

ЛИК ПОС - 1992 год
Дата

ХИМИЧЕСКИ ПОКАЗАТЕЛИ — НОРМА

Порядк номер	НАИМЕНОВАНИЕ НА ПРОБООБЪЕМНОЕ МЕСТО	6,5 - 8,5	Алкалност мг/л	Общая твердость < 30° Н	Кальций мг/л < 250	Магний мг/л < 80	Сероводород и сульфид мг/л	Разтворен O ₂ > 5	Окисляемость мг O ₂ /л < 15	Разтворен в-ва мг/л < 1000	Нерастворен в-ва мг/л < 30	Аммоний мг/л < 0,1	Хлорид мг/л < 300	Цианид мг/л < 0,02	Фенолы мг/л < 0,001	Нефтепродукты мг/л < 0,3	Железо мг/л < 1,0	Сульфат мг/л < 250	Медь до 0,3 мг/л	БПК ₅ до 10	
																					Средни стойности
1	КХП 1 01.92 год																				
	2 МСМДВ-Вх	7,19	16	16,52	84,16	20,67	0	6,25	4,46	324	61	0,64		0,32	1,11	7	2,7	24,0	0,28		
	3 - илх	7,08		15,12	74,14	20,66	0	6,58	12,63	304	23	5,74		0,43	4,63	7	4,54	0	0,24		
	18 МОВ-Вх	6,99		14,18	70,13	19,45	0	8,03	2,92	275	87	4,92		0,12	0	2	1,24	0	0		
	19 - илх	7,13		13,86	60,11	23,71	0	8,99	2,26	283	35	3,57		0	0	0	0,78	0	0		
2	Сборна 14																				
3	КСДП 12 02.92 год																				
4	ХВД МСМДВ-Вх	6,44		13,02	64,12	18,24	0	4,83	278	40	0,33			0,33	0,35	5,5	1,82	0	0,40		
5	ЦКЛ 4 - илх	6,51		13,86	68,13	17,82	0	8,67	283	31	5,49			0,43	4,9	5,75	3,89	0	0,53		
	5 МОВ-Вх	6,13		13,13	58,11	21,8	0	2,49	250	19	3,2			0	0	1	0,31	0	0		
	17 - илх	6,19		14,39	62,12	17,69	0	2,27	256	20	2,34			0	0	0	0,46	0	0		
6	ПД 7																				
7	ПСВ 8 03.92 год																				
	8 МСМДВ-Вх	7,43		13,50	67,33	19,45	0	12,38	297	61	3,02			0,43	0,42	5	2,83	36,51	0,37		
8	РМЗ 15 - илх	7,23		14,89	65,72	20,42	0	12,97	290	24	5,77			0,47	0,23	4,02	4,02	0	0,41		
9	ПГВ 16 МОВ-Вх	7,02		16,58	73,55	24,27	0	6,14	297	77	2,6			0	0	2,4	1,06	0	0		
10	Локомотивно депо 9 - илх	6,9		14,93	70,54	18,97	0	4,24	133	1	0,22			0	0	0	0,72	0	0		
11	Маслено стопанство 10																				
12	ЦУ - ф. колл. 04.92 год																				
13	Главен ф. колл. МСМДВ-Вх	6,26		13,30	68,13	16,41	0	7,24	357	73	3,19			0,18	0,49	6	1,57	33,62	0,36		
14	Главен д. колектор 2х илх	6,27		11,9	66,12	11,55	0	8,36	315	51	3,48			0,19	0,82	5,5	3,49	0	0,47		
15	Шламова станция МОВ-Вх	6,15		19,32	70,12	20,06	0	3,34	313	24	3,23			0,03	0	2	0,73	0	0		
16	ТЭС - илх	6,14		13,58	76,03	15,8	0	2,11	317	17	1,0			0	0	0	0,33	0	0		
17	АП																				
	05.92 год																				
	МСМДВ-Вх	6,70		13,16	86,17	13,98	0	5,48	319	105	2,77			0,33	0,19	7,5	6,18	0	0,66		
	- илх	6,68		13,44	70,13	15,8	0	10,45	272	72	4,96			0,5	0,26	4,2	4,76	0	0,53		

Зав. лаборатория:

Дата

ХИМИЧЕСКИ ПОКАЗАТЕЛИ — НОРМА

Горелки номер	НАИМЕНОВАНИЕ НА ПРОБООТБОРНИТЕ МЕСТА	ХИМИЧЕСКИ ПОКАЗАТЕЛИ — НОРМА																		
		Рн 6,5 — 8,5	Алкалност мг/л	Обща твърдост <30°Н	Калций мг/л <250	Магний мг/л <80	Сярководород и сулфати мг/л не	Разтворен O ₂ >5	Окисляемост мг O ₂ /л <15	Разтворена в-ва мг/л <1000	Нерастворени в-ва мг/л <30	Амونيак мг/л <0,1	Хлориди мг/л <300	Цианиди мг/л <0,02	Феноли мг/л <0,001	Нефтепродукти мг/л <0,3	Желязо мг/л <1,0	Сулфати мг/л <250	Манган до 0,3 мг/л	ВПК до 10
1	КХП 1	05. 92ггг																		
	2	МОВ-Вх	6,78		15,12	74,14	20,67	0		4,46	322	31	3,49	0	0	1,5	1,4	0	0	
	3	-цх	6,78		16,8	68,13	81,61	0		2,86	319	7	0,82	0	0	0	1,17	0	0	
	18																			
	19	06. 92ггг																		
2	Сборна 14	МОВ-Вх	2,07		7,50	48,10	4,78	0		16,10	298	41	7,3	0,55	4,32	9,8	5,59	0	0,56	
3	КСДП 12	-цх	6,68		8,62	43,29	11,19	0		12,71	134	44	6,97	0,53	2,84	7,8	4,65	0	0,23	
4	ХВО 6	МОВ-Вх	6,48		15,9	72,14	25,29	0		3,32	316	29	2,78	0	0	3	1,77	0	0	
5	ЦКЛ 4	-цх	6,57		2,8	68,94	18,48	0		2,43	323	8	1,1	0	0	0	1,53	0	0	
	5																			
	17	07. 92ггг																		
6	ТПП 7	МОВ-Вх	6,88		11,34	108,21	0	0		17,64	203	35	6,17	0,24	5,03	11	5,93	0	0,45	
	13	-цх	6,70		12,02	78,16	27,4	0		7,32	197	52	5,39	0,21	0,23	11	3,86	0	0,50	
7	ПСВ 8	МОВ-Вх	6,21		14,00	61,58	27,58	0		4,28	364	62	2,14	0	0	13	1,04	0	0	
8	РМЗ 15	-цх	6,20		16,38	62,25	32,51	0		2,4	255	9	0,71	0	0	5	0,85	0	0	
9	ПГВ 16																			
10	08. 92ггг																			
11	Локомотивно депо	МОВ-Вх	7,0		11,76	70,13	10,33	0		17,36	240	82	11,04	0,36	1,78	7,5	3,54	0	0,3	
12	Маслено стора	-цх	7,0		11,20	54,10	15,80	0		12,72	241	73	12,27	0,37	6,48	5,5	2,0	0	0,32	
13	Главен ф. колектор	МОВ-Вх	6,78		14,84	71,14	19,46	0		5,62	269	45	2,97	0,07	0	3,2	1,34	0	0	
14	Главен д. колектор	цх	6,75		14,56	82,16	13,37	0		3,65	259	25	1,52	0	0	0	0,93	0	0	
15	Шламова станция 3																			
16	ТЕЦ	09. 92ггг																		
17	АП	МОВ-Вх	6,92		8,18	51,30	17,35	0		14,14	202	121	10,3	0,40	1,57	6	4,4	0	0,36	
		-цх	6,82		9,26	46,49	12,10	0		9,37	192	33	5,79	0,41	1,24	6	2,53	0	0,32	
		МОВ-Вх	6,73		14,47	65,73	20,191	0		4,32	274	21	3,30	0	0	3	1,11	0	0	
		-цх	6,72		13,78	62,52	18,09	0		2,91	250	7	0,43	0	0	2	0,87	0	0	

Зав. лаборатория:

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ХИМИЧЕСКИ ПОКАЗАТЕЛИ — НОРМА

Порядк. номер	НАИМЕНОВАНИЕ НА ПРОБООТБОРНИТЕ МЕСТА	ХИМИЧЕСКИ ПОКАЗАТЕЛИ — НОРМА																		
		РН 6,5-8,5	Алкалност мгекв/л	Обща твърдост <30°Н	Калций мг/л <250	Магнесий мг/л <80	Сярород и сулфати мг/л не	Разтворен O ₂ >5	Окисляемост мг O ₂ /л <15	Разтворими в-ва мг/л <1000	Пероксидни в-ва мг/л <30	Амоняк мг/л <0,1	Хлориди мг/л <300	Цианиди мг/л <0,02	Феноли мг/л <0,001	Нитропродукти мг/л <0,3	Желязо мг/л <1,0	Сульфати мг/л <250	Манган до 0,3 мг/л	БПК ₅ до 10
1	КХП 1 10. 92 год.																			
	2 ПММДВ-вх	7,26		8,77	56,11	10,54	0	468	145	65	1,4		0,09	0,15	11	4,47	0	0,23		
	3 - илх	7,22		8,8	61,5	7,3	0	6,96	145	34	3,2		0,1	0,1	8	2,0	0	0,4		
	18 ПМДВ-вх	6,51		11,0	93,52	2,4	0	5,63	279	23	2,29		0	0	1	0,9	0	0		
	19 - илх	6,78		12,5	101,5	4,9	0	4,15	256	32	1,6		0	0	0	0,3	0	0		
2	Сборна 14																			
3	КСДП 12 М. 92 год.																			
4	ХВО ПММДВ-вх	7,95		9,71	82,83	0,81	0	22,70	134	51	4,01		0,43	16,76	34,5	5,33	0	0,31		
5	ЦКЛ 4 - илх	7,33		11,20	56,11	14,60	0	20,32	122	47	7,07		0,41	10,46	3,5	4,47	0	0,20		
	16 ПМДВ-вх	6,83		16,10	78,16	22,49	0	5,16	199	53	5,14		0	0	2,3	1,07	0	0		
	17 - илх	7,27		16,24	76,15	24,32	0	9,86	189	37	1,05		0	0	0	0,63	0	0		
6	ТЦП 7																			
	18. 92 год.																			
7	ПСВ 8 ПММДВ-вх	7,12		15,54	86,17	15,23	0	15,40	148	145	7,10		0,29	4,55	15	5,35	0	0,34		
8	РМЗ 15 - илх	6,95		16,66	107,19	11,64	0	14,67	161	26	6,03		0,28	0,41	6	3,08	0	0,29		
9	ПГВ 16 ПМДВ-вх	7,02		20,16	71,14	44,68	0	4,70	133	81	4,24		0	0	4	0,58	0	0		
10	Локомотивно депо 9 - илх	7,01		18,34	78,15	32,81	0	3,74	177	35	0,44		0	0	1	0,56	0	0		
11	Маслено стопанство 10																			
12	ЦУ — ф. колектор 20																			
13	Главен ф. колектор 11																			
14	Главен д. колектор 21																			
15	Шламова станция 3																			
16	ТЕЦ																			
17	АП																			

Зав. лаборатория:

СРЕДНИ РЕЗУЛТАТИ ОТ ИЗМЕРВАНИЯТА
НА ДЕВИТ И КОНЦЕНТРАЦИЯ НА ПРАХ
ЗА 1992 ГОДИНА

Очисно съоръжение №	Пред филтъра		След филтъра		
	Q ₀ мм ³ /ч	Z ₀ г/мм ³	Q ₀ мм ³ /час	Z ₀ г.р./мм ³	
Агломерационен цех	Ел. фр. № 1-Т	271036	3,368	309177	0,951
	2-А	223149	7,831	261702	0,318
	3-Т	276292	2,207	313206	0,460
	4-А	287826	3,600	313635	0,465
	5-Т	290383	3,870	332908	0,814
	6-А	360863	7,384	570929	0,203
	7-Т	300130	2,374	526180	0,123
	8-А	409722	5,163	476875	0,202
	9-Т	216858	2,493	432735	0,146
	10-А	303794	14,468	369045	0,050
	11-Т	283782	1,586	325082	0,354
	12-А	326543	11,928	383801	0,257
	13-А	187974	0,948	159930	0,010
	14-А	153684	8,093	159639	0,082
ЦМО	1-Т	34104	9,501	37943	6,763
	2-Т	40993	5,557	45625	3,065
	3-Т	43409	1,584	45856	0,496
	4-Т	47568	17,206	48000	4,782
САЗ	Г.2300к 1к-1			182972	0,081
	" " 1к-2			172483	0,290
	" " 1к-3			142106	0,106
	" " 1к-4			25090	0,003
	" " 1к-5			65409	0,151

IV. КОНТРОЛ НА ЗАМЪРСЯВАНЕТО НА ВСЯКО ПРОИЗВОДСТВО

1. В "Кремиковци"-АД съществува Лаборатория за изследване и контрол параметрите на околната среда в състава на Централна комбинатска лаборатория и е на пряко подчинение на Намалника на последната.

Лабораторията за изследване и контрол параметрите на околната среда има ръководител, 7 технолози, три групи за контрол (по прахогазови измервания, контрол на атмосферния въздух и работната среда и контрол на водите). Общия числен състав е 51 човека.

2. Качествените стандарти за въздуха, за водата, токсични вещества и шум са легализирани в България.

3. Не местни стандарти, а държавни.

4. Приложения №1 и 2.

5. Екологични проблеми, нуждаещи се от спешно решение:

- Премахване вторичното замърсяване на Сгуроотвала;
- Прекратяване на фенолните имисии от мокрото гасене на кокса;

- Въвеждане в експлоатация на физико-химичното стъпало на Пречиствателната станция за промишлено-дъждовни води;

- Реконструкция на електрофилтрите в АЦ на АДЗ с оглед достигане новите норми, които ще влязат в сила от 1995 г.;

- Изграждане на прахоуловителни и газопречистващи инсталации към литейните дворове в ДЦ на АДЗ;

- Реконструкция на пречиствателните съоръжения, монтирани в отделните цехове на СДЗ с оглед достигане новите норми и изграждане на нови съоръжения в Миксерно отделение;

- Капсуловане на транспортните ленти и изграждане на пречиствателни съоръжения на пресипките.

6. Оборудване за контрол на замърсяването има както следва:

- Лаборатория за прахогазови замервания работи със стандартизирана апаратура за периодичен контрол на прахоуловителните съоръжения (дебит и прах) и газоанализатор тип "Сенсоник"5000

- Лаборатория (група) за контрол на атмосферния въздух - измерва се периодично съдържанието на прах, азотни окиси и фенол в 6 пункта на територията на фирмата със стандартна преносима апаратура "Хигитест";

- Лаборатория (група) за води - работи се по методите на БДС за вредни вещества в промишлени и битово-фекални води.

Контролира се периодично вход и изход качеството на водите на пречиствателните станции.

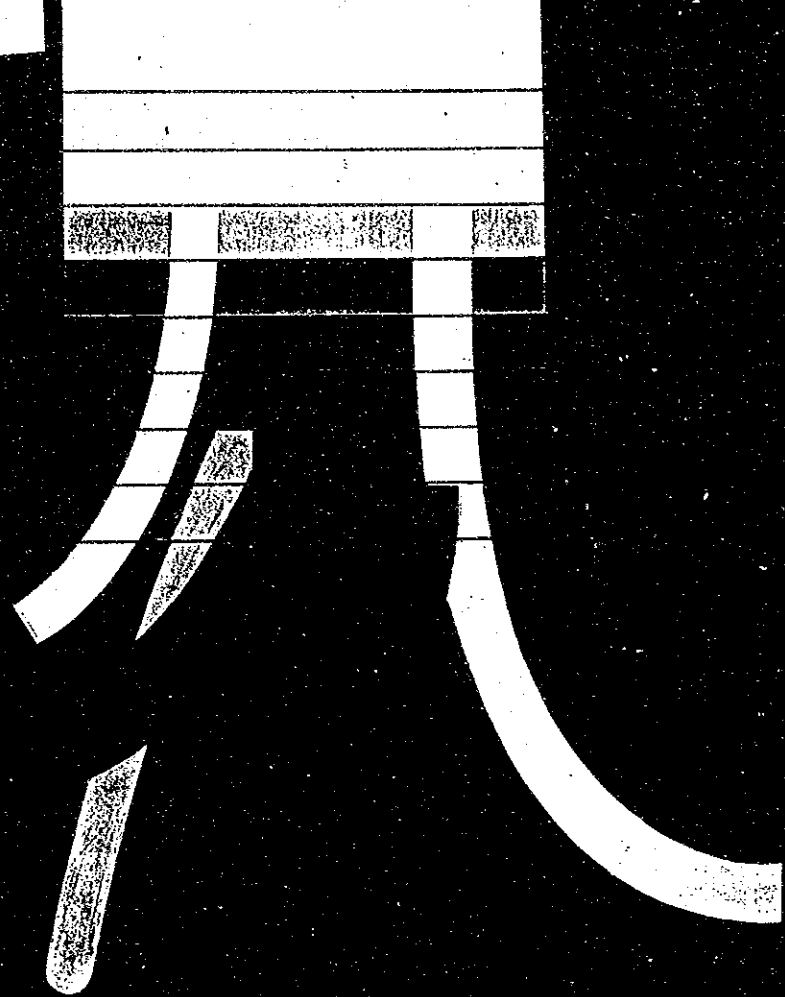
7. Приложения №2 и 3.

8. Доклади за решаване екологичните проблеми на "Кремиковци"-АД са разработени от следните фирми:

- "Фьост Алпине" - Австрия - 1988 г;
- "Джейка" - Япония - 1993 г;

stomana

資料 3-1)



«STOMANA» COMPANY
BULGARIA, 2304 PERNIK



FIRMA «STOMANA»
BULGARIEN, 2304 PERNIK

stomana

«**STOMANA**» company was commissioned into operation in 1953 and produces the following:

- ◆ ingot steel and billets (slabs and blooms) cast by means of a continuous casting machine;
- ◆ hot-rolled steel profiles as:
- ◆ reinforcement steel bars for steel-concrete constructions;
- ◆ equal-angle steel;
- ◆ channel steel;
- ◆ flat steel;
- ◆ square bars to be processed;
- ◆ bell-shaped and trough-shaped profile for supporting in mines;
- ◆ steel balls for ball mills;
- ◆ hot-rolled plate steel;
- ◆ hot-rolled, heat-treated, calibrated, hardened and grinded round profiles;
- ◆ burnt lime (quicklime);
- ◆ fired dolomite;
- ◆ centrifugal cast rolls and thick-walled tubes;

Besides attending to the metal needs of the country, «**Stomana**» Company exports its products to the countries of Europe, Asia, Africa and Latin America too.

