

1 SCOPE

Rails acc. DIN 536:1991		Special crane rails		Metric weight (kg/m)	
				Girder sections	
A 45	22.1	MRS 73	73.63	GCRD 42	41.91
A 55	31.8	MRS 86	85.50	GCRD 45	45.85
A 65	43.1	MRS 87A	86.80	GCR 108	107.9
A 75	56.2	MRS 125	125	GCR 183	183.1
A 100	74.3	MRS 192	192		
A 120	100.0	MRS 221	221.4		
A 150	150.3	CR 73	73.30		
		CR 100	100.2		
		CRS 140	139.8		
		RG 28	28.3		
		S 41A	41.24		
		AS 86	85.88		

2 MANUFACTURING

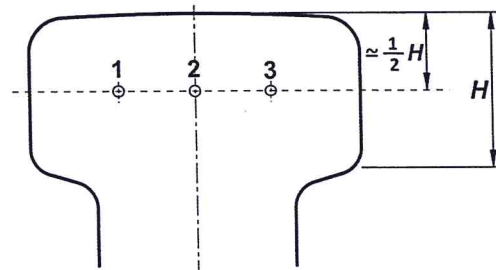
Metallurgical process is left at producer's decision, i.e., electric arc furnace (EAF) or basic oxygen furnace (BOF), with or without degassing, fully killed...according to the steel grade.

3 STEEL GRADES

3.1 Mechanical properties

Grade	TS min (MPa)	YS min (MPa)	Elongation 5d min (%)	Hardness min HB (for info. only) *
standard grades:				
70 kg	690	355	12	200
90 kg	880	440	8	260
110Cr-V	1080	640	7	320
on request:				
52-3-V	510	355	20	150
70 kg-V	690	450	15	200
90 kg-V	880	540	10	260

*) - the hardness is measured either 1 mm underneath the head surface (i.e. after removing 1 mm of material from the surface) or on the cross-section acc. to the drawing below:



3.2 Chemical composition

Grade	%C	%Mn	%Si max	%P max	%S max	%V	%Cr
standard grades:							
70 kg	0.40-0.60	0.80-1.20	0.35	0.045	0.045	—	—
90 kg	0.60-0.80	0.80-1.30	0.50	0.045	0.045	—	—
110Cr-V	0.65-0.85	0.90-1.30	0.50	0.040	0.040	0.05-0.15	0.20-0.80
on request:							
52-3-V	0.12-0.20	1.00-1.50	0.35	0.040	0.040	0.06-0.20	—
70 kg-V	0.30-0.50	0.70-1.25	0.35	0.045	0.045	0.06-0.20	—
90 kg-V	0.45-0.65	0.70-1.25	0.50	0.045	0.045	0.06-0.20	—

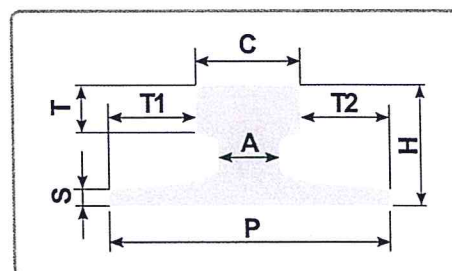
4 TOLERANCES

4.1 Tolerances on section

4.1.1 DIN rails (acc. to DIN 536:1991)

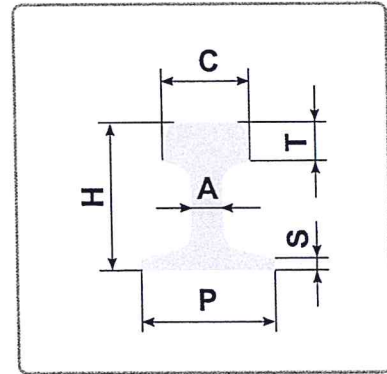
tolerances in (mm)

	H	P	C	t1=(T1-T2)	t2	A	S	T
A45	+1.0 -1.0	+1.5 -3.0	+0.6 -0.6	2.0	+0.6 -0.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0
A55	+1.0 -1.0	+1.5 -3.0	+0.6 -0.6	2.0	+0.6 -0.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0
A65	+1.0 -1.0	+1.5 -4.0	+0.8 -0.8	2.0	+0.6 -0.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0
A75	+1.0 -1.0	+2.0 -5.0	+0.8 -0.8	2.0	+0.8 -0.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0
A100	+1.5 -1.5	+2.0 -5.0	+1.0 -1.0	3.0	+0.8 -0.0	+1.0 -2.0	+1.0 -1.0	+1.0 -1.0
A120	+1.5 -1.5	+2.0 -5.0	+1.0 -1.0	3.0	+1.0 -0.0	+1.0 -2.0	+1.0 -1.0	+1.0 -1.0
A150	+1.5 -1.5	+2.0 -5.0	+1.0 -1.0	3.0	+1.0 -0.0	+1.0 -2.0	+1.0 -1.0	+1.0 -1.0



