

Data sheet: E4.1

## Flat bar & square bar

### Hot rolled, weldable structural steel sections

---

#### General description

ArcelorMittal Steel South Africa, Newcastle Steel produces an extensive range of structural steel flat bars and square bars. Non-standard sizes and steel specifications not covered by this data sheet may be considered on an enquiry basis.

Steel for structural sections is normally produced to SANS 50025 grade S355 JR and EN 10025 grade S275JR. Other grades, including the other grades in SANS 50025/EN 10025 and BS 4360 are available on enquiry.

For improved atmospheric corrosion resistance, COR-TEN<sup>®</sup> A should be used.

See data sheet: COR-TEN<sup>®</sup> (file reference E6.1)

For applications where mechanical properties of the steel are not important, flat bar and square bar can be ordered in the "mild steel" grade (commercial quality).

The "South African Steel Construction Handbook" published by the South African Institute of Steel Construction, should be consulted for section properties.

#### Quality assurance

Quality assurance systems based on the requirements of SANS ISO 9001: 2000 are in operation.

#### Protective coatings

When choosing a rust prevention method for a steel component or structure many technical factors including the environment, stress during transport, storage, fitting or erection must be considered. Adequate preparation of the substrate is of vital importance to the ultimate success of the coating, as is the method of application. Paint, hot-dip galvanizing or duplex coatings (zinc plus paint) can be specified for corrosion protection, depending on the aggressiveness of the environment. Choice of the protective mechanism is considered to be the responsibility of the specifier, fabricator or end user.

#### Surface quality

Surface defects up to a maximum depth of 3% of the nominal thickness shall not be considered as a reason for rejection.

Larger surface defects may be removed, providing the nominal thickness is not reduced by more than 7%.

For further information, contact:

ArcelorMittal Steel South Africa Limited, Newcastle Steel, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal Steel South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. **Effective date: January 2006**

## Steel specifications (mechanical properties)

Ladle analysis and mechanical properties certificates are supplied with each consignment.

Specification with thickness restriction	Code	Tensile Strength (MPa)	Yield Strength (MPa)	Elongation	Impact Test
BS 4360 Gr 50B (Thickness: ≤ 30 mm)	475 002	490 - 640	355 min ≤ 16 mm 345 min > 16 mm	20% min on $5,65\sqrt{S_o}^1$	27J at 20° C
BS 4360 Gr 50C (Thickness: ≤ 50 mm)	859 008	490 - 630	355 min ≤ 16 mm 345 min > 16 mm	22% min on $L_o = 5D_o$	27J at 0° C
⊗ BS 4360 Gr 55C (Thickness: ≤ 25 mm)	155 001	550 - 700	450 min ≤ 16 mm 430 min > 16 mm	19% min on $5,65\sqrt{S_o}^1$	27J at 0° C
DIN 17100 RST 37/2 (Thickness: ≤ 40 mm)	171 001	340 – 470 >2,5mm 360 - 510 ≤2,5mm	235 min ≤ 16 mm 225 min > 16 mm	26% min on $L_o = 5D_o$	-
DIN 17100 RST 44/2 (Thickness: ≤ 60 mm)	554 002	410 - 540	275 min ≤ 16 mm 265min>16≤40mm 255min>40≤60mm	22% on 3- 40mm 21% on 41- 63mm	27J at 20° C
DIN 17100 RRST 52/3 (Thickness: ≤ 30 mm)	474 008	490 - 630	355 min ≤ 16 mm 345 min > 16 mm	22% min on $L_o = 5D_o$	27J at 20° C
ASTM A36 - 93A	371 002	402 - 550	250 min	20% min	-
⊗ COR-TEN® A (Thickness: ≤12,7mm)	124 001	480 min ≤12,7mm 460 min > 12,7 mm	345 min ≤12,7mm 315 min >12,7mm	22%min≤12,7 mm 22%min>12,7 mm	-
SANS 50025/EN 10025 S275JR	064 002	410–560 (3-100mm) 430–580 ≤2,5mm	275 min ≤ 16 mm 265min>16≤40mm 255min>40≤63mm 245min>63≤100mm	22% on 3- 40mm 21% on 41- 63mm 20% on 64- 100mm	27J at 20° C
SANS 50025/EN 10025 S235JR (thickness: ≤ 25 mm)	016 001	340 - 470	235 min ≤ 16 mm 225 min > 16 mm	26% min on $L_o = 5D_o$	27J at 20° C
SANS 50025/EN 10025 S355JR (Thickness: ≤ 30 mm)	078 678	490 - 630	355 min ≤ 16 mm 345 min > 16 mm	22% min on $L_o = 5D_o$	27J at 20° C