Firma «**STOMANA**» (Stahl) Stadt Pernik ist seit 1953 in Betrieb und erzeugt:

- ◆ Blockstahl und Knüppeln (Brammen und Vorblöcke), die an Stranggußanlagen gegossen sind.
- ◆ warmgewalzte Stahlprofile, wie es folgt:
- ◆ Bewehrungsstahl für Stahlbetonkonstruktionen,
- ◆ gleichschenkliger Winkelstahl,
- ◆ U – förmiges Profil,
- ◆ Flachstahl,
- ◆ Quadratstahl für Verarbeitung,
- ◆ glocken – und trogförmige Profile für Grubenausbau,
- ◆ Stahlkugeln für Kugelmühlen,
- ◆ warmgewalztes Grobblech,
- ◆ Rundprofile – warmgewalzt, warmbehandelt, kalibriert, verfestigt und geschliffen,
- ◆ ungelöschter Kalk
- ◆ Sinterdolomit
- ◆ zentrifugalegegossene Walzen und dickwandige Röhre

Die Produktion der Firma deckt nicht nur den Bedarf unseres Landes, sondern sie wird auch nach vielen Staaten in Europa, Asien, Afrika und Lateinamerika exportiert.



Hot-rolled	Warmgewalztes
Plate Steel	Grobblech

2

Dimensions

in accordance with DIN 1543
 Thickness – 8 up to 25 mm
 Width – 1400 up to 1800 mm
 Length – 3000 up to 12000 mm

Shape and admissible Deviations
 in accordance with DIN 1543

Steel Grades

- ◆ St 33, St 37-2, St 37-3, St 44-2, St 44-3, St 52-3
DIN 17100
- ◆ Ck 10, Ck 15, C 22, C 25, C 30, C 40, C 45,
28Cr4, 34Cr4, 41Cr4 DIN 17200
- ◆ GL-A, GL-B, GL-A32, GL-D32, GL-A36, GL-D36,
GL – A 32 in accordance with "Lloyd" - Germany.

H – heat resistant boiler steel in accordance with
DIN 17155.
 E – low-alloyed fine-grained constructional steel in
accordance with DIN 17102.

Dispatch

In separate plates or packages.

*The rest technical requirements shall be agreed at
the time the order is accepted.*

Maße

nach DIN 1543
 Dicke – 8 bis 25 mm
 Breite – 1400 bis 1800 mm
 Länge – 3000 bis 12000 mm

Form und zulässige Abweichungen
 nach DIN 1543

Stahlmarken

- ◆ St 33, St 37-2, St 37-3, St 44-2, St 44-3, St 52-3
nach DIN 17100
- ◆ Ck 10, Ck 15, C 22, C 25, C 30, C 40, C 45,
28Cr4, 34Cr4, 41Cr4 nach DIN 17200
- ◆ GL-A, GL-B, GL-A32, GL-D32, GL-A36, GL-D36,
GL-E36 nach "Lloyd"-BRD

H (Kesselbaustahl thermoresistent)
nach DIN 17155
 E 355 (niedriglegierter feinkörniger
Konstruktionsstahl) nach DIN 17102

Expedition

einzelne Platten oder in Bündeln

*Die restlichen technischen Anforderungen werden
bei Auftragserteilung vereinbart.*



stomana

Calibrated	Kalibrierter
Round Steel	Rundstahl

3

Dimensions and admissible deviations:
rods with dia. 14 up to 100 mm in accordance with DIN 671(h₉) and DIN 668(h₁₁).

Maße und zulässige Abweichungen
Rundstäbe mit Durchmessern von 14 bis 100 mm nach DIN 67(h₉) und DIN 668(h₁₁).

Steel Grades

- ◆ St 37-2, St 50-2, DIN 17100
- ◆ 28Cr4, 34Cr4, 41Cr4, C 22, till C 60 DIN 17200
- ◆ Ck 10, Ck 15, 17623 DIN 17210

Stahlmarken

- ◆ St 37-2, St 50-2 nach DIN 17100
- ◆ 28Cr4, 34Cr4, 41Cr4, C 22, bis C 60 nach DIN 17200
- ◆ Ck 10, Ck 15, 17623 nach DIN 17210

Technical requirements and delivery conditions:

DIN 1632

- ◆ non-heat – treated (cold-hardened or cold-worked) steel;
- ◆ heat-treated (annealed);
- ◆ grinded;
- ◆ polished;
- ◆ oiled;
- ◆ with chamfer for rods with dia. 13 up to 65 mm.

Technische Anforderungen und

Lieferzustand

DIN 1652

- ◆ nichtwarmbehandelt (mit Kalthärtung)
- ◆ warmbehandelt (geglüht)
- ◆ geschliffen
- ◆ blank
- ◆ angefasste Rundstäbe mit Durchmessern von 13 bis 65 mm

Length

3 up to 6 m.

Länge

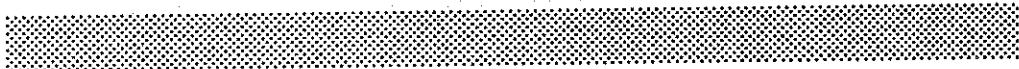
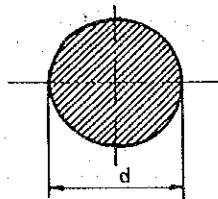
3 bis 6 m

Dispatch

In bundles with weight 2 up to 5 tons.

Expedition

in Bündeln mit einem Gewicht von 2 bis 5 t.



stomana

Hot-Rolled	Rundstahl,
Round Steel	warmgewalzt

4

Dimensions

diametres (d) 50 up to 100 mm in accordance with DIN 1013-11/76

Shape and Admissible Deviations
in accordance with DIN 1013-11/76

Steel grades

- ◆ St 33, St 37-2, St 50-2 DIN 17100
- ◆ Ck 10, Ck 15, C 22, C 25, C 30, C 35, C 45, 28Cr4, 34Cr4, 41Cr4, 40NiCr6 DIN 17200

Length

3 up to 7 m in accordance with DIN 1013-1/76

Dispatch

In bundles with weight up to 5 tons.

The rest technical requirements shall be agreed at the time the order is accepted.

Maße

Durchmesser (d) von 50 bis 100 mm nach DIN 1013-11/76

Form und zulässige Abweichungen
nach DIN 1013-11/76

Stahlmarken

- ◆ St 33, St 37-2, St 50-2 nach DIN 17100
- ◆ Ck 10, Ck 15, C 22, C 25, C 30, C 35, C 45, 28Cr4, 34Cr4, 41Cr4, 40NiCr6 nach DIN 17200

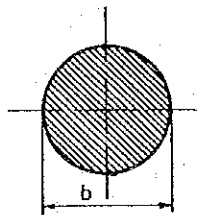
Länge

von 3 bis 7 m nach DIN 1013-1/76

Expedition

in Bündeln mit einem Gewicht bis 5 t

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



stomana

Hot-Rolled	Winkelstahl
Equal-angle	warmgewalzt,
Steel	gleichschenkelig

5

Dimensions

in accordance with DIN 1028-10/76

a x a x s

65 x 65 x 7 mm

70 x 70 x 6/7/9 mm

75 x 75 x 7/8 mm

80 x 80 x 6/8/10 mm

90 x 90 x 7/9 mm

100 x 100 x 8/10/12 mm

Shape and Admissible Deviations

In accordance with DIN 1028-10/76

Steel grade

◆ St 37-2, St 50-2, DIN 17100

Length

6 up to 9 m DIN 1028-10/76

Dispatch

In bundles with weight up to 5 tons.

The rest technical requirements shall be agreed at the time the order is accepted.

Maße

nach DIN 1028-10/76

a x a x s

65 x 65 x 7 mm

70 x 70 x 6/7/9 mm

75 x 75 x 7/8 mm

80 x 80 x 6/8/10 mm

90 x 90 x 7/9 mm

100 x 100 x 8/10/12 mm

Form und zulässige Abweichungen

nach DIN 1028-10/76

Stahlmarken

◆ St 37-2, St 50-2 nach DIN 17100

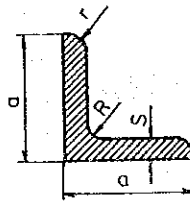
Länge

6-9 m nach DIN 1029-10/76

Expedition

In Bündeln mit einem Gewicht bis 5 t

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



stomana

Hot-rolled	Flachstahl
Flat Steel	warmgewalzt
(Bands)	

6

Dimensions

DIN 1017-1/67

H – 25 up to 60 mm;

B – 100 up to 150 mm

Shape and Admissible Deviations

DIN 1017-1/67

Warp

not more than 0,01 L

Steel grades

◆ St 37-2, St 44-2, St 50-2 DIN 17100

◆ C 35, C 45 DIN 17200

◆ St 30 Mn5

Length

2 up to 8 m in accordance with DIN 1017 – 1/67

Dispatch

In bundles with weight up to 5 tons.

The rest technical requirements shall be agreed at the time the order is accepted.

Maße

nach DIN 1017-1/67

H – von 25 bis 60 mm

B – von 100 bis 150 mm

Form und zulässige Abweichungen

nach DIN 1017-1/67

Krümmung nicht größer

als 0,01 L

Stahlmarken

◆ St 37-2, St 44-2, St 50-2 nach DIN 17100

◆ C 35, C 45 nach DIN 17200

◆ St 30 Mn5

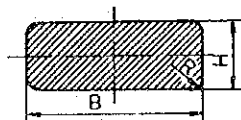
Länge

von 2 bis 8 m nach DIN 1017-1/67

Expedition

in Bündeln mit einem Gewicht bis 5 t

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



Stomang

Hot-rolled	U-förmiges Profil
Channel	warmgewalzt
Steel	(Schweller)

Dimensions
No. 8, No. 10 and No. 12

Maße
Nr. 8, Nr. 10 und Nr. 12

Technical data

Technische Charakteristik

Number of profile Nummer der Profile	Dimensions, mm / Maße, mm								Theoretic mass kg/m Theor. Masse kg/m
	h	Admissible deviations Zuläss. Abweich.	b	Admissible deviations Zuläss. Abweich.	s	t	R	r	
8	80	+/- 1,5	40	+/- 1,5	4,5	7,4	6,5	2,5	7,05
10	100	+/- 2,0	46	+/- 2,0	4,5	7,6	7,0	3,0	8,59
12	120	+/- 2,0	52	+/- 2,0	4,5	7,8	7,5	3,0	10,40

Channels

U 8; U 10 and U 12 in accordance with DIN 1026.

U-förmige Profile

U 8, U 10, und U 12 nach DIN 1026

Steel grades:

◆ St 37-2 in accordance with DIN 17100.

Stahlmarken

◆ St. 37-2 nach DIN 17100

Length

4 up to 9 m.

Admissible deviations on length
up to 8 m + 40 mm
above 8 m + 80 mm

Länge

von 4 bis 9 m

Zulässige Abweichungen in der Länge
bis 8 m + 40 mm
über 8 m + 80 mm

Warp

not more than 2mm per linear metre (0,2 per cent)

Krümmung

nicht größer als 2 mm/Meter (0,2%)

Dispatch

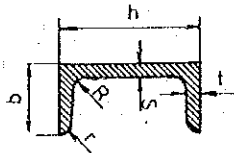
In bundles with weight up to 5 tons.

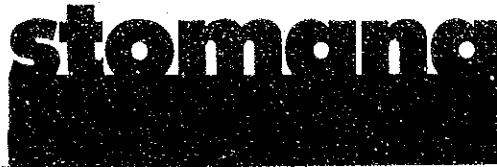
The rest technical requirements shall be agreed at the time the order is accepted.

Expedition

in Bündeln mit einem Gewicht bis 5 t

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.





Bell-shaped	Glockenförmige
Profile for	Profile
Supporting	für Grubenausbau
in Mines	

8

Dimensions and Technical data

Maße und technische Anforderungen

Symbol Bezeichnung	B	B ₁	H	b	s	h	R ₁	R ₂	R ₃	R ₄	Theoretic. mass Theor. Masse
Dimensions (mm) Maße (mm)	96	133	90,5	20	9	23	30	36	30	25	21,5 kg/m
Admissible deviat. Zuläss. Abw. (mm)	+/- 2,0	+/- 2,0	+/-2,0	+/- 2,0	+/- 0,5	+/- 1,0	-	-	-	-	+/- 5%

F	J _x	W _x	I _x
cm ² 27,4	cm ⁴ 195,4	cm ³ 43,1	cm ⁴ 2,67

Steel grades:

◆ C 25 DIN 17200

Stahlmarken

◆ C 25 nach DIN 17200

Length

It is supplied in 4 types.

1. type – 2150, 4300, 6450 mm
 2. type – 2400, 4800, 7200 mm
 3. type – 2800, 5600, 2000 mm
 4. type – 3400, 6800 mm
2. The other length groups in the range of 2150 up to 9000 mm shall be agreed at the time the order is accepted.
3. Admissible deviations on length:
up to 6 m + 40 mm
above 6 m + 80 mm
4. Profiles for supporting segments (frames) are with length accuracy + 5 mm.

Länge

1. Wird in 4 Typen geliefert. Die Typenschließen festgestellte Längen und durch sie teilbare Längen ein.
 1. Typ – 2150, 4300, 6450 mm
 2. Typ – 2400, 4800, 7200 mm
 3. Typ – 2800, 5600, 2000 mm
 4. Typ – 3400, 6800 mm
2. Andere Längengruppen im Bereich von 2150 mm bis 9000 mm werden bei Auftragserteilung vereinbart.
3. Zulässige Abweichungen in der Länge
bis 6 m + 40 mm
über 6 m + 80 mm
4. Werkstücke für Ausbausegmente (Rahmen) mit einer Längengenauigkeit von + 5mm.

Warp
Not more than 8 mm per linear metre.

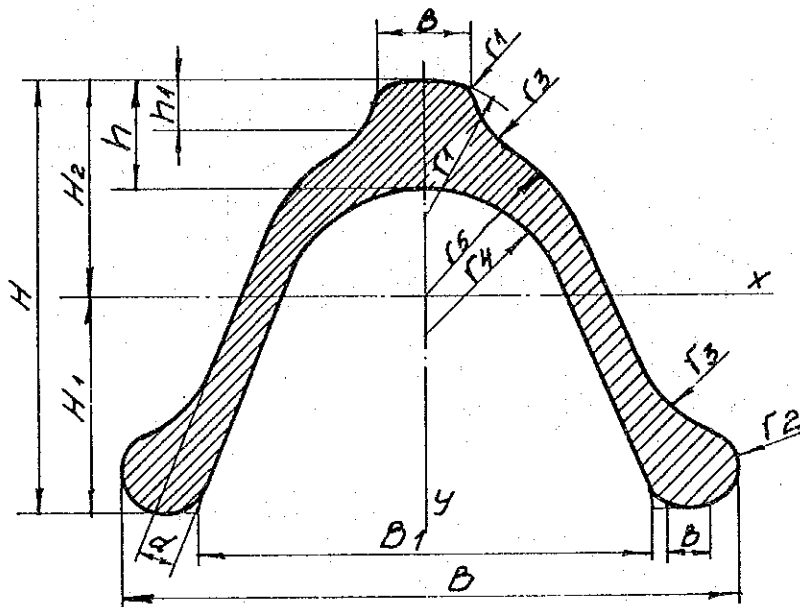
Krümmung
nicht größer als 8 mm/l.m

Dispatch
In bundles with weight up to 5 tons.

Expedition
In Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



Stomang

Trough-shaped Profile for Supporting in Mines (With mass 28,07 kg/l.m)	Troglförmige Profile für Grubenausbau mit Masse 28,07 kg/l.m
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10

Dimensions and Technical data

Maße und technische Charakteristik

Mass per 1 m Masse pro 1m	Cross-section surface Schnittfläche	Inertia moments Trägheitsmomente		Resistance moments Widerstandsmomente		Inertia radii Trägheitsradien		Ratio Verhältnis
		X-X	Y-Y	X-X	Y-Y	X-X	Y-Y	
G	F	J_x	J_y	W_x	W_y	i_x	i_y	W_y/G
kg/m	cm ²	cm ⁴	cm ⁴	cm ³	cm ³	cm	cm	-
28,07	35,76	678,24	777,61	113,04	103,02	4,36	4,66	4,03

Steel grades:

- ◆ St 37-2, St 44-2, St 50-2 DIN 17100
- ◆ C 25 DIN 17200

Length

1. It is supplied in 4 types.
 1. type – 2150, 4300, 6450 mm
 2. type – 2400, 4800, 7200 mm
 3. type – 2800, 5600, 2000 mm
 4. type – 3400, 6800 mm
2. The other length groups in the range of 2150 up to 9000 mm. are agreed at the time the order is accepted.
3. Admissible deviations on length up to 6 m + 40 mm above 6 m + 80 mm
4. Profiles for supporting segments (frames) are with length accuracy + 5 mm.

Stahlmarken

- ◆ St 37-2, St 44-2, St 50-2 nach DIN 17100
- ◆ C 25 nach DIN 17200

Länge

1. Wird in 4 Typen geliefert. Die Typen schließen festgestellte Längen und durch sie teilbare Längen ein.
 1. Typ – 2150, 4300, 6450 mm
 2. Typ – 2400, 4800, 7200 mm
 3. Typ – 2800, 5600, 2000 mm
 4. Typ – 3400, 6800 mm
2. Andere Längengruppen im Bereich von 2150 bis 9000 mm werden bei Auftragserteilung vereinbart.
3. Zulässige Abweichungen in der Länge bis 6 m + 40 mm über 6 m + 80 mm
4. Werkstücke für Ausbausegmente (Rahmen) mit einer Längengenauigkeit von + 5 mm.

Warp
Not more than 10 mm per linear metre.

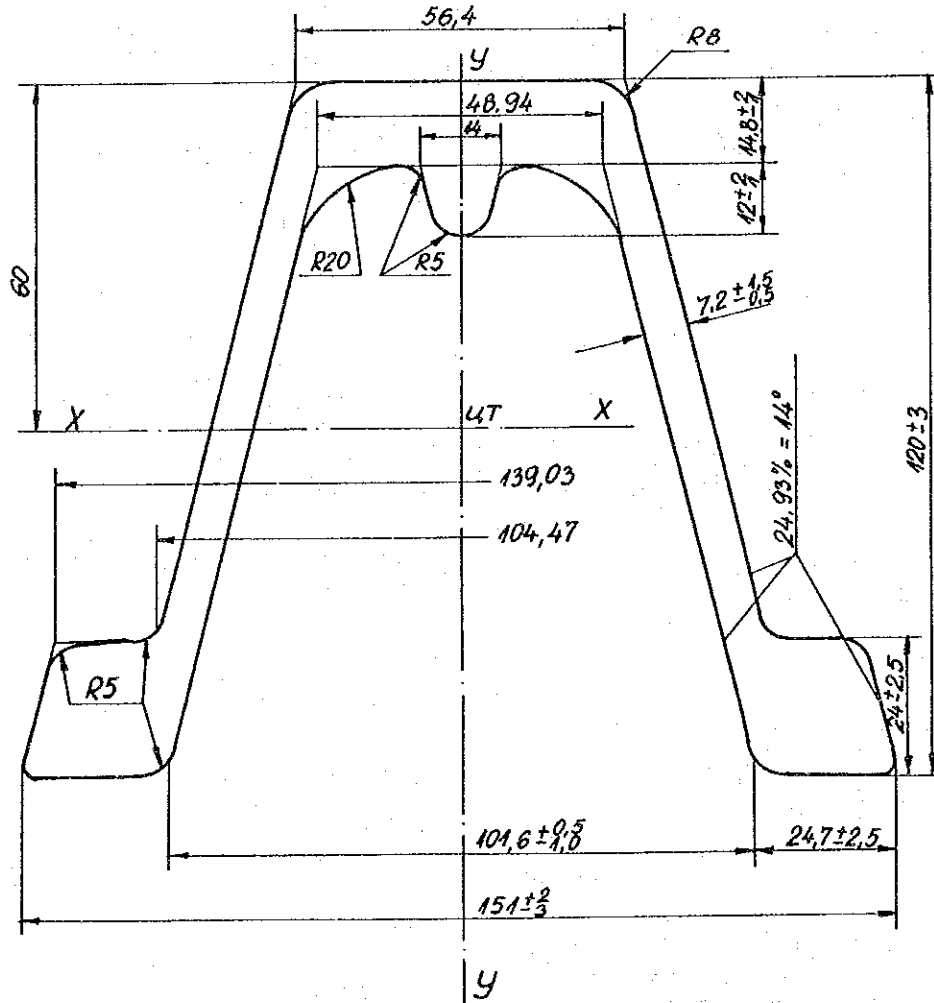
Krümmung
nicht größer als 10 mm/l.m

Dispatch
In bundles with weight up to 5 tons.