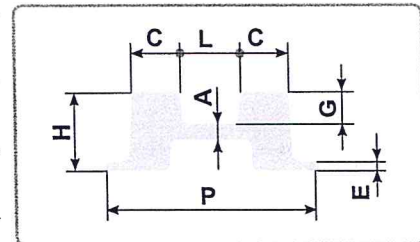
4.1.2 Special sections

	tolerances in (mm)					
	H	P	C	A	S	T
MRS 73	+0.8 -0.4	+1.6 -1.6	+1.0 -1.0	+1.0 -1.0		
MRS 86	+0.8 -0.4	+2.4 -2.4	+1.0 -1.0	+1.0 -1.0		
MRS 87A	+0.8 -0.8	+2.4 -2.4	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0
MRS 125	+0.8 -0.8	+2.4 -2.4	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0
MRS 192	+1.5 -1.5	+3.5 -3.5	+1.5 -1.0			
MRS 221	+1.5 -3.5	+2.0 -5.0	+2.0 -5.0	+2.0 -5.0		
CR 73	+1.0 -0.5	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0
CR 100	+1.0 -1.0	+2.0 -2.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0	+1.0 -1.0
CRS 140	+1.5 -1.5	+2.0 -5.0	+1.0 -1.0	+1.0 -2.0	+1.0 -1.0	+1.0 -1.0
RG 28	+2.0 -2.0	+1.5 -3.0	+1.0 -1.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0
S 41A	+0.5 -0.5	+1.0 -1.0	+0.5 -0.5	+1.0 -0.5	+0.5 -0.5	
AS 86	+1.5 -1.5	+2.4 -2.4	+1.0 -1.0	+1.0 -1.5	+1.0 -1.0	+1.0 -1.0



4.1.3 Girder sections

	tolerances in (mm)						
	H	P	A	C	G	L	E
GCRD 42	+1.5 -1.5	+3.0 -3.0	+1.0 -1.0	+1.0 -1.0	+1.5 -1.5	+2.0 -2.0	+1.0 -1.0
GCRD 45	+1.5 -1.5	+3.0 -3.0	+1.0 -1.0	+1.0 -1.0	+1.5 -1.5	+2.0 -2.0	+1.0 -1.0
GCR 108	+1.5 -1.5	+3.0 -7.0	+1.0 -1.0	+1.0 -1.0	+1.5 -1.5	+2.0 -2.0	+1.0 -1.0
GCR 183	+1.5 -1.5	+2.0 -4.0		+0.5 -1.0	+1.5 -1.5	+2.0 -1.0	+1.0 -1.0



4.2 Tolerances on metric weight

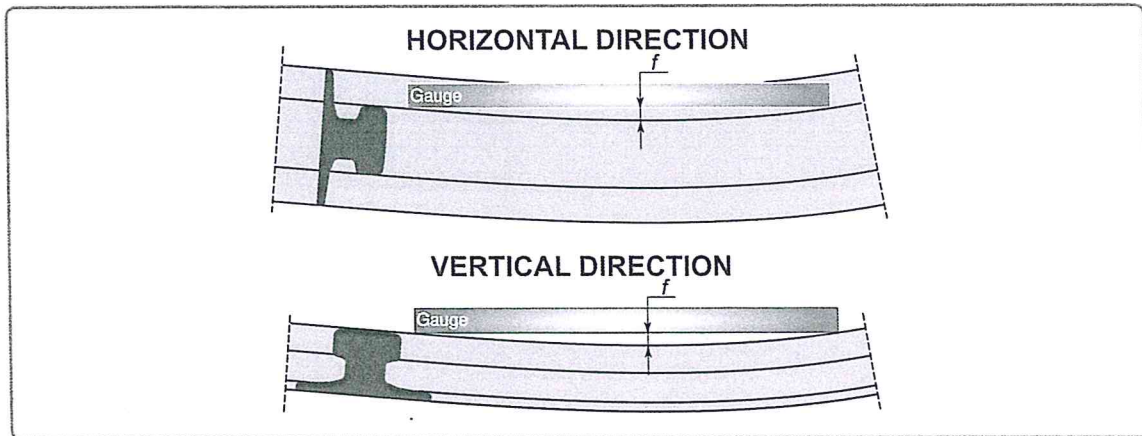
Compared to the theoretical weight:

- ±6% on each rail of the order,
- ±4% on the total order.

4.3 Tolerances on straightness

4.3.1 Standard straightening

The deviation measured all along the bar length with 1.0 m gauge shall not exceed 1.5 mm/m, in both vertical and horizontal planes and for the head and the base of the rail.



4.3.2 Double straightening

Double straightening is possible on request and after agreement by the mill before ordering. The deviation measured all along the bar length with 1.0 m gauge shall not exceed 0.5 mm/m in both vertical and horizontal planes and for the head and the base of the rail.

The double straightening is not possible on A 150, MRS 192, MRS 221 and all GCR sections.

4.3.3 Special straightening

Special straightening is possible, only on request and after agreement by the mill before ordering. The deviation measured on the whole length shall not exceed 0.1% of the total length in both vertical and horizontal planes.