1  $S_o$  = original cross-sectional area.

⊗ Non-standard: available on enquiry only.

### Weldability

The above-mentioned structural steel grades may be welded using any of the standard metal arc and resistance welding processes, usually without any special precautions. However, when welding heavy sections, BS 5135:1984 "Metal-arc welding of carbon and carbon manganese steels" should be consulted to determine preheat requirements at low heat inputs.

### Steel specifications and grades

Note: The tables of steel grades are not intended to be lists of equivalent grades. They are merely lists of generically similar steel grades available in each geographic region.

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

Americas	European Community	Pacific Rim
<b>3.1 structural steel</b>		
3.1.1 Standard grades Lower strength (for workability and weldability)		
	SANS 50025/EN 10025 S235JR	
	DIN 17100 RST 37-2	
Normal strength (for general use)		
ASTM A 36 - 93A	DIN 17100 RST 44-2	JIS G 3101 SS400
	SANS 50025/EN 10025 G S275 JR	
Higher strength (micro-alloyed steel)		
ASTM A 572 Gr 50	SANS 50025/EN 10025 S355JR/JO	
	DIN 17100 RST 52-3	
	BS 4360 Gr 50B/C	
3.1.2 Weathering steel - for improved atmospheric corrosion resistance		
Available on enquiry		

### Steel specifications (chemical composition)

The analyses may be modified to suit special customer requirements depending on the size of the order.

### Certification

Test and analysis certificates are supplied for all steel ordered to a specification. The mechanical and chemical laboratories of ArcelorMittal Steel S A, Newcastle Steel are SANAS accredited facilities.

Analysis (ladle analysis) certificates are supplied for steel specifications listed in table below.

Specification	Code	C	Mn	P	S	Si	Al
SAE 1006	285 135	0,08	0,40/0,60	0,025	0,025	0,12/0,35	-
SAE 1008	098 180	0,10	0,30/0,50	0,03	0,03	-	-
SAE 1010	758 140	0,08/0,13	0,40/0,60	0,03x	0,03x	0,15/0,25	-
SAE 1015	112 101	0,13/0,18	0,40/0,60	0,03	0,03	0,15/0,35	-
SAE 1020	916 160	0,18/0,23	0,30/0,60	0,03x	0,03x	0,15/0,35	-
SAE 1045	521 500	0,43/0,50	0,60/0,90	0,03x	0,03x	0,35x	-
⊗ SAE 1058	466 370	0,55/0,60	0,60/0,80	0,04x	0,04x	0,15/0,35	-
Commercial Quality	250 555	0,30	-	-	-	-	-
⊗ BS 970/1983: Part1 070M55	542 370	0,55/0,60	0,60/0,80	0,04x	0,04x	0,15/0,35	-
BS 970: 1983: Part1 080M40	581 683	0,37/0,44	0,60/0,90	0,04x	0,05x	0,15/0,35	-
BS 4360: 1986 Gr 50B	475 002	0,20	1,50	0,04	0,045	0,4	-
BS 4360: 1986 Gr 50C	859 008	0,18	1,50	0,035	0,035	0,50	0,02/0,06
SANS 50025/EN 10025: 1993 S275JR	064 002	0,21	1,50	0,03	0,045	-	-
SANS 50025/EN 10025: 1993 S235JR	016 001	0,17	1,40	0,03	0,045	-	-
SANS 50025/EN 10025: 1993 S355JR	078 678	0,20	1,50	0,04	0,045	0,4	-
DIN 17100: 1980 RST 37/2	171 001	0,17	1,40	0,05x	0,05x	-	-
DIN 17100: 1980 RST 44/2	554 002	0,21	1,50	0,03	0,045	-	-
DIN 17100/1980 RST 52/3	474 008	0,18	1,50	0,035	0,035	0,50	0,02/0,06
ASTM A36-93A	371 002	0,22	1,50	0,03x	0,04x	0,35	-