Expedition
in Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



Stomana

Trough-shaped Profile for Supporting in Mines (With Mass 36 kg/l.m)	Trogförmige Profile für Grubenausbau mit Masse 36 kg/l.m
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12

Dimensions and Technical data

Maße und technische Charakteristik

F	G	J _x	J _y	W _x	W _y	W _y /W _x	I _x	I _y	W _x /G	W _y /G
cm ²	kg/m	cm ⁴	cm ⁴	cm ³	cm ³		cm	cm	cm ³ /kg	cm ³ /kg
45,85	35,99	1202,77	725,48	120,91	144,65	1,196	5,12	3,97	3,36	4,018

Steel grades:

- ◆ St 37-2, St 44-2, St 50-2 DIN 17100
- ◆ C 25 DIN 17200

Length

1. It is supplied in 4 types.
 1. type – 2150, 4300, 6450 mm
 2. type – 2400, 4800, 7200 mm
 3. type – 2800, 5600, 2000 mm
 4. type – 3400, 6800 mm
2. The other length groups in the range of 2150 up to 9000 mm are agreed at the time the order is accepted.
3. Admissible deviations on length up to 6 m + 40 mm above 6 m + 80 mm
4. Profiles for supporting segments (frames) are with length accuracy + 5 mm.

Stahlmarken

- ◆ St 37-2, St 44-2, St 50-2 nach DIN 17100
- ◆ C 25 nach DIN 17200

Länge

1. Wird in 4 Typen geliefert. Die Typen schließen festgestellte Längen und durch sie teilbare Längen ein.
 1. Typ – 2150, 4300, 6450 mm
 2. Typ – 2400, 4800, 7200 mm
 3. Typ – 2800, 5600, 2000 mm
 4. Typ – 3400, 6800 mm
2. Andere Längengruppen im Bereich von 2150 bis 9000 mm werden bei Auftragserteilung vereinbart.
3. Zulässige Abweichungen in der Länge bis 6 m + 40 mm über 6 m + 80 mm
4. Werkstücke für Ausbausegmente (Rahmen) mit einer Längengenauigkeit von + 5 mm.

Warp
Not more than 10 mm per linear metre.

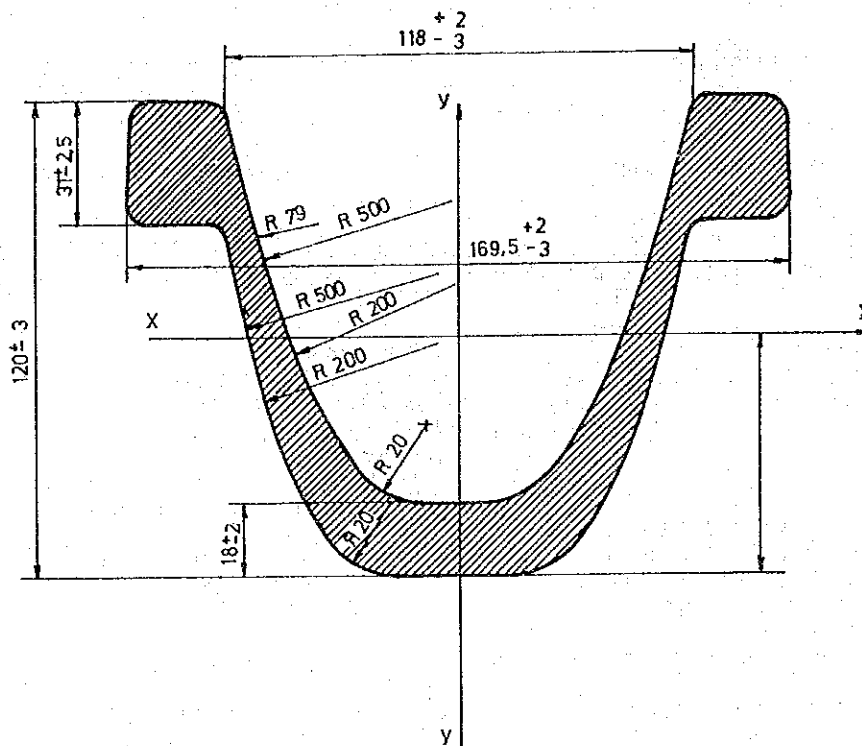
Krümmung
nicht größer als 10 mm/l.m

Dispatch
in bundles with weight up to 5 tons.

Expedition
in Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.



Stomana

Trough-shaped Profile for Supporting in Mines (With Mass 28.70 kg/l.m)	Trogförmige Profile für Grubenausbau mit Masse 28.70 kg/l.m
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14

Dimensions and Technical data

Maße und technische Charakteristik

F	G	Y_x	Y_y	W_{x1}	W_{x2}	W_y	W_y/W_{x1}	I_x	I_y	W_{x1}/G	W_{x2}/G
cm ²	kg/m	cm ⁴	cm ⁴	cm ³	cm ³	cm ³	—	cm	cm	cm ³ /kg	cm ³ /kg
36,53	28,68	404,05	633,68	81,44	72,95	87,31	1,072	4,35	4,47	2,84	2,54

Steel grades

- ◆ St 37-2, St 44-2, St 50-2 DIN 17100
- ◆ C 25 DIN 17200

Stahlmarken

- ◆ St 37-2, St 44-2, St 50-2 nach DIN 17100
- ◆ C 25 nach DIN 17200

Length

1. It is supplied in 4 types.
 1. type – 2150, 4300, 6450 mm
 2. type – 2400, 4800, 7200 mm
 3. type – 2800, 5600, 2000 mm
 4. type – 3400, 6800 mm
2. The other length groups in the range of 2150 up to 9000 mm are agreed at the time the order is accepted.
3. Admissible deviations on length up to 6 m + 40 mm above 6 m + 80 mm
4. Profiles for supporting segments (frames) are with length accuracy + 5 mm.

Länge

1. Wird in 4 Typen geliefert. Die Typen schließen festgestellte Längen und durch sie teilbare Längen ein.
 1. Typ – 2150, 4300, 6450 mm
 2. Typ – 2400, 4800, 7200 mm
 3. Typ – 2800, 5600, 2000 mm
 4. Typ – 3400, 6800 mm
2. Andere Längengruppen im Bereich von 2150 bis 9000 mm werden bei Auftragserteilung vereinbart.
3. Zulässige Abweichungen in der Länge bis 6 m + 40 mm über 6 m + 80 mm
4. Werkstücke für Ausbausegmente (Rahmen) mit einer Längengenauigkeit von + 5 mm.

Warp
Not more than 10 mm per linear metre.

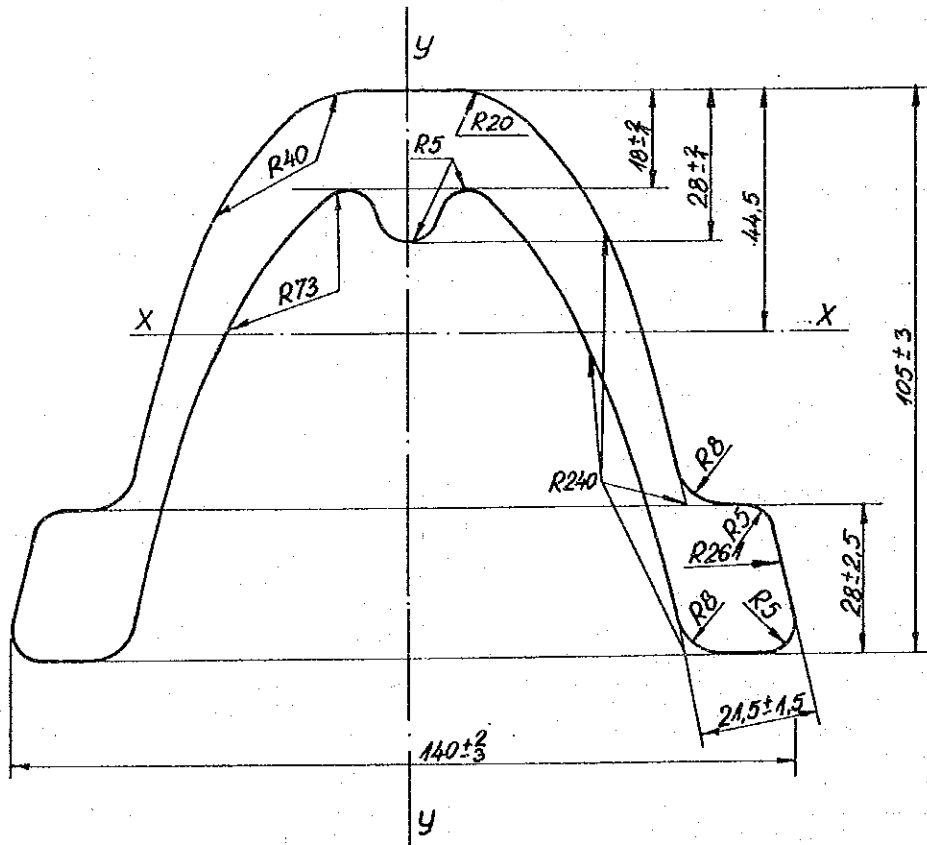
Krümmung
nicht größer als 10 mm/l.m

Dispatch
In bundles with weight up to 5 tons.

Expedition
In Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.





Hot-rolled	Quadratstahl
Square	warmgewalzt
Bars to be	zur
Processed	Verarbeitung

16

Dimensions
side of square a = 50 up to 120 mm.

Maße
Quadrat mit Seite a = 50 bis 120 mm

Technical data

Technische Charakteristik

Side of square a (mm) Quadratseite	Deviation a (mm) Toleranz	Radius of curvature R (mm) Abrundungs- radius	Cross-section surface (mm ²) Querschnittfläche	Theoretical mass (kg/m) Theor. Masse	Warp not more than (mm/l. m) Krümmung nicht größer
50	+/-1,2	7	24,58	19,3	15
55			29,55	23,2	
60	+/-1,6	9	35,30	27,7	15
65			41,55	32,6	
70			48,30	37,9	
75			55,01	43,2	
80	+/-2,0	12	62,76	49,3	15
85			71,01	55,7	
90			79,76	62,6	
95			88,32	69,3	
100	+/-2,4	15	98,06	77,00	15
105			108,32	85,0	
110			118,21	92,8	
115	+/-2,7	18	129,46	101,6	15
120			141,21	110,9	

Steel grades:

- ◆ St 37-2, St 44-2, St 50-2 17100
- ◆ C 35, C 45 DIN 17200
- ◆ 28Cr4, 34Cr4, 41Cr4, 30Mn5 DIN 17200

Stahlmarken

- ◆ St 37-2, St 44-2, St 50-2 nach 17100
- ◆ C 35, C 45 nach DIN 17200
- ◆ 28Cr4, 34Cr4, 41Cr4, 30Mn5 nach DIN 17200

Length

3 up to 8 m

Admissible deviations on length:

- up to 4 m + 30 mm;
- above 4-6 m + 50 mm;
- above 6 m + 70 mm

Länge

3 bis 8 m

Zulässige Abweichungen in der Länge:

- bis 4 m + 30 mm,
- 4-6 m + 50 mm,
- über 6 m + 70 mm

Dispatch

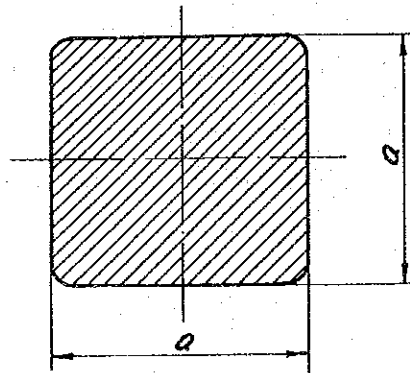
In bundles with weight up to 5 tons.

Expedition

in Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.





Hot-rolled	Warmgewalzte
Channel	U-förmige
Steel	Stahlprofile

18

Dimensions
40 x 120 mm

Maße
40 x 120 mm

Technical data

Technische Charakteristik

a (mm)	Admis. deviat. Zuläss. Abweich.	B (mm)	Admis. deviat. Zuläss. Abweich.	h (mm)	Admis. deviat. Zuläss. Abweich.	r ₁	Admis. deviat. Zuläss. Abweich.	z ₂	Admis. deviat. Zuläss. Abweich.	Theoretical mass (kg/m) Theor. Masse	Cross-section surface (cm ²) Quer- schnittfläche
10	+/-0,6	12	+/-0,8	40	+/-1,0	2	+0 -1	4	+0 -1	14,7	18,77

Steel grades:
◆ 30 Mn5 DIN

Stahlmarke
◆ 30 Mn5 nach DIN

Length
4 up to 7 m

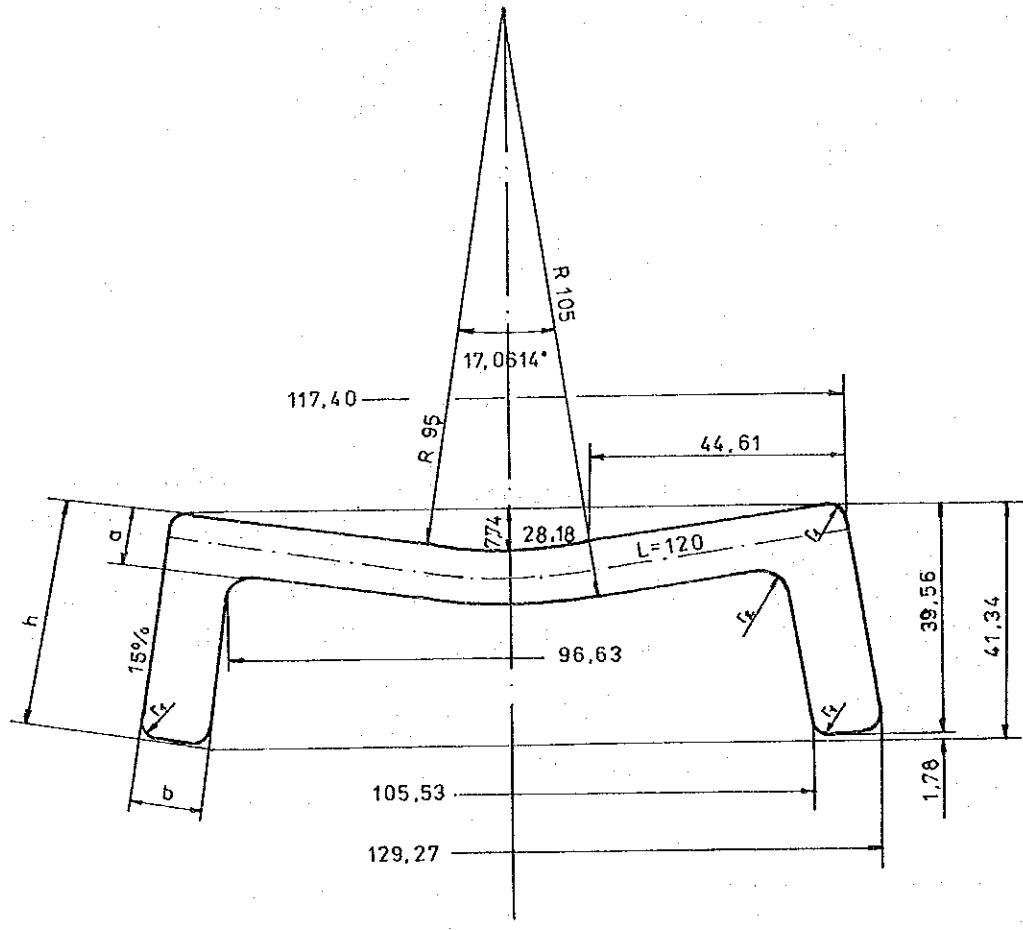
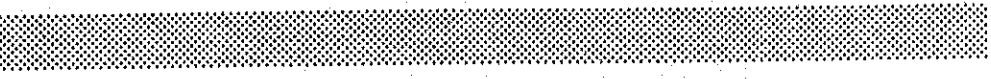
Länge
4 bis 7 m

Dispatch
in bundles with weight up to 5 tons.

Expedition
in Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.





Hot-rolled	Warmgewalzter
Steel Profile	Stahl –
for Railway	Verbindungsprofil
Connections	für Eisenbahnschienen
Type 49	Typ 49

20

Dimensions and Technical data

Maße und technische Anforderungen

Steel grades

◆ C 30, C 35 DIN 17200

Length

4 up to 9 m.

Warp

not more than 0,025.

Dispatch

In bundles with weight up to 7 tons.

The rest technical requirements shall be agreed at the time the order is accepted.

Stahlmarken

◆ C 30, C 35 nach DIN 17200

Länge

4 bis 9 m

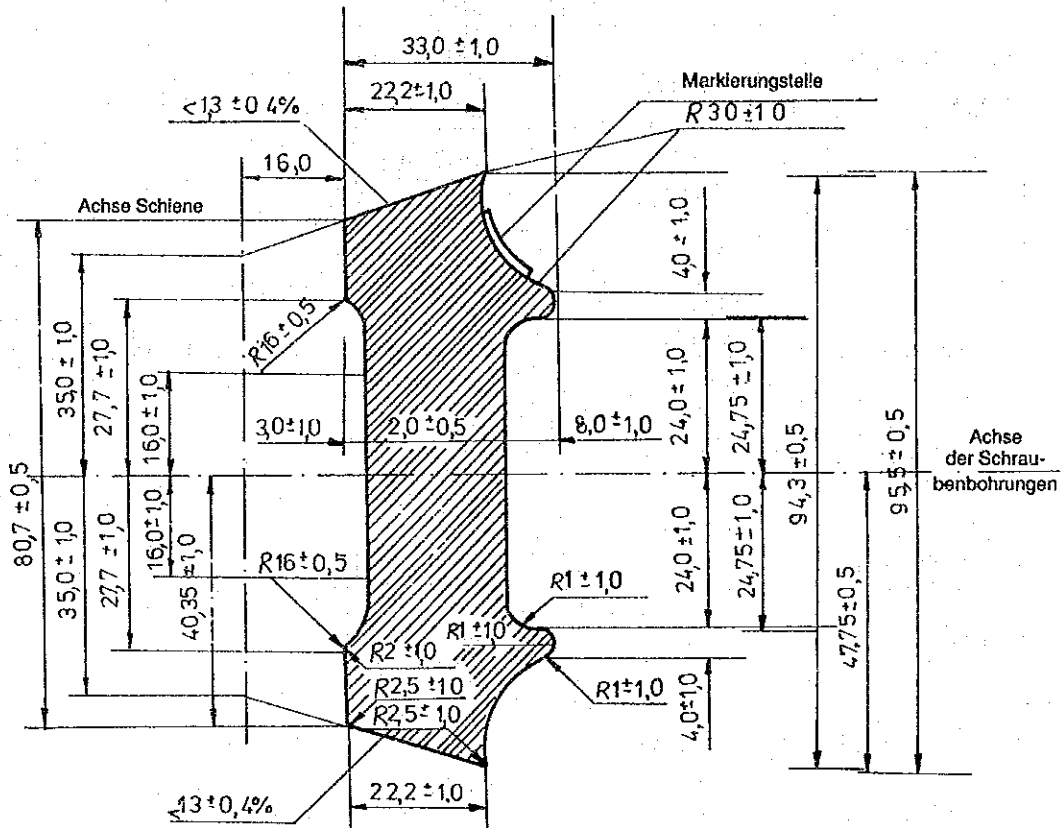
Krümmung

nicht größer als 0,025

Expedition

in Bündeln mit einem Gewicht bis 7 t

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.