4.4 Tolerances on twist

The maximal twist along the length shall be 0.4 mm/m, with a maximum of 2 mm on the whole length of the rail.

4.5 Tolerances on length

4.5.1 Standard tolerance

For straight or bias cut:

- $-0/+100$ mm or ± 50 mm

4.5.2 On request at the time of order:

On request at the time of order:

- $-0/+30$ mm or ± 15 mm,
- $-0/+6$ mm or ± 3 mm (for container transport).

For bias cut: ± 5 mm

4.6 Tolerances on cut

4.6.1 Straight cut

- Vertical plane: $\pm 2\%$ of the height of the rail with a maximum deviation of ± 2.5 mm,
- Horizontal plane: $\pm 1\%$ of the base width for small sections and $\pm 2\%$ for MRS 125 / MRS 192 / MRS 221 and A 150.

4.6.2 Bias cut

- Vertical plane: $\pm 2\%$ of the height of the rail with a maximum deviation of ± 3 mm.
- Horizontal plane: $\pm 1^\circ$ on the angle for small sections and $\pm 2^\circ$ for MRS 125 (bias cut on MRS 192 / MRS 221 and A 150 is not possible).
- Other tolerances are possible but only on request and after agreement by the mill or AMCRPS before ordering.
- Bias cut is not possible on all GCR sections.

4.7 Surface aspect

- On the head of the rail (rolling surface)* the depth of a defect can not exceed 0.5 mm and on the other parts of the rail the defect can not exceed 0.7 mm. Deeper defects shall be repaired.
- Rails can be repaired by grinding or any other repair technique, disregarding the number and the size of repairs but respecting in every case the tolerances on the section.
- A continuous defect all along the rail length is considered as a single defect. A repetitive defect at a certain interval all along the length is considered as a single defect (interval shall not be smaller than 2 m).
- Rails are stocked outside. The Low C-1 corrosion level acc. to American Rust Standard Guide is applicable up to 2 months from the rolling date. Later on the corrosion level can be higher (Low C-3 or more). A surface covered by a generalized atmospheric corrosion is not detrimental to the use of the rails.

*) – the rolling surface ($k - 2r_1$) is defined as the head width k minus two times the radius r_1 (please refer to the drawing of DIN 536 Fig. 1).

5 OTHER POINTS

5.1 Ultrasonic testing

All crane rails are tested in an automatic ultrasonic device except A 45, A 55, RG 28 and all GCRs. These profiles can be tested manually on request and after agreement by the mill before ordering.

5.2 Welding

All the steel grades of this specification can be welded using adapted techniques for high carbon steel.

5.3 Marking

- The basic standard marking is:
 - a QR code label stick on the cross section of each rail at one end – for Rodange
 - a cold stamping of the heat number at one end of each bar – for Królewska
- Special marking different from the basic standard one shall be requested at the time of order (subjected to mill's agreement)
- One standard label is used per bundle
- Additional color codes can be used acc. to the customer's requirement
- Manufacturer's identification marks are: 'AMRS' for ArcelorMittal Belval & Differdange (site of Rodange) and 'HK' for ArcelorMittal Poland SA – Unit Huta Królewska
- An additional hot marking can also be put on some sections (on request at the time of order and after agreement of the mill)
- Rails can also be additionally identified by codes written with permanent marker and/or by stamping codes or other marks at the base of the foot

5.4 Bundling

The types of bundling indicated in the table below are only for information. Without any other specific requirement this standard bundling will be applied.

At the time of order, a different bundling can be requested with different number of bars per bundle or any other kind of specific requirement. This is always subjected to the prior agreement of the mill.

	Bundle of	Total weight (t) for 12 m length
A45 (PR 1B)	9 rails	2.387
A55 (PR 2B)	7 rails	2.671
A65 (PR 3B)	5 rails	2.586
A75 (PR 4B)	5 rails	3.372
A100 (PR 5B)	3 rails	2.675
A100 (PR 5B)	5 rails	4.458
A120 (PR 6B)	3 rails	3.600
A150 (PR 7B)	loose rails	1.804
MRS 73	3 rails	2.651
MRS 73	5 rails	4.418
MRS 86	3 rails	3.078
MRS 87A	3 rails	3.125
MRS 125	3 rails	4.500
MRS 192	loose rails	2.304
MRS 221	loose rails	2.657
CR 73	3 rails	2.639
CR 100	3 rails	3.607
CRS 140	loose rails	1.678
RG 28	7 rails	2.377
S 41A	5 rails	2.474
AS 86	3 rails	3.092

5.5 Mill certificate

All the rails of this technical specification are delivered with a 3.1 certificate acc. to EN 10204:2004.

On request and at the time of order, a 3.2 certificate can be requested with inspection at mill by an independent third party or the customer's representative.

Again on request and at the time of order, other tests can be requested and added onto the certificate like hardness, sulphur print or others. They are subjected to the prior agreement of the mill.

5.6 Warranty

The basic warranty is of 5 years ex works. Conditions of application of this warranty is described in a separate document entitled 'basic warranty', dated on 1st September 2016 – for Rodange and on 1st January 2017 – for Królewska.