*Steel grades produced with modified chemical analysis as listed.*

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

⊗ *Non-standard - available on enquiry only*

**Flat bar with ≤ 150 mm width**

Nominal width	Width Variation	Nominal thickness	Thickness variation	Difference between diagonals
≤ 35 mm	± 0,75 mm	≤ 20 mm	± 0,50 mm	3% max
>35 to 75 mm	± 1,00 mm	>20 to 40 mm	± 1,00 mm	4% max
>75 to 100 mm	± 1,50 mm	<20 20 – 40 mm 40 – 65 mm	± 0,50 mm ± 1,00 mm ± 1,5 mm	3% max 4% max 4% max
>100 to 120 mm	± 2,0 mm	<20 20 – 40 mm 40 – 65 mm	± 0,50 mm ± 1,00 mm ± 1,5 mm	3% max 4% max 4% max
>120 to 150 mm	± 2,50 mm	<20 20 – 40 mm 40 – 65 mm	± 0,50 mm ± 1,00 mm ± 1,5 mm	3% max 4% max 4% max

**Camber / Straightness:**

Maximum deviation shall not exceed 2,5 mm/m with an area > 1000 mm<sup>2</sup> and 4,0 mm/m for ≤ 1000 mm<sup>2</sup> area.

**Flat bar with > 150 mm width**

Width		Thickness		
Nominal width	Width variation	Nominal thickness	Thickness variation	Difference between diagonals
> 150 mm	± 2% of the nominal width	< 10 mm	-0,40 +0,60 mm	3% max
		10 to 19 mm	-0,40 +0,80 mm	3% max
		20 to 24 mm	-0,50 +0,90 mm	4% max
		25 to 29 mm	-0,60 +1,00 mm	4% max
		30 to 39 mm	-0,70 +1,10 mm	4% max
		40 to 49 mm	-0,90 +1,10 mm	4% max

**Camber / Straightness:**

Maximum deviation shall not exceed 2,5 mm/m

**Flatness:**

Maximum deviation in thickness over width shall not exceed 0,50 mm.

**Square bar**

Nominal bar size (mm)	Width variation (mm)	Corner radius variation (mm)	Twist (degree/m)	Twist over total length (degree/length)
10 to 12,7	± 0,40	1 max	4 max	24 max
14	± 0,40	1,5 max	4 max	24 max
16	± 0,50	1,5 max	3 max	18 max
20	± 0,50	1,5 max	3 max	18 max

**Difference between diagonals:**

The difference between the diagonals of a given cross-section shall not exceed 4%. The corner radius shall be taken into account in the measurement.

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

## Standard sizes and nominal mass

### Flat bar

Thick ness (mm)	Mass per meter length for available widths indicated																		
	Width (mm)																		
	20	25	30	40	45	47,6	50	60	65	70	80	90	100	110	130	150	180	200	250
4,5	0,707	0,883	1,060	1,413	1,590	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	0,785	0,981	1,178	1,570	1,766	1,869	1,963	-	-	-	-	-	-	-	-	-	-	-	-
6	0,942	1,178	1,413	1,884		-	2,355	2,826	3,062	3,297	3,768	-	4,710		-	-	-	-	-
8	1,256	-	-	2,512		-	3,140	3,768	4,082	4,396	5,024	5,652	6,280		8,164	9,420	-	-	-
10	1,570	-	-	3,140		-	3,925	4,710	5,103	5,495	6,280	7,065	7,850	8,635	10,205	11,775	14,130	15,700	-
12	-	-	-	3,768		-	4,710	-	6,123	-	7,536	8,478	9,420		12,246	14,130	-	18,840	-
16	-	-	-	5,024		-	-	-	-	-	10,048	-	12,560		16,328	18,840	-	25,120	31,400
20	-	-	-	-		-	-	-	-	-	12,560	-	15,700		20,410	23,550	-	31,400	39,250
25	-	-	-	-		-	-	-	-	-	-	-	19,625		25,513	29,438	-	-	49,063
30	-	-	-	-		-	-	-	-	-	-	-	-		-	-	-	-	58,875
46,5	-	-	-	-		-	-	-	-	-	-	-	36,503		-	-	-	-	-