Steel Balls	Stahlkugeln
for	für
Grinding	Kugelmühlen

22

Dimensions and Technical data

Maße und technische Anforderungen

Diameter (mm) Durchmesser	Brinell hardness not less than		Theoretical mass kg/m Theoret. Masse
	normal	enhanced	
	Härte nach Brinell nicht weniger als		
	normal	erhöht	
40	400	451	0,263
50	400	451	0,514
60			0,888
70			1,410
80			2,104
90	350	375	2,996
100			4,110
110			5,471
120	300	325	7,102

The rest dimensions in the range of 40 mm up to 120 mm shall be agreed at the time the order is accepted.

Andere Maße im Bereich von 40 mm bis 120 mm bei Vereinbarung mit den Käufer.

Steel grades

1. Carbon steel with carbon contents not less than:

- ◆ 0,35% for balls with dia. 40-60 mm
- ◆ 0,60% for balls with dia. 70-120 mm

2. Alloyed steel grades with the following chemical composition:

Stahlmarken

1. C-Stahl mit einem Kohlenstoffgehalt nicht weniger als:

- ◆ 0,35% für Kugeln mit Durchmessern 40-60 mm
- ◆ 0,60% für Kugeln mit Durchmessern 70-120 mm

2. Legierte Stahlmarken mit folgender chemischen Zusammensetzung:

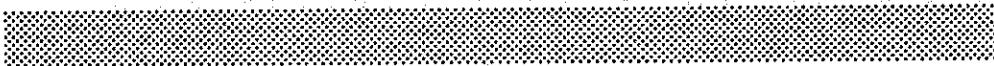
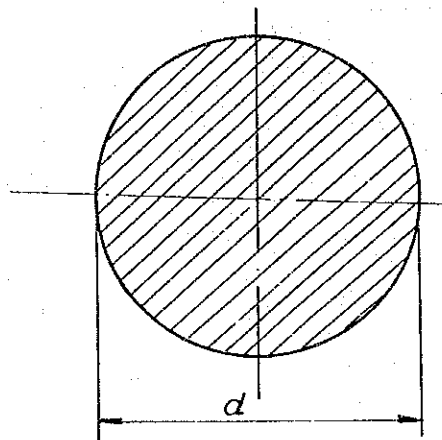
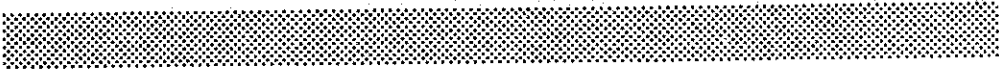
Chemical Composition (%)

Chemische Zusammensetzung (%)

C	Mn	Si	P	S	Cr	Mo	Nb
0,50-0,65	0,70-1,00	0,20-0,50	up to 0,060	up to 0,050	0,30-0,60	0,10-0,30	—
0,65-0,80	0,80-1,10	up to 0,50	up to 0,045	up to 0,045	—	—	0,02-0,04
0,50-0,65	0,75-1,10	0,30-0,60	up to 0,060	up to 0,050	0,40-0,80	—	—
0,45-0,60	0,70-1,00	0,20-0,50	up to 0,060	up to 0,050	0,50-0,80	—	—

Dispatch :
in bulk or in closed
vessels (barrels).

Expedition
im Schüttzustand in geschlossenen
Behältern (Fässern).



Stomana

Hot-Rolled	Warmgewalzter
Reinforcement Steel	Bewehrungsstahl für
for Steel-concrete	Stahlbetonkonstruktionen
Constructions	

24

Shape and Sizes

Class A I

round smooth profile with diameters 14, 16, 18 & 20.

Class A II

lengthwise and crosswise ribbed round profile with screw-shaped circumference of the traverse ribs with diametre 12, 14, 16, 18 and 20 mm.

Class A III and III S

lengthwise and crosswise ribbed round profile, with alder-shaped circumference of the traverse ribs with diametres 12, 14, 16, 18 & 20 mm.

Form und Maße

Klasse A I

rundes glattes Profil mit Durchmessern von 14, 16, 18 und 20 mm;

Klasse A II

Rundprofil mit Längs - und Querrippen und mit einem schraubenförmigen Umfang der Querrippen mit Durchmessern von 12, 14, 16, 18 und 20 mm;

Klasse A III und III S

Rundprofil mit Längs - und Querrippen, mit tannenförmigem Umfang der Querrippen, mit Durchmessern von 12, 14, 16, 18 und 20 mm.

Technical Data

Technische Charakteristik

Nominal diameter	Sizes and admissible deviations, mm / Maße und zulässige Abweichungen, mm										Cross-Section surface	Theor. Mass	
	d ₁	admis. dev.	d ₂	admis. dev.	h	admis. dev.	l	admis. dev.	a	b			r
Nom. Durchm. (mm)		zul. Abw.		zul. Abw.		zul. Abw.		zul. Abw.					
12	11,3		13,8		1,25		8,0		2	1	1,9	1,131	0,888
14	13,3	+0,3	15,8	+/-1,5	1,25	+/-0,5	11,0	+/-1,0	2	1	1,9	1,539	1,208
16	16,3	-0,5	18,3		1,50		12,0		2	1	2,2	2,011	1,578
18	17,3		20,3		1,50		14,0		2	1,5	2,2	2,545	1,997
20	19,3		22,3		1,50		15,7		2	1,5	2,2	3,142	2,466

Class Klasse	Chemical composition % / Chemische Zusammensetzung %									Mechanical properties Mechanische Eigenschaften			
	C	Mn	Si	S	P	Cr	Ni	Cu	As	Tensile Strength Zugfestigkeit MN/m ²	Yield point Streckgrenze MN/m ²	Relative elongation Relative Dehn. %	Cold bending Kaltbiegen
	not more than / nicht mehr als									not less than / nicht weniger als			
A I	0,24	0,65	0,35	0,050	0,045	—	—	—	—	372	235	25	180°-0,5
A II	0,37	0,80	0,35	0,055	0,045	0,30	0,30	0,30	0,08	490	294	19	180°-3
A III	0,29	1,60	0,90	0,045	0,040	0,30	0,30	0,30	0,08	588	392	14	90°-3
DIN	0,22 (0,24)	—	—	0,050	0,030	—	—	—	—	500	420	10	180°

Length of Bars

2 up to 12 m

Admissible deviations:

at length up to 6 m + 50 mm

at length above 6 m + 70 mm

Stangenlänge

von 2 bis 12 m

Zulässige Abweichungen:

bis 6 m + 50 mm

über 6 m + 70 mm

Warp

up to 6 mm per linear metre

Krümmung

bis 6 mm pro Meter

Dispatch:

In bundles with weight up to 5 tons

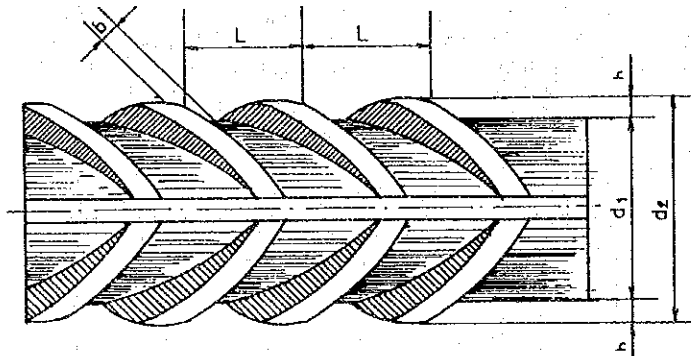
Expedition

in Bündeln mit einem Gewicht bis 5 t

The rest technical requirements shall be agreed at the time the order is accepted.

Die restlichen technischen Anforderungen werden bei Auftragserteilung vereinbart.

Ansicht/View



Stomana

Centrifugal	Zentrifugalgegossene
Cast Iron	Gußeisewalzen
Rolls –	für Walzstraßen
Smooth and	glatt und
Non-calibrated	nichtkalibriert

26

Material
nodular cast iron, two-layered; chilled and grey iron.

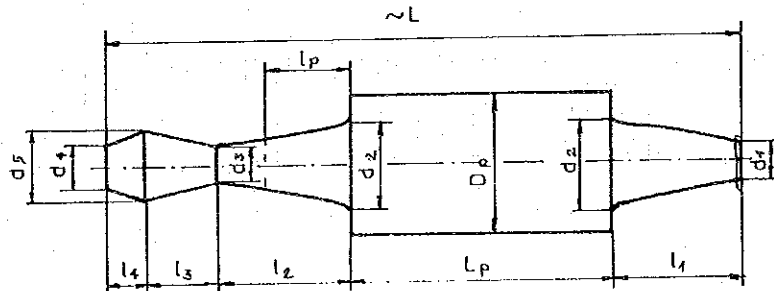
Dimensions of the working surface:
 D_b – 270 up to 710 mm
 L_b – 450 up to 1830 mm

Specials orders are carried out according to prearrangement.

Werkstoff
sphärolitisches Gußeisen;
doppelschichtig – gefeintes und graues Gußeisen

Abmessungen des Arbeitsteils
 D_b – 270 bis 710 mm
 L_b – 450 bis 1830 mm

Nach vorheriger Absprache werden auch Sonderausführungen ausgearbeitet.



№	D _p	L _p	l _p	d ₁	d ₂	d ₃	d ₄	d ₅	l ₁	l ₂	l ₃	l ₄	L	G ₁ (kg)	G ₂ (kg)
I	732	1680	1100	310	420	335	240	445	1130	1100	550	330	4790	7660	7120
II	725	1910	1040	396	510	426	240	470	1060	1040	510	360	4880	9000	8130
III	725	1080	740	270	375	284	240	415	1060	775	475	280	3670	5030	4450
IV	694	1080	740	270	375	284	240	415	1060	775	475	280	3670	4750	4180
V	654	1080	740	270	375	284	240	415	1060	775	475	280	3670	4400	3830
VI	624	1080	740	270	375	284	240	415	1060	775	475	280	3670	4160	3590
VII	474	1080	565	255	320	255	230	330	800	570	530	280	3260	2490	2080
VIII	400	870	510	185	275	232	230	275	750	650	450	230	2960	1560	1270
IX	345	650	645	165	242	200	-	230	660	655	545	-	2510	920	760
X	330	700	320	168	200	175	-	210	330	320	530	-	1880	690	580
XI	310	700	320	168	200	175	-	210	330	320	530	-	1880	540	530
XII	290	700	320	168	200	175	-	210	330	320	530	-	1880	590	480
XIII	664	1080	900	330	475	402	240	415	1410	900	500	330	4220	5950	5180
XIV	595	1080	890	296	425	356	240	445	1230	890	510	330	4040	4720	4000
XV	480	870	610	205	300	264	240	368	830	610	490	330	3130	2260	1790
XVI	450	870	610	205	300	264	240	368	830	610	490	330	3130	2120	1650
XVII	434	700	480	202	300	270	240	356	980	495	505	280	2960	1820	1370
XVIII	434	870	610	202	300	264	240	368	830	610	490	330	3130	2050	1570
XIX	376	560	500	170	240	210	-	270	700	500	500	-	2260	1000	640
XX	342	560	395 495	162	240	210	-	240	785	495	505	-	2345	870	700 720



Centrifugal Cast Tube Ingots	Zentrifugalgegossene Rohrwerkstücke

28

Material

iron – any grades;
alloyed steel – any grades.

Dimensions

- ◆ 150 up to 400 mm
- ◆ 15 up to 120 mm
- ◆ 2000 up to 3000 mm

Special orders are carried out according to prearrangement.

Material

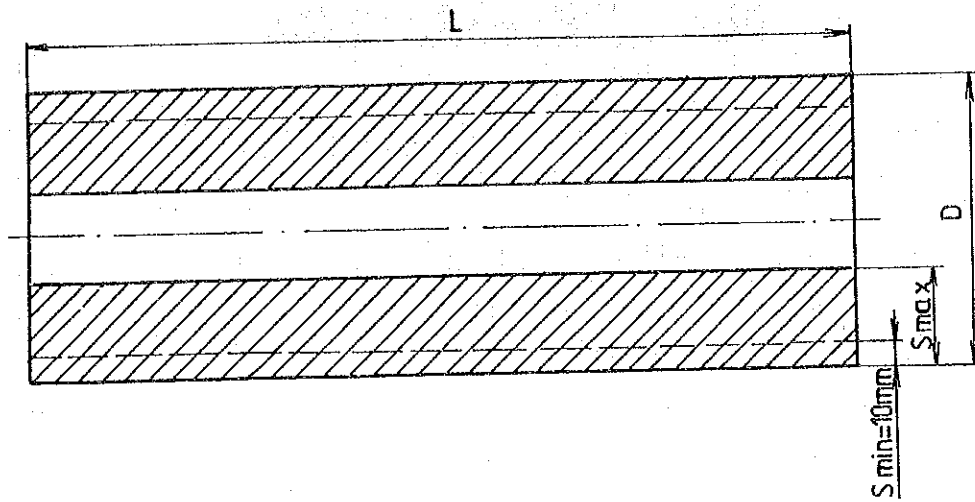
Gußeisen – jederlei Marken
Legierter Stahl – jederlei Marken

Maße

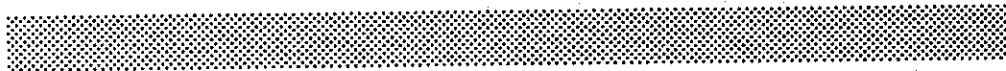
- ◆ 150 bis 400 mm
- ◆ 15 bis 120 mm
- ◆ 2000 bis 3000 mm

Nach vorheriger Absprache werden auch Sonderausführungen ausgearbeitet.





D (mm)	S_{max} (mm)	L (mm)
404	140	2090
389	132	2090
328	110	1910
305	100	1980
297	97	1940
290	97	3015
278	90	1885
242	73	1895
215	50	2670
159	35	2180



Stomana

Hot-rolled	Stahl
Heat-treated	warmgewalzt
Steel	warmbehandelt
(Annealed)	(geglüht)

30

Dimensions and Technical Requirements

rods with dia. 50 up to 100 mm in accordance with DIN 1013-1.

Steel grades

◆ C 35, C 40, C 45, 28Cr4, 34Cr4, 41Cr4, 40MnCr6 DIN 17200

Length

3 up to 7 m

Dispatch

In bundles with weight up to 5 tons.

Maße und technischen Anforderungen

Rundstäbe mit Durchmesser von 50 bis 100 mm nach DIN 1013-1

Stahlmarken

◆ C 35, C 40, C 45, 28Cr4, 34Cr4, 41Cr4, 40MnCr6 nach DIN 17200

Längen

3 bis 7 m

Expedition

in Bündeln mit einem Gewicht bis 5 t





Burnt Lime	Ungelöschter
(Quicklime)	Kalk

31

Technical data DIN 1060

Technische Charakteristik

Indices	% Content
CaO	above 90
MgO	0,5 – 8,0
SiO ₂	0,2 – 1,5
Fe ₂ O ₃	0,1 – 0,4
Al ₂ O ₃	0,1 – 0,5
CO ₂	0,4 – 1,5
Contents of humidity	0,1 – 0,9

Merkmale	Gehalt in %
CaO	über 90
MgO	0,5 – 8,0
SiO ₂	0,2 – 1,5
Fe ₂ O ₃	0,1 – 0,4
Al ₂ O ₃	0,1 – 0,5
CO ₂	0,4 – 1,5
Feuchtigkeitsgehalt	0,1 – 0,9

Granulometric Composition:

- "A" fraction 0 – 5 mm
- "B" fraction 6 – 16 mm
- "C" fraction 16 – 55 mm

Korngrößenzusammensetzung:

- "A" Fraktion 0 – 5 mm
- "B" Fraktion 6 – 16 mm
- "C" Fraktion 16 – 55 mm

Package

Hermetically closed two-layered sacks out of jute and polypropylene up to 1,5 m³.

