good	very good
Weldability		partially weldable with special electrodes			
Application examples			Pumps, fittings	Compressors, cylinders, pistons	Steam turbines, presses
General properties		Light, thin-walled castings, parts for general machine construction	Medium-walled castings, textile machines, machine and vehicle con-struction	Thick-walled castings for highly stressed parts and parts subject to greater wear	Thick-walled castings for highly stressed parts and parts for the chemical industry

Values expected in casting





[1)] The mechanical properties in separately cast specimen 30 mm dia. The mechanical properties in the casting depend on the wall thickness

[2)] Reference values, for mean wall thicknesses

special materials on request

International material standards

Cast iron with nomular graphite DIN EN 1563	Germany DIN 1693	France NF	Great Britain BS	Netherlands NEN	Sweden MNC	USA ASTM A536
EN-GJS-350-22-LT	GGG-35.3	FGS 370-17	370/17	GN 38	0717-15	–
EN-GJS-400-18-LT	GGG-40.3	–	–	–	–	60-40-18
EN-GJS-400-15	GGG-40	FGS 400-12	420/12	GN 42	0717-02	60-40-18
EN-GJS-450-10	–	–	420/12	–	–	65-45-12
EN-GJS-500-7	GGG-50	FGS 500-7	500/7	GN 50	0727-02	65-45-12 / 80-55-06
EN-GJS-600-3	GGG-60	FGS 600-3	600/3	GN 60	0732-03	80-55-06
EN-GJS-700-2	GGG-70	FGS 700-2	700/2	GN 70	0737-01	100-70-03
EN-GJS-800-2	GGG-80	FGS 800-2	800/2	–	–	120-90-02
EN-GJS-1000-5 (DIN EN 1564)	GGG-100B/A	–	–	–	–	850-550-10
EN-GJS-AX NiSiCr35 5 2	GGG-NiSiCr 35 5 2	FGS-Ni35Si5Cr2	S5S	–	–	Type D-5S

Cast iron with lamellar graphite DIN EN 1561	Germany DIN 1691	France NF	Great Britain BS	Netherlands NEN	Sweden MNC	USA ASTM A48
EN-GJL-150	GG-15	Ft 15 D	Grade 150	GG 15	01 15-00	20 B / 25 B
EN-GJL-200	GG-20	Ft 20 D	Grade 180 / Grade 220	GG 20	01 20-00	25 B / 30 B
EN-GJL-250	GG-25	Ft 25 D	Grade 220 / Grade 260	GG 25	01 25-00	35 B / 40 B
EN-GJL-300	GG 30	Ft 30 D	Grade 300	GG 30	01 30-00	40 B / 45 B

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