#### For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

**Non-standard sizes and nominal mass**

Note: available on enquiry only

**Flat bar**

Thickness (mm)	Mass per meter length for available widths indicated																
	Width (mm)																
	16	17	22	25	30	35	40	45	47,5	50	60	65	70	75	80	90	95
4,5	-	-	-	-	-	-	-	-	-	1,766	-	-	-	-	-	-	-
5	-	-	-	-	-	1,374	-	-	1,864	-	2,355	-	-	2,944	-	-	-
6	0,754	-	-	-	-	1,649	-	2,120	-	-	-	-	-	3,533	-	-	-
8	-	1,068	1,382	1,570	1,884	-	-	-	-	-	-	-	-	4,710	-	-	-
9	-	-	-	-	-	-	2,826	-	-	-	-	-	-	-	-	-	-
10	-	-	-	1,963	2,355	2,748	-	3,533	-	-	-	-	-	5,888	-	-	-
12	-	-	-	2,355	2,826	3,297	-	4,239	-	-	5,652	-	6,594	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	6,594	-	-	-	-	-	-
15	-	-	-	-	3,533	4,121	4,710	5,299	-	5,888	-	-	8,243	-	-	-	-
16	-	-	-	-	3,768	-	-	-	-	6,280	7,536	8,164	8,792	9,420	-	11,304	11,932
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,424
20	-	-	-	-	-	-	6,280	7,065	-	7,850	9,420	10,205	10,990	-	-	14,130	-
22	-	-	-	-	-	-	-	-	-	-	-	-	12,089	-	-	-	-
25	-	-	-	-	-	-	7,850	8,831	-	9,813	11,775	12,756	13,738	14,719	15,700	17,663	-
30	-	-	-	-	-	-	-	-	-	11,775	14,130	15,308	16,485	-	18,840	21,195	-
35	-	-	-	-	-	-	-	-	-	-	-	-	19,233	-	21,980	-	-
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25,120	-	-

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

**Non-standard sizes and nominal mass - flat bar (continued)**

Thickness (mm)	Mass per meter length for available widths indicated													
	WIDTH (mm)													
	100	105	110	120	122	125	130	140	150	160	180	200	220	250
6	-	-	5,181	-	-	-	-	-	-	-	-	-	-	-
8	-	-	6,908	7,536	-	7,850	-	-	-	10,048	-	12,560	-	-
9	7,065	-	-	-	-	-	-	-	10,598	-	-	14,130	-	-
10	-	-	-	9,420	-	-	-	11,000	-	12,560	-	-	17,270	-
12	-	-	10,362	11,304	-	11,775	-	-	-	-	16,956	-	-	-
14	11,000	-	-	-	-	-	-	-	16,485	-	-	-	-	-
15	11,775	12,364	-	-	-	-	15,308	-	17,663	-	-	-	25,905	29,438
16	-	-	13,816	-	-	15,700	-	-	-	-	22,608	-	-	-
18	-	-	-	-	-	-	18,369	-	21,195	-	-	28,260	-	-
19	-	-	-	-	-	-	-	-	22,373	-	-	29,830	-	-
20	-	-	17,270	-	-	-	-	-	-	-	28,260	-	34,540	-
25	-	-	21,588	23,550	-	-	-	-	-	-	35,325	39,250	43,175	-
30	23,550	-	25,905	28,260	-	-	30,615	32,970	35,325	37,680	42,390	47,100	51,810	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	28,260	-	-	-	-	-	-	-	-	-	-	-	-	-
40	31,400	-	34,540	-	-	-	40,820	43,960	47,100	-	56,520	62,800	69,080	78,500
41	32,185	-	-	-	39,265	-	-	-	-	-	-	-	-	-
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46,5	-	-	-	-	-	45,628	47,453	-	-	-	-	-	-	-
50	39,250	-	43,175	47,100	-	-	51,025	-	58,875	62,800	70,650	78,500	-	98,125
51,5	-	-	-	-	-	-	-	-	60,642	-	-	-	-	-
60	-	-	-	-	-	-	-	-	70,650	-	-	-	-	-
61,5	-	-	-	-	-	-	-	-	72,416	-	-	-	-	-
65	-	-	-	-	-	-	-	-	-	81,640	-	-	-	-
80	-	-	-	-	-	-	-	-	-	100,480	-	-	-	-