Verpackung

in hermetisch verschlossenen Zweischichtsäcken aus Polypropylen und Jute bis 1,5 m³

Fired Dolomite

Indices	% Content
CaO	52 – 55,5
MgO	not less than 39
SiO ₂	not more 0,6
Fe ₂ O ₃	not more 0,35
Al ₂ O ₃	not more 0,3
Losses at burning	not more 0,9

Sinterdolomit

Merkmale	Gehalt in %
CaO	52 – 55,5
MgO	nicht weniger als 39
SiO ₂	nicht mehr als 0,6
Fe ₂ O ₃	nicht mehr als 0,35
Al ₂ O ₃	nicht mehr als 0,3
Glühverluste	nicht mehr als 0,9

**Granulometric composition
4 to 12 mm**

Density:
not less than 3,00 g/cm³

**Korngrößenzusammensetzung
4 bis 12 mm**

Dichte
nicht weniger als 3,00 g/cm³

PHONE:
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359 (076) 7151, 71-52, 71-53
359 (076) 72151, 52, 53, 54
GENERALDIREKTOR
359 (02) 881643
DEPUTY DIRECTOR
359 (076) 72182
„IMPORT EXPORT“
SALES DEPARTMENT
359 (076) 74212
TELEX: 028501;
FAX: 359 (076) 74570

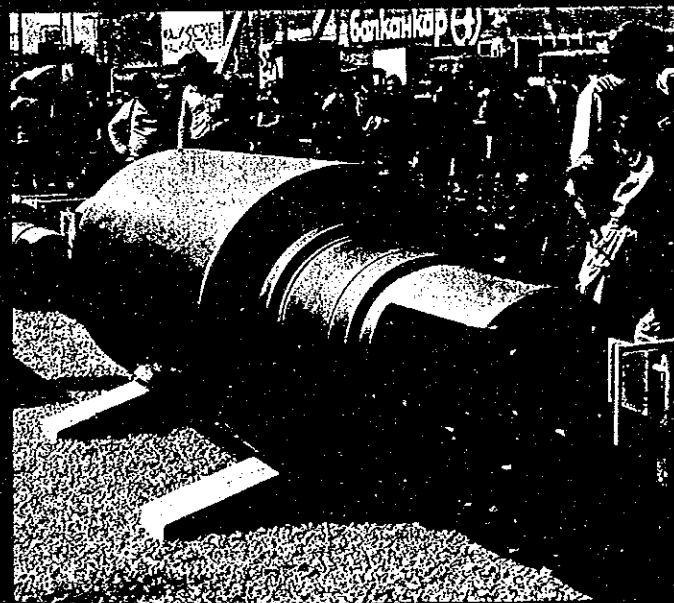
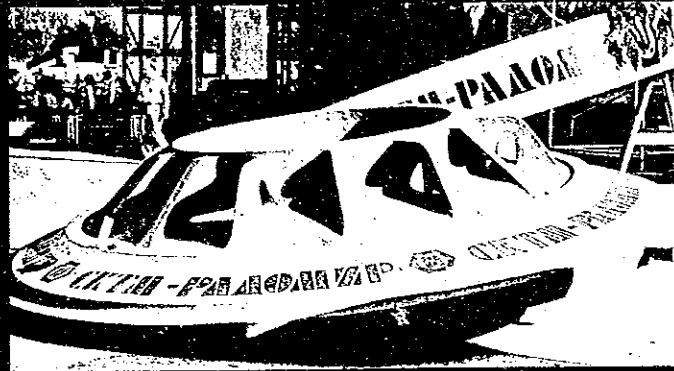
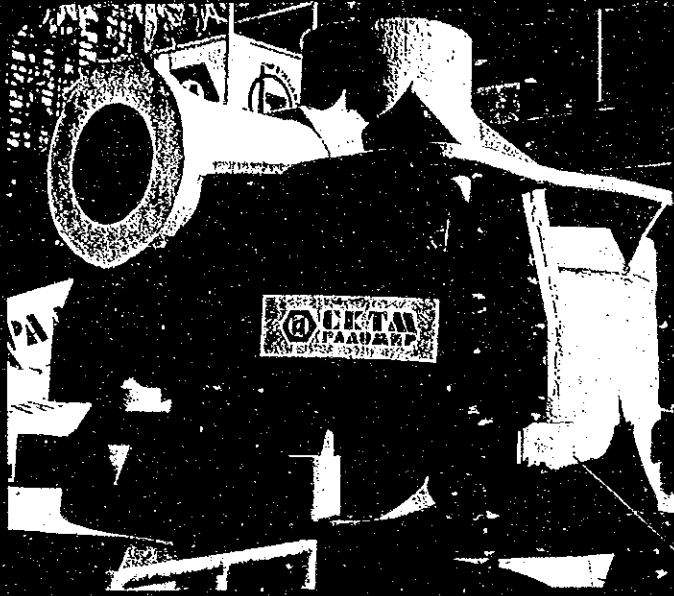
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Radomir-LEKO KO. Ltd

資料 4 - 1)



Radomir-LEKO KO. Ltd

RANGE OF ACTIVITIES

The range of activities of the Heavy Machinebuilding Corporation in Radomir cover the following: organization of scientific-applied engineering, production, trade and investments in turnkey projects both at home and abroad, production lines and unique metallurgical equipment, turbines, steam boilers, water heating boilers and industrial boilers; steam generators and other equipment for hydroelectric, thermal and nuclear power stations; powerful compressor and pump stations for gas-pipe lines, chemical industry and pipeline transport; process lines for construction materials production equipment; big-size and unique cutting machines; unique forgings and castings made of ordinary and special steels and other durable technique.



Lloyd's Register of Shipping

CERTIFICATE NO: RAT/02780E/001

This is to Certify

that **ZTN "Radomir",**
Bulgaria
has been approved in accordance with the requirements of Lloyd's Register of Shipping for the manufacture of:-

Carbon Steel Forgings.

This approval is conditional on the materials being manufactured, tested and used in compliance with the provisions noted below.

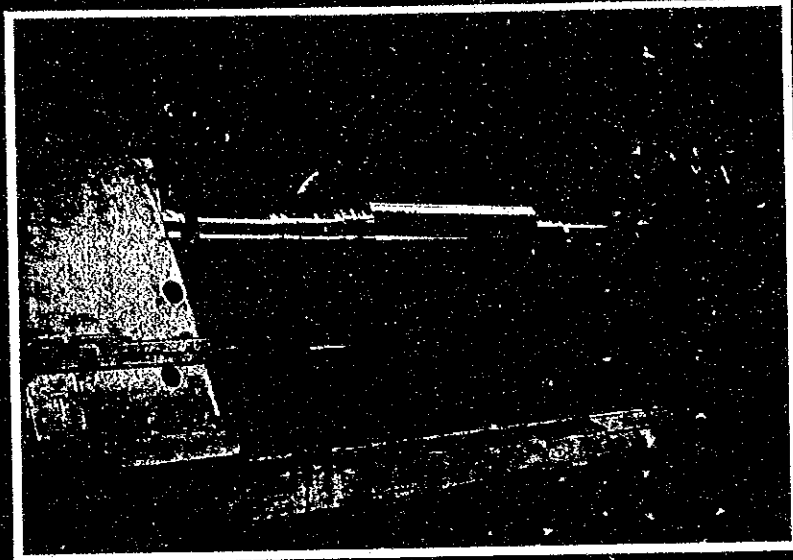
The Society is to be notified of any change of plant, formulation, or Quality Control Routines introduced during the validity of this Certificate.

This Certificate is valid for an initial period of three years from the Date of Approval given below. Its validity will be extended for further periods of three years on completion of a satisfactory inspection by the Society's Surveyors.

Date of Approval: 15 January 1980.

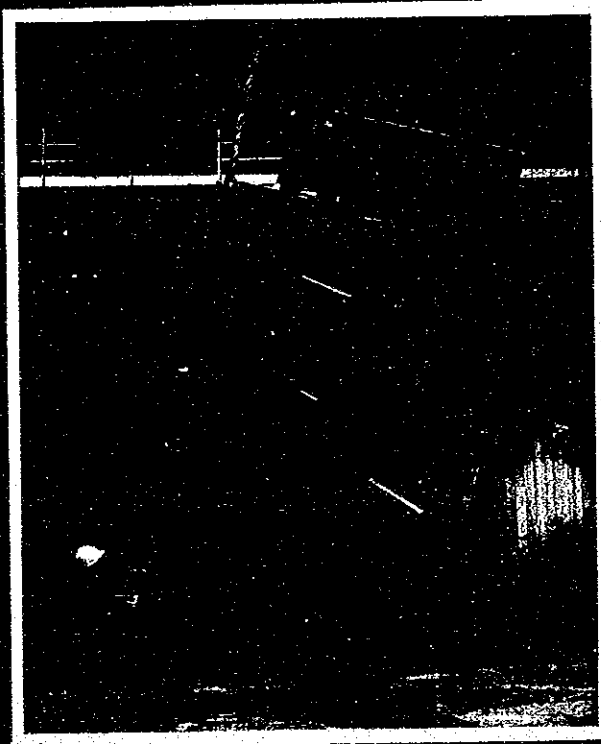

Lloyd's Register of Shipping
15, Broad Street, London EC2M 4QS

NOTE - THIS CERTIFICATE IS SUBJECT TO THE TERMS AND CONDITIONS OVERLEAF, WHICH FORM PART OF THIS CERTIFICATE.



Radomir-LEKO KO. Ltd

A NAME WITH TRADITIONS IN THE PRODUCTION OF



HIGH-QUALITY PROFILE STEEL
CASTINGS FROM 5 TO 120 TONS

HIGH-QUALITY FORGINGS OF CAR-
BON AND ALLOYED STEEL UP TO 100
TONS

CASTINGS AND FORGINGS ARE
USED TO BUILD EQUIPMENT FOR
THE MINING, INDUSTRY, THE
POWER INDUSTRY, METALLURGY,
SHIPBUILDING, CHEMICAL INDUS-
TRY, HEAVY MACHINERY.

ROLLS FOR HOT AND COLD ROLL-
ING ON MILLS OF SHEETS AND BARS

ROUGH AND FINALLY MACHINED
SPARE PARTS

WOODEN PATTERNS AND WOODEN
PRODUCTS

ALL THESE ARE CERTIFIED BY THE
LLOYD'S REGISTER OF SHIPPING

2400 Radomir, BULGARIA, telephone: +359 777 3480 telex: 28413 LKX +359 777 2134

FORGINGS

Under the conditions of increasing quality requirements of the forgings, our efforts are aimed at meeting the highest technical demands of our clients. We are achieving this by adopting most up-to-date technologies and equipment which guarantee a product quality of the highest order.

The attached schematic drawings contain the main types of forgings made by us. Their weight ranges between 1000 and 56000 kg.

At the request of our clients, we are in a position to make forgings of types other than those shown on the schematics, too.

The schematics also indicate some limitations determined by the capabilities of our equipment.

The quality of our forgings meets the specifications of the following standards:

BDS (Bulgarian State Standard)

GOST

ASTM

BS

JIS

Further technical requirements set by our clients can be met too, in as much as feasible.

The following process sequence is used in the production of our forgings:

A. To produce the required steel we use electric arc furnaces and VOD-VAD equipment where the molten metal is treated after the furnaces. This method of treatment helps obtain steels of excellent quality — low impurity content, low gas and non-metal inclusions. Their chemical composition and gas content in the metal are continuously controlled with modern precision equipment.

Forging itself is carried out by free forging hydraulic presses of 3600/4000 t, 1600 t and 630 t, capacity equipped with automatically operated tool and forging manipulators.

Natural gas heated and automatically controlled furnaces are used to heat the ingots before forging. In the process of heating and forging all main process data are automatically controlled and recorded. The plastic deformation obtained as a result of the forging is a guarantee of high quality, but is nevertheless verified at the end of the production process where all forgings undergo final tests.

What is normally tested in the following:

the size of the forged products

the density of material — by means of supersonic non-destructive tests

the quality of material — by metallographic analysis

Upon request, a capillary method and magnetic powder testing can be additionally applied for the roughly machined forgings.

The forgings made by us are mainly used for building equipment for

the power industry, nuclear power stations included

ship-building — for shafts, rudder stocks, etc.

metallurgy — from blast furnaces to rolling mills

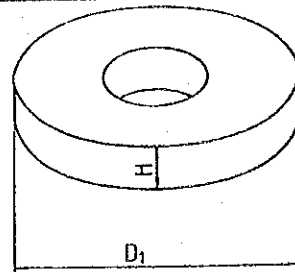
mining industry,

chemical industry.

FORGINGS

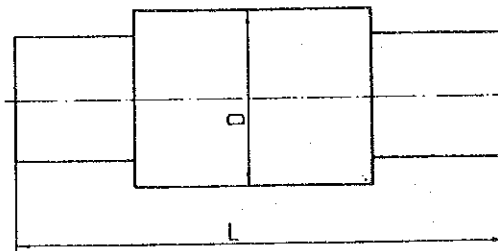
RING SHAPED FORGINGS

D (mm)	max 3300
H (mm)	min 200
Forging weight (t)	max 45



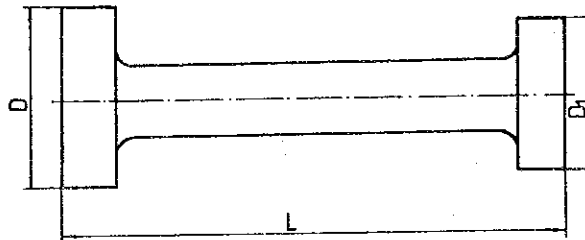
SHAFT-GEAR WHEELS

D (mm)	max 1800
L (mm)	max 8000
Forging weight (t)	max 50



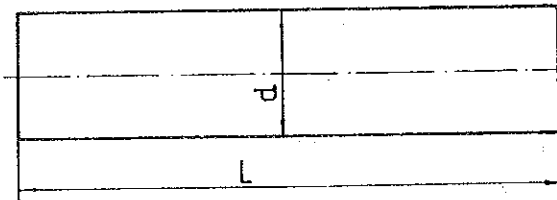
INTERMEDIATE SHAFTS

L (mm)	max 10 000
Forging weight (t)	max 50



ROUND BARS

D (mm)	min 200
L (mm)	max 12 000
Forging weight (t)	max 60



FORGINGS FOR SHIP-BUILDING SHAFTS

D (mm)	max 1800
L (mm)	max 8500
Forging weight (t)	max 45

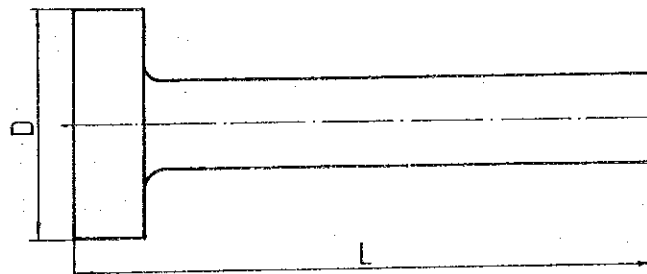
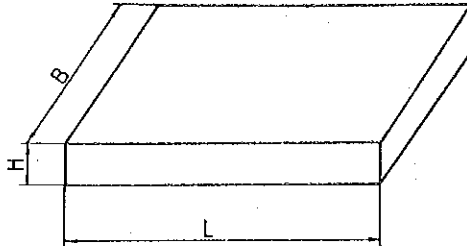


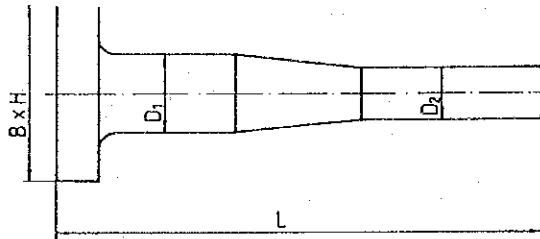
PLATE SHAPED FORGINGS

H [mm]	min 200
B [mm]	max 1700
L [mm]	max 5000
Forging weight (t)	max 50



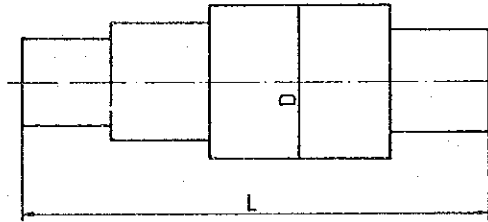
STRAIGHT RUDDER STOCKS

L [mm]	max 12 000
Forging weight (t)	max 55



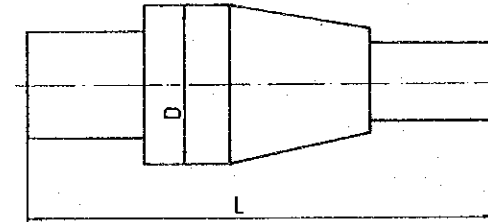
ROLLS

D [mm]	max 1700
L [mm]	—
Forging weight (t)	max 55



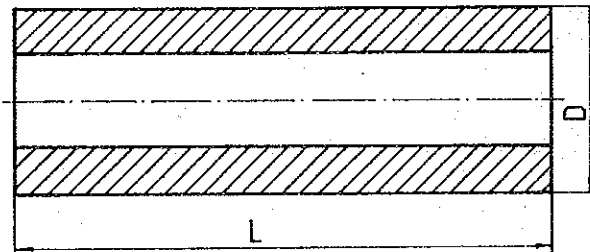
CONE SHAPED ROLLS

L [mm]	max 9000
Forging weight (t)	max 50



HOLLOW CYLINDERS

D [mm]	max 1800
L [mm]	max 12000
Forging weight (t)	max 56



ROLLS

Rolls for hot and cold rolling on mills of sheets and bars produced at the Heavy Machinebuilding Works in Radomir possess a number of valuable properties such as guaranteed strength, plasticity and good operating qualities which are mainly due to:

the high quality of molten steel ensured through vacuum treatment and blowing of inert gases

the low content of non-metal conclusions, ensured by the vacuum-carbon deoxidation

the low content of harmful impurities — oxygen, hydrogen, nitrogen and sulphur — ensured by the VAD treatment

up-to-date vanguard technology for forging of mechanised forging complexes

heating for forging and heat treatment in heat-treatment furnaces with uniform temperature field ensured by an automatic programme mode which determines an evenly fine granular structure

differential heat treatment which guarantees a roll life increase 2—2,5 times more in comparison with the life of rolls produced by standard technology

100% control by means of modern methods and equipment that provide strict implementation of technology and guaranteed high quality of the manufactured rolls.

The rolls produced at the Heavy Machinebuilding Works in Radomir are in compliance with the technical requirements of the All-Union Standard (GOST) 3541-74 and GOST 10207-70.

WORKING ROLL

WORK ROLL for sheet rolling (hot rolling). It is designed for reversing thick-sheet mill 2300 FB.

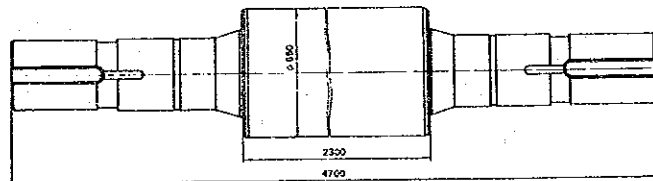
Technical characteristics:

Overall dimensions:

roll length — 4700 mm

roll diameter — 650 × 2300 mm (working part)

weight — 7211 kg.



WORKING ROLL

WORK ROLL FOR BAR ROLLING — hot rolling. It is designed for 500 FB mill.

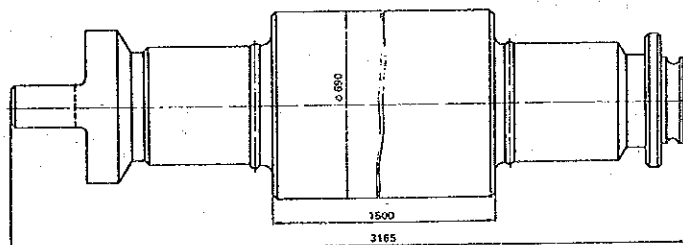
Technical characteristics:

Overall dimensions:

roll length — 3165 mm

roll diameter — 690 × 1500 mm

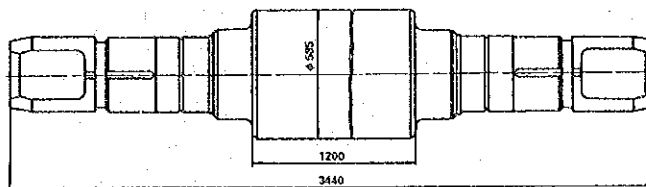
weight — 6130 kg.



WORKING ROLL

WORK ROLL — cold rolled stock. It is designed for a 1200-CB mill. The mill is used for sheets with thickness 0.3, 0.4, 0.5 and 0.6 mm.

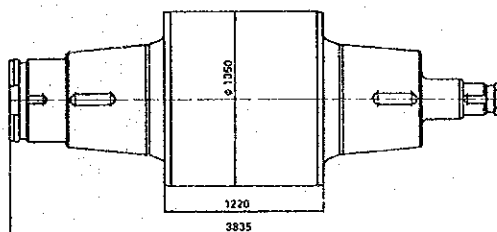
Technical characteristics:
Overall dimensions:
roll length — 3440 mm
roll diameter — 580 × 1200 mm
weight — 4 t.



THRUST SHAFT

BACKING ROLLER — cold rolling. It is designed for a 1200-CB mill. Sheets with thickness of 0.3, 0.4, 0.5 and 0.6 mm are milled on it.

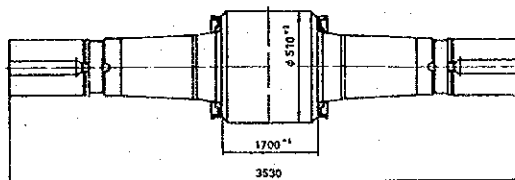
Technical characteristics:
Overall dimensions:
roll length — 3835 mm
roll diameter — 1350 × 1220 mm
weight — 21 t.



WORKING ROLL

ROLL dia. 500 × 1700
The roll is designed for rolling of sheets and strips of thickness 0.3, 0.4, 0.5 and 0.6 mm.

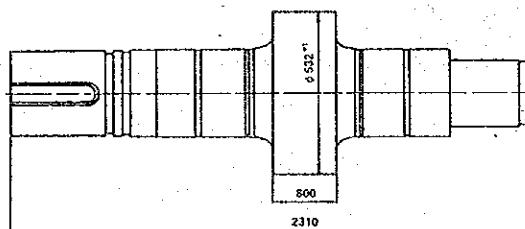
Technical characteristics:
Roll length — 3630 mm
Roll diameter — 500 mm
Weight — 3340 mm



WORKING ROLL

ROLL dia. 530 × 800
The roll is designed for billet rolling in a continuous wire rod mill 700/500. The billet section is 80 × 80.

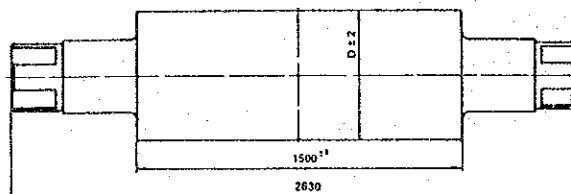
Technical characteristics:
Roll length — 2310 mm
Roll diameter — 530 mm
Weight — 2010 mm



WORKING ROLL

ROLL dia. × 1500
The roll is designed for making of various shapes.

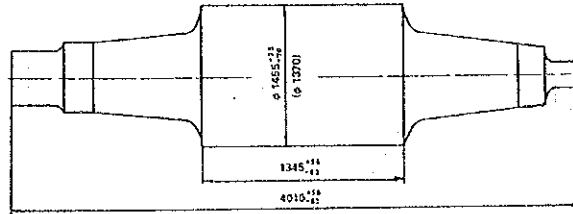
Technical characteristics:
Roll length — 2630 mm
Roll diameter — after applied table
Weight — after applied table.



ROLLS

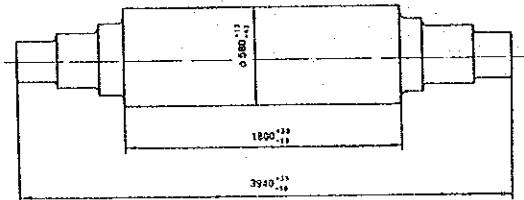
FORGING OF A ROLL

The roll is designed for a 1200 mill for skin-rolling necessary for cold rolling production at the "Leonid Brezhnev" Metallurgical Works.



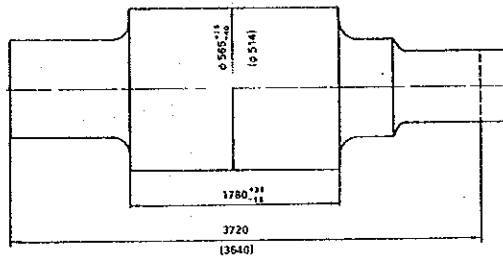
FORGING OF A ROLL

The roll is designed for a 1200 mill for cold rolling production at the "Leonid Brezhnev" Metallurgical Works.



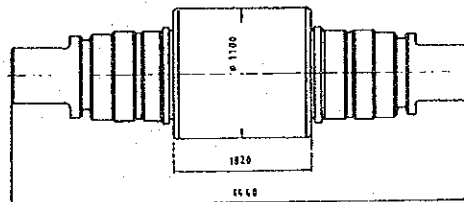
FORGING OF A ROLL

The roll is designed for 1700 mm dia. mill — cold rolling production at the "Leonid Brezhnev" Metallurgical Works.



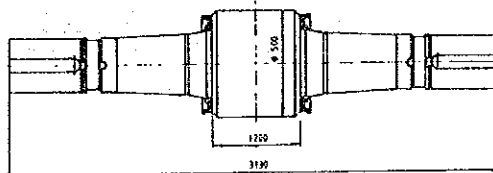
WORKING ROLL

Diameter 1110 x 1820
Designed for rolling mill 1700 — hot rolling.
Overall dimensions:
length — 4440 mm
roll diameter — 1110 x 1820
roll weight — 18 t.



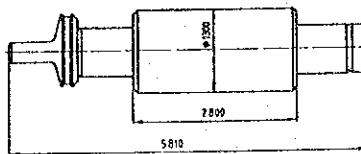
WORKING ROLL

Diameter 500 x 1200
Designed for mill 1200
Overall dimensions:
roll length — 3130 mm
roll diameter — 500 x 1200
roll weight — 2544 kg.



WORKING ROLL

Diameter 1300 x 2800
Designed for slab mill 1150 — hot rolling
Overall dimensions:
roll length — 5810 mm
roll diameter — 1300 x 2800
roll weight — 39800 kg.



CASTINGS

By using progressive technologies and equipment our company's efforts are aimed at satisfying the steady growing demand of our clients for high-quality products.

The main types of steel castings produced by our company are shown on the attached schematic drawings.

We are capable of producing castings of weight ranging from 3 to 120 t. of low and medium-carbon steels with higher requirements for the sulphur and phosphorus content, as well as low and medium alloy steels of the 110G13L type. The molten steel is obtained in arc furnaces built by BBC, Switzerland using modern technologies.

The company has available VAD-VOD equipment for treatment of the molten metal which provides for the high metal purity.

Depending on the required weight and size of the castings, moulding is done on mechanised moulding lines of 3 to 5 t., produced by Kobe Steel Ltd., Japan or 5 to 20 t. of BMW, West Germany and casting pits.

High quality sand mixes and paints are used to prepare the casting moulds guaranteeing for the high quality of the produced castings.

Castings undergo the following tests subject to the particular requirements:

- Visual testing
- Magnetic powder testing
- Capillary testing
- Supersonic testing.




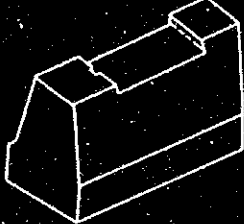

Our castings meet the specifications of the Bulgarian State Standard, GOST and DIN.

At the same time we are in a position to satisfy any further and more specific requirements of our clients.

The casting are used to build equipment for:

- the mining industry
- the power industry
- metallurgy
- ship-building and other important branches of industry.

CASTINGS

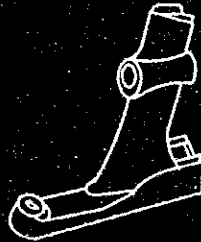
BAR SHAPED CASTINGS		Guide plate Mixer rotor
PLATE SHAPED CASTINGS		Armour plate Rotor blade
BELL SHAPED CASTINGS		Bell Cover Hopper Slag bucket
ANVIL SHAPED CASTINGS		Anvil Upper and lower steering wheel Plunger
RING SHAPED CASTINGS		Ring Gear wheel Gear rim

CYLINDER SHAPED CASTINGS



Steeve, pipe, upper and lower housing
 Collet head
 Steering wheel with convex ends
 Cylinder
 Dog

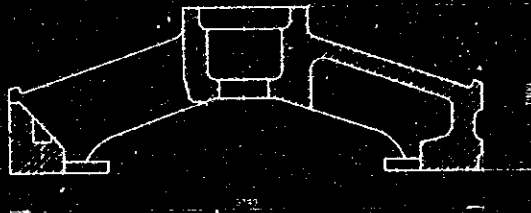
FRAME SHAPED CASTINGS



Stern frame
 Rolling mill stand
 Steering wheel lever
 Steering wheel frame

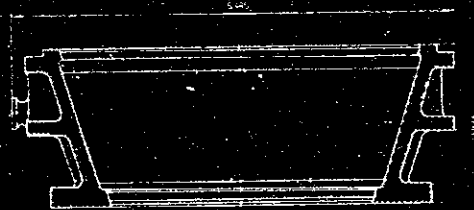
TRAVERSER

Designed for cone crusher of 2200 mm dia
 Parameters: average wall thickness — 220 mm, weight — 47 t
 Technical characteristics:
 length — 5740 mm
 width — 3800 mm
 height — 1900 mm



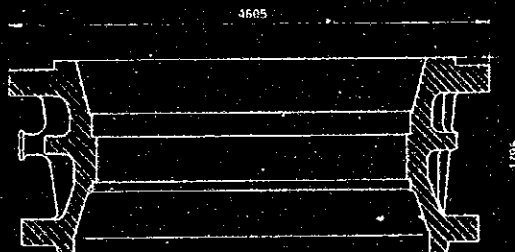
UPPER RING

Designed for cone crusher of 1500 mm dia
 Parameters: wall thickness — 110 mm min — 245 mm max, weight — 63 t
 Technical characteristics:
 length — 5385 mm
 width — 4950 mm
 height — 1815 mm



LOWER RING

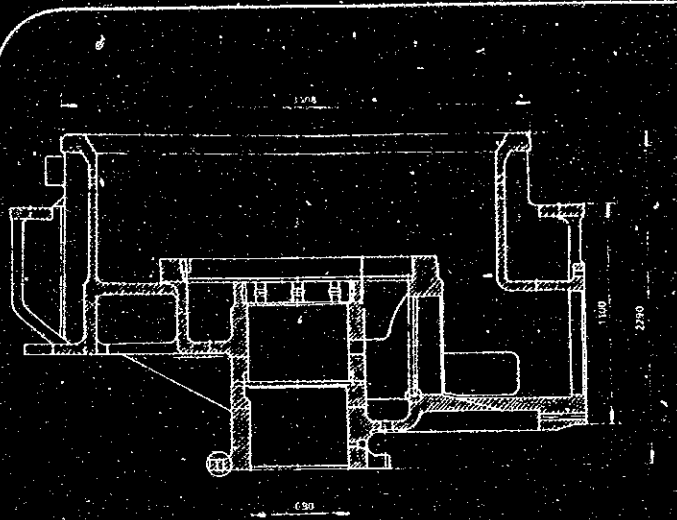
Designed for cone crusher of 1500 mm dia
 Technical characteristics:
 Parameters: wall thickness — 110 mm
 min.—230 mm max; dia. — 1500 mm,
 weight — 59.5 t
 Overall dimensions:
 dia. — 4605 mm
 height — 1795 mm



CASTING — BODY

Designed for cone crusher, 2200 mm dia
Wall thickness: 40 mm min, 220 mm, max
weight — 29 t

Technical characteristics
length — 3800 mm
width — 3180 mm
height — 1280 mm



 **Radomir-LEKO KO. Ltd**

STEELCASTING, FORGING AND MACHINERY WORKS

2400 RADOMIR, BULGARIA

TELEPHONE: +359 /777/ 34 89

TELEFAX: +359 /777/ 21 34

TELEX: 28413

"RADOMIR LEKO KO" LTD

R A D O M I R

"RADOMIR - LEKO KO" LTD is located 45km west of Sofia and has a convenient transport connection by road and rail to ports at the Black Sea Coast and the Danube River.

The total volume of the production buildings is about 1100 thousand m², while the built-up area is about 700 thousand m². The total length of the crane runway is 30 000m.

"RADOMIR - LEKO KO" LTD, Radomir consists of 3 plants. The product-mix of the plant covers:

- Nuclear Power Station and Thermo-Power Station Equipment;

- Complete projects - Metallurgical Plants, Foundries, etc.;

- Large-size castings and forgings of ordinary carbon steel and special steel;

- Metallurgical equipment;

- Mill, crushing and transport equipment for mining, ore-dressing and cement industries;

- Cold and hot rolled rolls;

- Gantry and Overhead cranes, etc.

The most important plants in the company from production point of view are: the steel making and steel casting plant, forging plant and machining plant.

The Steel making and steel casting plant is designed to supply feedstock for the machining shop and namely, forging ingots and castings. Its production programme covers a wide range of more than 100 steel grades, corrosion-resistant steel, etc. It is designed for 75 000 tons of steel ingots and 45 000 tons of mould castings for the needs of ship-, automobile-, crane-building, etc.

It structurally comprises: steel making shop with scrap yard, steel casting shop with heat fettling section, pattern shop and repair shop.

The steel making shop is designed for the production of 150 000 tons of liquid steel per year. Three electric arc

furnaces of 15-ton, 25-ton and 60 ton capacity respectively were manufactured by the Swiss company BBC and have been installed there as well as steel refining plant - VAD/VOD system.

The technology of Kobe Steel is used in the steel making shop for casting forging ingots of 1 to 80 tons weight. The technology allows steel making with or without steel degassing.

By using the VAD/VOD installation, supplied by Standart Messo Company - Germany, steel grades of higher purity with regard to sulphur, gases and non-metallic inclusions are produced.

The steel casting shop is designed for making castings of 3 to 120 tons weight. It comprises a moulding line for castings of 3 to 5 tons weight, supplied by the Japanese company Kobe Steel.

The finishing of castings is based on Kobe Steel Know-How.

The pattern shop is designed for making complex wooden patterns and for processing of 6000 m³ timber annually.

The steel grades, which are used in the production of castings and ingots for forgings are given in the application

STEEL MAKING AND STEEL CASTING CASTING PLANT

TECHNOLOGICAL EQUIPMENT

Description	Maker	Feature
MELTING EQUIPMENT		
60 tons	Switzerland	60 tons
25 tons	Switzerland	25 tons
15 tons	Switzerland	15 tons
STEEL DEGASSING		
VAD	Germany	25-75 tons
VOD	Germany	13-70 tons

Ladles

- 60 tons	Germany	60 tons
- 25 tons	Germany	25 tons
- 15 tons	Germany	15 tons

FETTLING, GOUGING & REPAIR EQUIPMENT

Shot Blasting Chamber

- 150 tons	Japan	9 x 9 x 7,5 m
- 60 tons	Japan	7 x 7 x 4 m
- 30 tons	Japan	5 x 5 x 3,8 m
Knock-out machines	Japan	30 tons
	Japan	80 tons

HEAT TREATMENT EQUIPMENT

Heat treatment furnaces

- 250 tons	Japan	13 x 9 x 4 m
- 150 tons	Japan	11 x 8 x 3,5 m
	Germany	
- 80 tons	Japan	8 x 5 x 2,5 m
	Germany	
- 50 tons	Japan	8 x 5 x 2,5 m

The Forging Plant is equipped with unique equipment for production of rolls and forgings of different type and size and for rolls and forgings tempering in the heat treatment plant. All parameters are automatically controlled during the heating and forging process and further analyses are also possible on customer's request.

FORGING SHOP

TECHNOLOGICAL EQUIPMENT

1. 3600/4500-ton Press:

Type: Vertical, 4 - column, oil-hydraulic

Operating pressure: max. 250 kg/cm²

Dimensions: Vertical clearance - 5000 mm

Column distance - 4200 x 2300 mm

Table: 2500 x 6000 mm

2. 1600-ton Press:

Type: Vertical, 2 - column, oil-hydraulic

Operating pressure: max. 250 kg/cm²

Dimensions: Vertical clearance - 3000 mm

Column distance - 2600 x 1700 mm

Table: 1600 x 3000 mm

3. Double Frequency Induction Machine

Frequency: 50 Hz ; 1000 Hz

Dimensions of rolls:

Barrel diameter: up to 900 mm

Total length: up to 7000 mm

4. Supporting Unit for 1600-ton Press:

Loading capacity: 10 tons

Equipped with chain and spring for suspension

5. 160 - M.T. Forging Manipulator

6. 40 - M.T. Forging Manipulator

7. Tool Manipulator

FURNACES

1. 150-ton Heating Furnace, bogie-hearth type - 2 off

2. 150-ton Heating Furnace, bogie-hearth type - 5 off

3. 50-ton Heating Furnace, bogie-hearth type - 2 off

4. 25-ton Heating Furnace, bogie-hearth type - 4 off

5. 150-ton Annealing Furnace, bogie-hearth type - 1 off

Inner Dimensions: 4000 wide x 10000 long x 3500 high/mm/

6. 150-ton Annealing Furnace, bogie-hearth type - 1 off

Inner Dimensions: 3000 wide x 15000 long x 3000 high/mm/

7. 90-ton Annealing Furnace, bogie-hearth type - 4 off

Inner Dimensions: 3000 wide x 10000 long x 2500 high/mm/

8. 35-ton Annealing Furnace, bogie-hearth type - 1 off

Inner Dimensions: 2500 wide x 6000 long x 2500 high/mm/

OTHER EQUIPMENT

Automatic Gas Cutting Machine 2 off

Maximum cutting thickness: 2500 mm; Equipped with an optic system for components configuration copying.

HEAT TREATMENT SHOP

1. 25-ton Horizontal Heat Treatment Walking Beam Furnace
- 3 off

Inner dimensions: 1000 wide x 7500 long x 1000 high/mm/

2. 90-ton Horizontal Heat Treatment Walking Beam Furnace
- 5 off

Inner dimensions: 2500 wide x 9000 long x 1800 high/mm/

3. 30-ton Horizontal Resistance Furnace Walking Beam Type

Inner dimensions: 1000 wide x 5000 long x 1000 high/mm/

4. 15-ton Heat Treatment Furnace, Chamber Type, Walking Beam Type

Inner dimensions: 1700 wide x 6000 long x 1500 high/mm/

5. 100-ton Heat Treatment Furnace, Chamber Type, Walking Beam Type - 2 off

Inner dimensions: 4500 wide x 9000 long x 3500 high/mm/
3000 x 15000 x 3000

6. 90-ton High Speed Heating Furnace

Components size: 600 - 1600 mm dia, 3000 mm long

7. Shaft Furnace - 2 off

Inner dimensions: 1800 dia x 6000 mm
3000 dia x 15000mm

Capacity: 10 & 50 tons

8. Oil Quenching Tanks - 4 sets

Dimensions: 1300 x 7000 x 1000 mm

9. Quenching Machine

Capacity: 13 tons

10. Quenching Machine

Capacity: 90 tons

11. Subzero Temperature Treatment Unit

Capacity: 13 tons

Coolant: liquid nitrogen

Inner dimensions: 900 wide x 7000 long x 1000 high/mm/

14. Water - quenching Tanks

Dimensions: 2000 wide x 14000 long x 5000 high/mm/

MACHINING PLANT

This plant is equipped with lathes for rolls, boring

machines, milling machines and punching machines. The latter two have possibilities for punching holes from 30 to 135 mm and length up to 12000 mm. Rolls for hot and cold rolling on mills of sheets and bars and other equipment for metallurgy are produced in the shops of the machining plant.