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005

## Standard sizes and nominal mass

### Square bar

Dimensions (mm)	Mass (kg/m)
10 x 10	0,785
12 x 12	1,130

## Non-standard sizes and nominal mass

Note: available on enquiry only

### Square bar

Dimensions (mm)	Mass (kg/m)
12,7 x 12,7	1,266
14 x 14	1,539
16 x 16	2,010
20 x 20	3,140

**Cutting tolerance:** -0 +50 mm

- Light profiles - Lengths from 6m up to 18 meters in increments of 100 mm can be ordered.
- Medium profiles – lengths from 6m up to 18 meters in increments of 100mm can be ordered.

### Bundling

Bundles are securely tied, normally containing a standard number of units per size and length. Bundles are secured with wire ties or steel straps depending on profile, two adjacent straps 300mm from each end and intermediate straps at approximately 1,5 meter intervals.

### Bundle mass

Bundle masses from 2 ton to 5 ton to be specified by customer

Mill	Minimum	Maximum	Deviation from gross mass
Medium Mill	3 ton	5 ton	-10% on ordered bundle mass
Bar Mill	1,5 ton	2,0 ton	-10% on ordered bundle mass

### Tolerance specifications

Squares are rolled to DIN 1014 Part 1.

Flats up to and including 150 mm wide are rolled to DIN 1017 Part 1.

Flats over 150 mm wide are rolled to DIN 59200.

### Basis for invoicing

Invoicing based on theoretical mass.

### Labels and marking

#### Labels

One polyester labels on a metal backing will be tied to each end of the coil/bundle by means of wire ties or laced to bundle straps at Works option.

*Coloured metal backings are available in:* white, blue, green, purple, grey, brown, orange, pink, black, beige, light green, light blue and red.

Where no metal backing colour is specified on orders, white labels will normally be used at the works' discretion.

Labels will bear information to a maximum of four lines with a maximum of forty-five characters per line.

*The following standard information will normally be stated:*

- ArcelorMittal Steel South Africa's order confirmation number
- Port of destination (export)
- Cast number.
- Steel specification, grade and size
- Bundle mass
- Bundle number (also printed on bar code)

For further information, contact:

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: enquiries.newcastle@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: October 2005



## ***Colour marking***

### *Paint marking*

Water based paint marking is available in single colours or up to three stripes in two colours or up to three stripes in three colour combinations for customers' identification purposes.

*Colours available:* red, green, blue, pink and white

Coloured lines/bands are approximately 50mm or 100mm wide and are applied through approximately 180 degrees. Colour splashes are approximately 100mm in diameter.

### **For further information, contact:**

ArcelorMittal South Africa Limited, Newcastle Works, PO Box 2, Newcastle 2940. Tel (034) 314-8629, Fax (034) 314-8211  
e-mail address: [enquiries.newcastle@arcelormittal.com](mailto:enquiries.newcastle@arcelormittal.com)

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. **Effective date: October 2005**