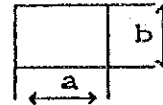
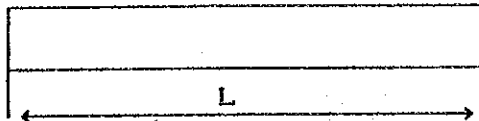
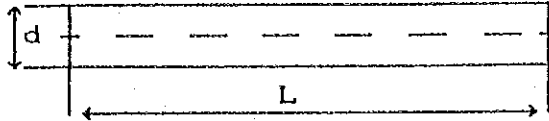
Capacities for the production of oxygen, water glass and liquid nitrogen are also available.

The production of RADOMIR LEKO KO LTD is well recieved in numerous countries in Europe and Asia. Our regular clients are "Steinhoff" and "Ferrostahl" - Germany , "Stalvalsar" - Sweden, ABB Drives - Finland, Novolipetzk Metallurgical Works - Russia as well as the plants and companies in metallurgy, power generation, mining industry and shipbuilding in Bulgaria.

APPLICATION TECHNICAL POSSIBILITIES

/ FORGINGS, HEAT TREATMENT AND MACHINING /

1. ROUND AND RECTANGULAR BARS



$\phi(d)$; $a \times b$	200-300	300-600	600-800
L [mm]	3000-4000	4000-6000	≤ 6000

or special orders: weight 30 000 kg.

$L \leq 10\ 000\ \text{mm}$

condition: forgings - annealed, normalized or tempered.

2. ROLLS FOR ROLLING MILLS

2.1 COLD WORK ROLLS

=> weight : 200-13000kg

D_b : 200-900mm

2.2 HOT WORK ROLLS

=> weight : up to 35000kg

D_b : 200-1500mm

2.3 BACK UP ROLLS

=> weight : up to 35000kg

D_b : 200-1500mm

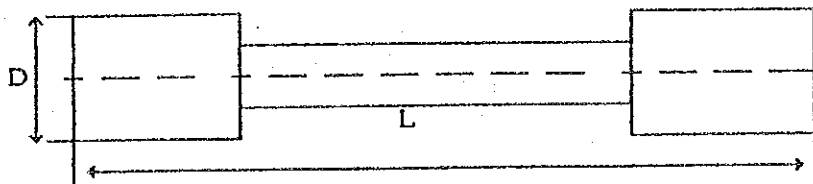
condition: forged, heat treated and machined

3. SPARE PARTS FOR SHIPBUILDING

3.1 SECONDARY SHAFTS

=>weight : <=35000kg

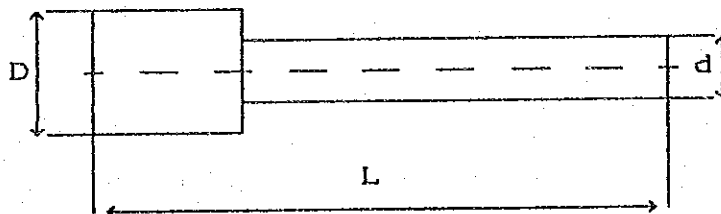
D : <=1500mm; L : <=13000mm



3.2 PROPELLER SHAFTS

>weight : <=35000kg

D : <=1500mm ; L : <=13000mm



3.3 RUDDER STOCK

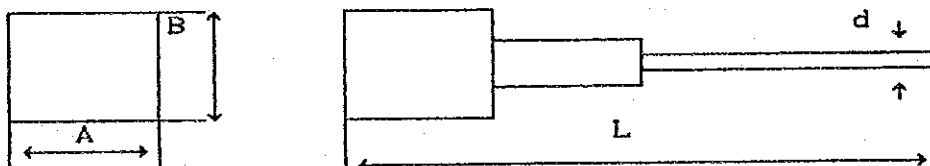
=>weight : <=35000kg

A x B : <=1500 x 1500mm

L : <=13000mm

condition: forged, heat treated and machined

requirements: Lloyd's Register of shipping



4. GENERAL ENGINEERING SPARE PARTS

4.1 SHAFTS, AXLES, GEAR SHAFTS

weight : <=35000kg

D : 200-1350mm

4.2 DISKS, GEARS

=>weight : >=500kg

D : <=2500mm

H : <=1000mm

4.3 RINGS

D : $\leq 3000\text{mm}$

H : $\leq 1000\text{mm}$

condition: forged, heat treated and machined

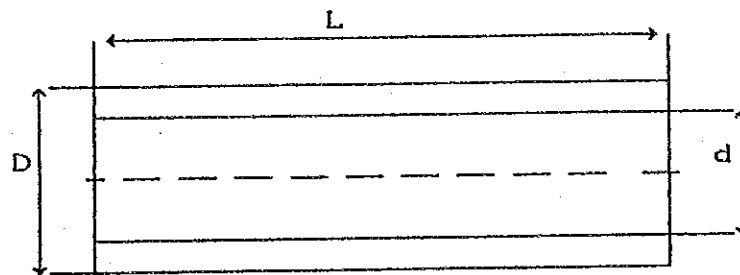
requirements: Customer's Application

notes: The weight is dependent on the dimensions of the blank

4.4 HOLLOW FORGINGS /TUBES/

requirements: Customer's Application

notes: The weight is dependent on the dimensions of the blank



4.4.1 conditions: forged, heat treated and premachined

D : $\leq 1500\text{mm}$

d : $\geq 300\text{mm}$

L : $\leq 4000\text{mm}$

4.4.2 conditions: forged, heat treated and
premachined /without centre bore/

D : $\leq 1500\text{mm}$

d : $\geq 300\text{mm}$

L : $\leq 6000\text{mm}$

COMPARISON BETWEEN JIS AND DIN STANDARDS
CASTINGS STEELS

No.	Standard JIS	Type	Chemical composition											acc. to DIN
			C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V		
1.	S472	15L11	0,10-0,20	0,20-0,60	0,40-0,70	0,040	0,040	<0,30	<0,30	<0,40	<0,30	-	-	1.0420
2.	S478	16ChML	0,12-0,20	0,35-0,50	0,50-0,80	0,030	0,030	0,90-1,30	0,40-0,60	<0,30	<0,30	-	-	1.7357
3.	S478	17Ch2MFL	0,14-0,20	0,30-0,50	0,60-0,70	0,030	0,030	1,20-1,70	0,90-1,20	<0,30	<0,30	0,25-0,40	-	1.7709
4.	S478	20L11	0,17-0,20	0,30-0,50	0,50-0,80	0,035	0,035	<0,30	-	<0,40	<0,30	-	-	1.0619
5.	S550	25ChML	0,22-0,27	0,20-0,50	0,50-0,80	0,040	0,040	0,80-1,20	0,20-0,30	<0,40	<0,30	-	-	1.7718
6.	S472	25L11	0,20-0,30	0,20-0,60	0,40-0,90	0,040	0,040	<0,30	-	<0,40	<0,30	-	-	1.0446
7.	S550	30ChML	0,25-0,35	0,20-0,50	0,50-0,80	0,040	0,040	0,80-1,20	0,20-0,30	<0,40	<0,30	-	-	1.7229
8.	S550	35SL	0,30-0,40	0,20-0,50	1,20-1,60	0,040	0,040	<0,30	-	<0,30	<0,30	-	-	1.1167
9.	S472	35L11	0,30-0,40	0,20-0,60	0,40-0,80	0,040	0,040	-	-	-	-	-	-	1.0957
10.	S550	40ChML	0,38-0,45	0,20-0,50	0,50-0,80	0,040	0,040	0,80-1,20	0,20-0,30	<0,40	<0,30	-	-	1.7225
11.	S550	45SL	0,40-0,50	0,20-0,50	0,80-1,20	0,040	0,040	<0,30	-	<0,30	<0,30	-	-	1.1159
12.	S472	45L11	0,40-0,50	0,20-0,60	0,40-0,70	0,040	0,040	-	-	-	-	-	-	1.0558
13.	S631	Ch12Ni0SL	<0,15	<2,00	<2,00	0,040	0,040	17,0-19,0	-	8,0-12,0	-	-	-	1.4312
14.	S631	Ch12Ni4ML	<0,08	<1,00	<1,50	0,035	0,035	11,5-13,5	<1,00	3,50-5,00	-	-	-	1.4313
15.	S631	Ch12Ni10SL	<0,07	<2,00	<2,00	0,040	0,040	17,0-19,0	<0,50	8,0-12,0	-	-	-	1.4308
16.	S631	Ch18Ni10Ni2SL	<0,07	<2,00	<2,00	0,040	0,040	17,0-19,0	2,00-2,50	9,0-12,0	-	-	-	1.4408
17.	S631	1Ch13L	<0,15	<0,70	0,40-0,80	0,040	0,040	12,0-14,0	-	<1,0	-	-	-	1.4006
18.	S631	2Ch13L	0,15-0,30	<0,70	0,40-0,80	0,040	0,040	12,0-14,0	2,00-2,50	<1,0	-	-	-	1.4027

COMPARISON BETWEEN BDS AND DIN STANDARDS
STEELS FOR FORGINGS

Nr	Standard BDS	Chemical composition														acc. to
		C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V	N	Ti	Z	DTH	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1.	4820	09825	<0,12	0,50-0,80	1,30-1,70	0,035	0,040	<0,30	-	<0,30	<0,30	-	-	-	-	
2.	7738	30CH2BF	0,30-0,40	0,15-0,40	0,15-0,40	0,030	0,030	2,20-2,70	-	<0,35	<0,30	0,20-0,50	7,50-9,00	-	1,2581	
3.	7938	50CHM	0,50-0,60	0,15-0,35	0,50-0,80	0,039	0,030	0,50-0,80	0,15-0,30	1,40-1,80	<0,30	-	-	-	-	
4.	7938	50CHMF	0,50-0,60	0,15-0,35	0,50-0,80	0,030	0,030	1,00-1,30	0,50-0,70	1,60-1,90	<0,30	0,05-0,15	-	-	1,2714	
5.	†	9CH2MF	0,55-0,95	0,20-0,50	0,20-0,70	0,039	0,030	1,70-2,10	0,20-0,30	<0,30	<0,30	0,10-0,20	-	-	-	
6.	6354	12CHN3A	0,09-0,16	0,17-0,37	0,30-0,60	0,025	0,025	0,60-0,90	<0,15	2,75-3,65	<0,30	<0,05	<0,20	<0,03	-	
7.	†	15CH2M	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.	6354	18CH6T	0,17-0,23	0,17-0,37	0,80-1,10	0,035	0,035	1,00-1,30	<0,15	<0,30	<0,30	<0,05	<0,20	10,05-0,09	-	
9.	5755	29	0,18-0,24	0,17-0,37	0,35-0,65	0,035	0,040	<0,25	-	<0,25	<0,25	-	-	-	1,0402	
10.	6354	20CH2N4A	0,16-0,22	0,17-0,37	0,30-0,60	0,025	0,025	1,25-1,65	<0,15	2,75-3,65	<0,30	<0,05	<0,20	<0,03	-	
11.	†	20CR6	-	-	-	-	-	-	-	-	-	-	-	-	-	
12.	†	20G5	-	-	-	-	-	-	-	-	-	-	-	-	-	
13.	6354	20CH2M	0,17-0,25	0,17-0,37	0,40-0,70	0,035	0,035	<0,30	0,20-0,30	1,50-1,90	<0,30	<0,05	<0,20	<0,03	-	
14.	†	Z0CH2SA	-	-	-	-	-	-	-	-	-	-	-	-	1,0406	
15.	5785	25	0,22-0,30	0,17-0,37	0,50-0,80	0,035	0,040	<0,25	-	<0,25	<0,25	-	-	-	-	
16.	6354	256	0,22-0,30	0,17-0,37	0,70-1,00	0,035	0,035	<0,30	<0,15	<0,30	<0,30	<0,05	<0,20	<0,03	-	
17.	5785	30	0,27-0,35	0,17-0,37	0,50-0,80	0,035	0,040	<0,25	-	<0,25	<0,25	-	-	-	1,0528	
18.	†	30CH2MFH	-	-	-	-	-	-	-	-	-	-	-	-	-	
19.	6354	30CH6T	0,24-0,32	0,17-0,37	0,80-1,10	0,035	0,035	1,00-1,30	<0,15	<0,30	<0,30	<0,05	<0,20	10,05-0,09	-	
20.	6354	30CH4A	0,25-0,33	0,17-0,37	0,40-0,70	0,025	0,025	0,80-1,10	0,15-0,25	<0,30	<0,30	<0,05	<0,20	<0,03	-	
21.	6354	30CH2N4A	0,27-0,34	0,17-0,37	0,30-0,60	0,025	0,025	0,60-0,90	0,20-0,30	1,25-1,65	<0,30	<0,05	<0,20	<0,03	-	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
122.	6354	30CHNZHFA	0, 27-0, 34	0, 17-0, 37	0, 30-0, 60	0, 025	0, 025	0, 50-0, 90	0, 20-0, 30	2, 00-2, 40	<=0, 30	0, 10-0, 18	<=0, 20	<=0, 03	-
123.	6354	306	0, 27-0, 35	0, 17-0, 37	0, 70-1, 00	0, 035	0, 035	<=0, 30	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	1.1146
124.	6354	3062	0, 26-0, 35	0, 17-0, 37	1, 40-1, 80	0, 035	0, 035	<=0, 30	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	1.1155
125.	†	34CHMA													
126.	†	34CHMIN													
127.	†	34CHNSX													
128.	†	34CHNSFA													
129.	5785	35	0, 32-0, 40	0, 17-0, 37	0, 50-0, 80	0, 035	0, 040	<=0, 25	-	<=0, 25	<=0, 25	-	-	-	1.0501
130.	6354	35CHNSA	0, 32-0, 39	1, 10-1, 40	0, 80-1, 10	0, 025	0, 025	1, 10-1, 40	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	-
131.	6354	35CHM	0, 32-0, 40	0, 17-0, 37	0, 40-0, 70	0, 035	0, 035	0, 80-1, 10	0, 15-0, 25	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	1.7720
132.	†	35CHNFA													
133.	6354	356	0, 32-0, 40	0, 17-0, 37	0, 70-1, 00	0, 035	0, 035	<=0, 30	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	-
134.	4758	3565	0, 30-0, 37	0, 50-0, 90	0, 80-1, 20	0, 040	0, 045	<=0, 30	-	<=0, 30	<=0, 30	-	-	-	-
135.	6354	38CHA	0, 35-0, 42	0, 17-0, 37	0, 50-0, 80	0, 025	0, 025	1, 00-1, 30	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	1.7043
136.	6354	38CHBL	0, 39-0, 43	0, 17-0, 37	0, 80-1, 10	0, 035	0, 035	0, 50-0, 80	<=0, 15	0, 70-1, 00	<=0, 30	<=0, 05	<=0, 20	<=0, 03	-
137.	†	38CHJU													
138.	†	38CHMUA													
139.	6354	38CHNSHA	0, 33-0, 40	0, 17-0, 37	0, 25-0, 50	0, 025	0, 025	0, 80-1, 20	0, 20-0, 30	2, 75-3, 25	<=0, 30	<=0, 05	<=0, 20	<=0, 03	-
140.	6354	38CHNSHFA	0, 33-0, 40	0, 17-0, 37	0, 25-0, 50	0, 025	0, 025	1, 20-1, 50	0, 35-0, 45	3, 00-3, 50	<=0, 30	0, 10-0, 18	<=0, 20	<=0, 03	-
141.	6354	38CHS	0, 34-0, 42	1, 00-1, 40	0, 30-0, 60	0, 035	0, 035	1, 30-1, 60	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	-
142.	5785	40	0, 37-0, 45	0, 17-0, 37	0, 50-0, 80	0, 035	0, 040	<=0, 25	-	<=0, 25	<=0, 25	-	-	-	1.0511
143.	6354	40CH	0, 36-0, 44	0, 17-0, 37	0, 50-0, 80	0, 035	0, 035	0, 80-1, 10	<=0, 15	<=0, 30	<=0, 30	<=0, 05	<=0, 20	<=0, 03	1.7035

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
122.	6354	30CHNZHFA	0,27-0,34	0,17-0,37	0,30-0,60	0,025	0,025	0,60-0,90	0,20-0,30	2,00-2,40	<=0,30	0,10-0,18	<=0,20	<=0,03	-
123.	6354	306	0,27-0,35	0,17-0,37	0,70-1,00	0,035	0,035	<=0,30	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	1.1146
124.	6354	3062	0,26-0,35	0,17-0,37	1,40-1,80	0,035	0,035	<=0,30	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	1.1165
125.	†	34CHVA													-
126.	†	34CHNIN													-
127.	†	34CHNSM													-
128.	†	34CHNSFA													-
129.	5785	35	0,32-0,40	0,17-0,37	0,50-0,80	0,035	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0601
130.	6354	35CHNSA	0,32-0,39	1,10-1,40	0,80-1,10	0,025	0,025	1,10-1,40	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	-
131.	6354	35CHN	0,32-0,40	0,17-0,37	0,40-0,70	0,035	0,035	0,80-1,10	0,15-0,25	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	1.7720
132.	†	35CHNFA													-
133.	6354	356	0,32-0,40	0,17-0,37	0,70-1,00	0,035	0,035	<=0,30	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	-
134.	4758	356S	0,30-0,37	0,60-0,90	0,80-1,20	0,040	0,045	<=0,30	-	<=0,30	<=0,30	-	-	-	-
135.	6354	36CHA	0,35-0,42	0,17-0,37	0,50-0,80	0,025	0,025	1,00-1,30	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	1.7943
136.	6354	36CHGN	0,38-0,43	0,17-0,37	0,80-1,10	0,035	0,035	0,50-0,80	<=0,15	0,70-1,00	<=0,30	<=0,05	<=0,20	<=0,03	-
137.	†	36CHJu													-
138.	†	36CHMUA													-
139.	6354	36CHNSA	0,33-0,40	0,17-0,37	0,25-0,50	0,025	0,025	0,80-1,20	0,20-0,30	2,75-3,25	<=0,30	<=0,05	<=0,20	<=0,03	-
140.	6354	36CHNSFA	0,33-0,40	0,17-0,37	0,25-0,50	0,025	0,025	1,20-1,50	0,35-0,45	3,00-3,50	<=0,30	0,10-0,18	<=0,20	<=0,03	-
141.	6354	36CHS	0,34-0,42	1,00-1,40	0,30-0,60	0,035	0,035	1,30-1,60	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	-
142.	5785	40	0,37-0,45	0,17-0,37	0,50-0,80	0,035	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0511
143.	6354	40Ch	0,36-0,44	0,17-0,37	0,50-0,80	0,035	0,035	0,80-1,10	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	1.7033

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
144.1	†	140CHM	0,36-0,44	0,17-0,37	0,50-0,80	0,035	0,035	0,45-0,75	<=0,15	1,00-1,40	<=0,30	<=0,05	<=0,20	<=0,03	1.5711
145.1	‡	140CHM	0,37-0,45	1,20-1,60	0,30-0,60	0,035	0,035	1,30-1,60	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	-
146.1	‡	140CHS	0,42-0,50	0,17-0,37	0,50-0,80	0,040	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0503
147.1	‡	5785	0,41-0,49	0,17-0,37	0,50-0,80	0,035	0,035	0,80-1,10	<=0,15	<=0,30	<=0,30	<=0,05	<=0,20	<=0,03	-
148.1	‡	145CH	0,47-0,55	0,17-0,37	0,50-0,80	0,035	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0540
149.1	‡	5785	0,52-0,60	0,17-0,37	0,50-0,80	0,035	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0535
150.1	‡	5785													
151.1	†	155CH													
152.1	‡	5785	0,57-0,65	0,17-0,37	0,50-0,80	0,035	0,040	<=0,25	-	<=0,25	<=0,25	-	-	-	1.0601
153.1	†	140CH2SNF													
154.1	†	160CHM													
155.1	†	160CHNF													
156.1	‡	1856	0,62-0,70	0,17-0,37	0,80-1,20	0,035	0,035	<=0,25	-	<=0,30	<=0,30	-	-	-	1.1240
157.1	†	175CHM													
158.1	†	175CHNF													
159.1	†	1CH12M													
160.1	‡	1CH18KPT	<=0,12	<=0,80	<=2,00	0,035	0,025	17,0-19,0	<=0,30	8,00-10,00	-	-	-	5x7C-0,80	1.6541
161.1	†	1CH18N12MST													
162.1	†	1KGB-12													
163.1	‡	1LEKO	0,55-0,65	0,50-0,80	0,70-1,00	0,025	0,025	0,80-1,30	<=0,30	0,30-0,50	<=0,20	-	-	-	-
164.1	†	1KOH-4													
165.1	‡	156CH15	0,95-1,05	0,17-0,37	0,20-0,45	0,027	0,020	1,30-1,65	-	<=0,30	<=0,25	-	-	-	1.3505

ブルガリア鉍工業プロジェクト選定確認調査
対 処 方 針

1993. 8. 25

鉍工業開発調査部計画課

1. 調査の目的

開発途上国に対する我が国の技術協力のうち、鉍工業関係の開発計画を効率的に実施するため、既に要請がある「製鉄所の環境対策及び近代化」について、その背景及び経済開発計画における位置付け等を調査し、協力可能な範囲を明確にするとともに、今後、我が国が協力の可能性のあるプロジェクトの発掘を目的とする。

2. 調査の背景と経緯

戦後のブルガリアは、旧コメコン分業体制の下に、原燃料の大部分を旧ソ連からの輸入に依存しながら、重工業化路線を推進した結果、鉄鋼、非鉄金属、機械、電力、化学などの新しい工業部門が発展し、国民所得に占める工業の比重は1960年47.3%、1970年64.8%と1960~1970年の間に急増した。

しかしながら、1970年代に入るとブルガリア経済は減速し始め、鉄鋼業においても粗鋼生産は1980年代後半には年間290万トンの水準で停滞を続け、旧コメコン体制の崩壊後の1991年には162万トンに激減した。鋼材生産も年間320万トン程度であったが、1991年には131万トンに落ち込んでおり、設備効率、生産能率の問題も生じている。また、原燃料多消費型産業である鉄鋼業にとっては、省エネは大きな課題となっている。

一方、製鉄所では、生産設備に公害防止設備が設置されていないか、又は、設置されている公害防止設備でも、国の排出基準を満足していないか、又は稼働していない状況にあり、環境対策も重要な課題となっている。

かかる背景のもと、本年2月に、省エネ・環境対策を含む鉄鋼産業開発計画推進の方策の策定を内容とする「(ブルガリア国内製鉄所全ての)製鉄所の環境対策及び近代化」調査の要請書(別添参照)の提出があった。

本件に関しては、ブルガリアにおける製鉄所の廃止、再編をも含む調査内容も考えられるところ、先方の真意はどこにあるのか、産業省と製鉄所側との間で調整がとれているのか、国内での情報では不十分なため、産業省、製鉄所側から要請の背景、内容の確認をした上で、JICAとしての協力範囲を明確にするとともに、資料収集を目的として、今般、調査団を派遣することとした。また、ブ国においては現在「省エネルギー計画」調査を実施中であるが、5年度要請は前記の1件のみであり、新規案件の発掘にも先方政府と協議することとした。

3. 調査団構成

団長・総括	棚橋 滋雄	JICA 鉱工業開発調査部長
技術協力政策	佐藤 秀雄	外務省経済協力局開発協力課課長補佐
技術協力行政	岩倉 知明	通産省通商政策局技術協力課係長
製鉄行政	長谷川洋二	通産省基礎産業局製鉄課課長補佐
工業開発	永江 勉	JICA 鉱工業開発調査部工業開発調査課
製鉄技術	堀 珊吉	(社) 日本鉄鋼連盟技術管理部長
環境対策	橋爪 繁幸	(財) 日本環境協会事業担当理事
調査企画	永井 均	JICA 鉱工業開発調査部計画課課長代理

4. 調査日程

平成5年9月1日(水)～平成5年9月11日(土)

(詳細は別紙のとおり)

5. 調査事項

- (1) 要請内容の確認
- (2) 協力の範囲についての協議
- (3) その他我が国が協力しうる鉱工業関係プロジェクトの発掘
- (4) 関連情報・資料の収集

6. 開発調査新規候補案件

- イ. 中小企業育成
- ロ. 石炭火力発電所の環境対策
- ハ. 工場団地
- ニ. 石炭火力発電所におけるリグナイト使用の可能性

7. 対処方針案

(1) 製鉄所の環境対策及び近代化について

イ. 先方政府が JICA 調査に対し、ブルガリア国として鉄鋼業をどうするか、将来の戦略を構築したいのか、即ち、鉄鋼産業開発のための M/P 作成を期待するのか、工場の設備改善、省エネ、環境対策についての F/S 調査を期待するのか、ブルガリア側の意向を確認する。

ブルガリアの鉄鋼業の在り方として考えられるところは、

- 1) 製鉄所の廃止
- 2) 高炉から電気炉への転換(一貫製鉄の廃止、高炉の一部又は全部の廃止)

3) 高炉の今までどおりの存続

なお、M/P調査の中でクレミコフチ製鉄所を含む4製鉄所を対象として、工場の設備改善に係る調査を実施するものとする。

ロ. 先方が、本件調査について、両者を含む調査を要望する場合は、F/S調査の効率性の観点から、まず初めにブルガリア国の鉄鋼業の開発計画のためのマスタープラン作りを優先させることとする。その調査結果を踏まえ、先方政府よりF/S調査の要請が出されればその実施の可否につき検討するものとする。

ニ. 今後の調査スケジュールを問われた場合は、事前調査は12～1月ごろとなる見通しであると回答する。

(2) 新規案件について

イ. 今回の調査は平成6年度以降を対象としていることを説明する。

ロ. 新規案件候補については、先方の要望内容を聴取するものとし、開発調査として適当と判断される案件については要請書の提出を促すこととするが、その採択に関しては、要請書接到後我が国において関係省庁の協議により決定することを説明する。

ハ. JICA開発調査が必ずしも資金協力に結びつくものではないことを説明する。

調 査 日 程 (案)

1. 9月1日(水) 移動(成田14:05-----18:55フランクフルト) (LH711) フランクフルト 泊
 2. 2日(木) 移動(フランクフルト08:40---09:40ミュンヘン10:55---13:50パリ) ヲパリ 泊
(LH122) (LH3386)
- 日本大使館訪問
3. 3日(金) 午前:産業省 午後:クレミコフチ製鉄所現地調査 //
 4. 4日(土) 資料整理 //
 5. 5日(日) 資料整理 //
 6. 6日(月) *棚橋、佐藤、岩倉、永井*(新規案件候補) //
環境省、エネルギー委員会、産業省

長谷川、永江、堀、橋爪
クレミコフチ製鉄所現地調査
 7. 7日(火) *コンサルを除く全員* //
午前:産業省 午後:予備

コンサル
午前:クレミコフチ製鉄所現地調査
午後:ベルニク製鉄所現地調査
 8. 8日(水) 予備日(自動車工場調査) //
 9. 9日(木) 日本大使館報告

移動(パリ16:20---ウィーン17:00) (OS814) ウィーン 泊
 10. 10日(金) 日本大使館報告、JICA事務所報告

移動(ウィーン16:10---18:10アムステルダム19:40---
(KL260) (JL414) 機内泊
 11. 11日(土) ---13:50 成田)

1. 要請背景

① 第一回JICA専門家派遣 (1992年 2月22日 - 3月 9日)

- 背景 : ク製鉄所は首都ソフィア最大の汚染源と認識されており、ブ政府の環境政策いかんで存亡の危機をむかえる状況にあり、早急に対策を講じる必要がある。
- 派遣目的 : ク製鉄所の環境保全・省エネに関する現状調査、問題点の抽出、対策立案
- 調査結果 : 現状の操業条件の元に、環境保全対策・省エネ対策の検討
[同時に、設備効率、生産能率上の問題も浮上(生産能力の半分以下の生産実績、多品種少量生産)]
- 提言 : 環境・省エネ対策将来計画の策定については、適切な生産規模、生産品種を策定のうえ、最適な生産プロセス選定と設備能力を設定することが前提条件。
更にその前提条件として、ブ政府の産業政策、中長期政策、鉄鋼産業政策を分析する必要あり。

② 第二回JICA専門家派遣 (1992年11月30日 - 12月24日)

- 派遣目的 : 第一回調査不足部分の追加調査
 - ・ 環境改善計画のための設備改造案・新設備案・同建設費用を含めた総合改善計画の作成。
 - ・ 上記計画立案のための、粗鋼生産量の検討
 - ・ ブ国側追加要請として生産プロセスの検討
- 調査結果 : 環境改善計画(案)の提示
 - ・ 電気炉中心の製鉄プロセスを採用した場合の試算、及び現状維持のうえでの環境対策費用の対比資料の作成。
(電気炉 70.0 M.\$ - 現状維持 135.2 M.\$)
(* 電気炉については既存2基に1基追加するプラン)

③ 調査結果に対するコメント

ク製鉄所 : ク製鉄所の将来的な生産プラントは電気炉がベターだがコスト次第
- 問題点として、
・ 電力の確保 (供給量不足)
・ スクラップの確保 (輸出品として 外貨獲得)
・ 高炉休止による労働者の削減 (3,500 人程度)
上記問題点は解決可能?

ブ産業省 : - 鉄鋼産業の将来計画・戦略を構築する。
(高炉の廃止、一部廃止、ク製鉄所の廃止等)

ブ大使館 : - 135M.\$ の設備投資はネガティブ
- 電気炉が有望と思われるが、日本側としては、選択肢提供のための調査にしたい。

2. 要請内容

ブルガリア製鉄所公害対策及び近代化 要請内容（要約）

(1) 案件名：Restructuring and modernization of steel industry in Bulgaria
(for the purpose of improving its effectiveness in the condition
of market economy)

(2) 調査対象地：

	粗鋼	従業員	タイプ
クレミコフチ（ソフィア）	230万t	1.6 万人	一貫高炉+電気炉
ストマナ（ベルニク）	?	?	?
カメット（ベルニク）	?	?	?
プロメット（ブルガス）	?	?	?
必要に応じその他の工業			

(3) 意義：－エネルギー大量消費、公害問題などを含む鉄鋼産業の危機的状況の打開
－高品質の鉄鋼を最小限のコストで生産するための可能性の研究

(4) 関連プロジェクト：

本件調査を受け、関連産業（原料、耐火煉瓦等）の調査が考えられる。
－Managan Joint Stock Company
－Company "Dinas"

(5) T O R：

1) 必要性：J I C Aの開発調査に基づき、ブ側で省エネ・公害対策を含む鉄鋼産業開発
計画推進のための方策を策定する。

－経済分析に基づくケーススタディーを含む開発調査。

－長期的社会・経済計画を考慮した上で、J I C A提言の中から適当なものを
選択する。

2) 目的：ブルガリア鉄鋼産業の将来計画を設定するために

－経済評価を含む、生産量の増加、製品構成計画の立案

－鉄鋼製品種別の輸出入可能性の調査

－国内調達原料（スクラップを含む）の最大利用可能性

－国内規制法に合わせるための環境汚染対策

－省エネ対策

3) スコープ：

ブ側提供の基礎資料を参考・検討のうえ、下記の事項につき調査を行う。

① 調査の背景

- ブルガリア経済概況
- ブルガリア鉄鋼産業の概況

② 鉄鋼製品の需要供給状況（輸送・配送を含む）

③ 原材料（鉄鉱石、石炭、スクラップ、石灰岩等）

④ 各製鉄所の現状

- 製鉄所概要
- 過去5年間における生産量、販売実績の調査
- 過去5年間における輸出入実績
- 従業員数
- 各設備の容量
- 付帯設備
- 生産基盤（電力、天然ガス、工業用水、原料供給ルート）
- 公害防止
- 市場調査（セールスネットワークを含む）
- 生産コスト
- 経済分析

①～④の調査結果を踏まえ、

ブルガリア鉄鋼産業再構築のためのプロポーザル（マスタープラン）
（代替案も含め）を作成する

- 生産計画（製品構成、生産量）
- 設備投資計画
- 設備投資計画・詳細
- 生産基盤
- 雇用人数
- 新規投入設備導入コスト試算
- 生産コスト試算
- 建設スケジュール
- 財務分析
- 経済評価

*ブ側提供資料

- 鉄鋼需要供給予測（生産量・品種）
- 各製鉄所の設備改善案
- 電力供給の現状と将来計画
- スクラップ供給政策と将来計画

3. 調査の概要

1. プ政府中長期産業政策の把握・確認

2. 同政策における鉄鋼産業の位置付けの把握・確認

3. 鉄鋼産業将来計画策定（鉄鋼需要予測・市場計画・製品構成計画・原料供給計画）
（生産計画・分業・環境対策・労働問題対策）

4. 製鉄所の近代化計画作成

1) 各製鉄所の製品構成・生産規模の検討

2) 各製鉄所の生産工程・プラントの検討

例) ①自動車、家電製品⇒圧延鋼板⇒コークス炉－高炉－転炉（一貫製鉄所）

②建設、土木 ⇒鋼材 ⇒電気炉（スクラップ）

－環境対策・省エネ対策の実施

I . INTRODUCTION

In response to the request of the Government of Republic of Bulgaria the Government of Japan decided to conduct the Study on Restructuring and Modernization of the Steel Industry in Republic of Bulgaria (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the the Government of republic of Bulgaria.

The present document sets forth the scope of work for the Study.

II . OBJECTIVE OF THE STUDY

The objective of the Study is to formulate a comprehensive master plan for restructuring and modernization of the steel industry.

III . SCOPE OF THE STUDY

In order to achieve the above objective, the Study shall be conducted in accordance with the following items :

1. Background of the Study
 - 1-1 Economic situation of Bulgaria
 - 1-2 Mid and long term policy on industrial development
 - 1-3 Relevant laws and regulations

2. Present situation of steel industry in Bulgaria
 - 2-1 Present situation and policies of steel and iron industries
 - 2-2 Present situation and trend of supply and demand of steel
(quantity and product)
 - 2-3 Product transportation and distribution

3. Present situation of supply of raw materials and energy
 - 3-1 Present situation of supply of raw materials
 - 3-2 Future prospect of supply of raw materials
 - 3-3 Present situation of supply of energy (electricity, coal, etc.)
 - 3-4 Future prospect of supply of energy (electricity, coal, etc.)

4. To study present situation of steelworks
 - 4-1 Outline of four (4) steelworks (Kremikovtzi, Stomana, Kamaet and Promet)
 - 4-1-1 Production and sales record for the past five years
 - 4-1-2 Export and import records of steel products for the past five years
 - 4-1-3 Organization, administration and manpower
 - 4-1-4 Production capacity
 - 4-1-5 Utilities (including power, natural gas, industrial water)
 - 4-1-6 Supply route for raw materials
 - 4-1-7 Pollution control measures and facilities
 - 4-1-8 Market for products including sales networks
 - 4-1-9 Production cost
 - 4-1-10 Financial situation
 - 4-2 Literay study of other steelworks
5. To formulate a master plan for the restructuring and modernization of steel industry
 - 5-1 Future strategy
 - 5-1-1 Future demand and supply of steel
 - 5-1-2 Production plan (products and quantity)
 - 5-1-3 Raw material (iron ore, scrap)
 - 5-1-4 Energy source
 - 5-1-5 Pollution control maesures
 - 5-1-6 Overall restructuring plan of steelworks
 - 5-2 Modernization of four (4) steelworks (Kremikovzi, Stomana, Kamat and Promet)
 - 5-2-1 Production plan including products mix, quantity, and material balance sheet
 - 5-2-2 Cost estimation for modernization
 - 5-2-3 Organization, administration and manpower
 - 5-3 Conclusion and recomendation

IV. WORK SCHEDULE

The Study will be carried out in accordance with the attached tentative work schedule.

V. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Republic of Bulgaria

- Ten (10) copies of the Inception Report
- Ten (10) copies of the Progress Report
- Twenty (20) copies of the Interim Report
- Thirty (30) copies of the Draft Final Report
- Thirty (30) copies of the Final Report

VI. UNDERTAKING BY THE GOVERNMENT OF THE REPUBLIC OF BULGARIA

1. The Government of the Republic of Bulgaria shall accord privileges, immunities and other benefits to the Japanese study team (hereinafter referred to as "the Team") in accordance with the Agreement on Technical Cooperation between the Government of Japan and the Government of the Republic of Bulgaria.
2. To facilitate smooth conduct of the Study, the Government of the Republic of Bulgaria shall take necessary measures :
 - 2-1 To secure safety of the Team
 - 2-2 To permit the members of the Team to enter, leave and sojourn in Thailand for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees
 - 2-3 To exempt the members of the Team from taxes, duties and other charges on equipment, machinery and other materials brought into, and out of, Bulgaria for the conduct of the Study
 - 2-4 To exempt the members of the Team from income tax and charges of any kind imposed on, or in connection with, any emoluments or allowances paid to them for their services for the implementation of the Study
 - 2-5 To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Bulgaria from Japan for the implementation of the Study
 - 2-6 To secure permission for entry into private properties or restricted areas for the conduct of the Study
 - 2-7 To secure permission for the Team to take all data and documents including photographs related to the Study out of Bulgaria
 - 2-8 To provide medical service as needed. (Its expenses can be charged to the members of the Team.)

3. The Government of the Republic of Bulgaria shall bear claims, if any arises against the members of the Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the Team members.

4. The Department of XXXX, Ministry of Industry (hereinafter referred to as "XXX"), shall act as a counterpart agency to the Team as well as the coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

5. XXX shall, at its own expenses, provide the Team with the following in cooperation with other organizations concerned :

- 5-1 Available data and information related to the Study
- 5-2 Counterpart personnel
- 5-3 Suitable office space with necessary equipment
- 5-4 Credentials or identification cards
- 5-5 Vehicles

6. XXX shall organize the Steering Committee (hereinafter referred to as "the Committee") for the purpose of smooth and effective implementation of the Study.

The Chairman of the Committee shall be the Director General of XXX and its secretariat shall be set up within XXX.

VII. UNDERTAKING BY JICA

For the implementation of the Study, JICA shall take the following measures :

- 1. To dispatch, at its own expenses, a series of study teams to the Republic of Bulgaria
- 2. To pursue technology transfer to the Bulgarian counterpart personnel

VIII. OTHERS

JICA and XXX shall consult with each other in respect of any matters that arise from, or in connection with, the Study.

