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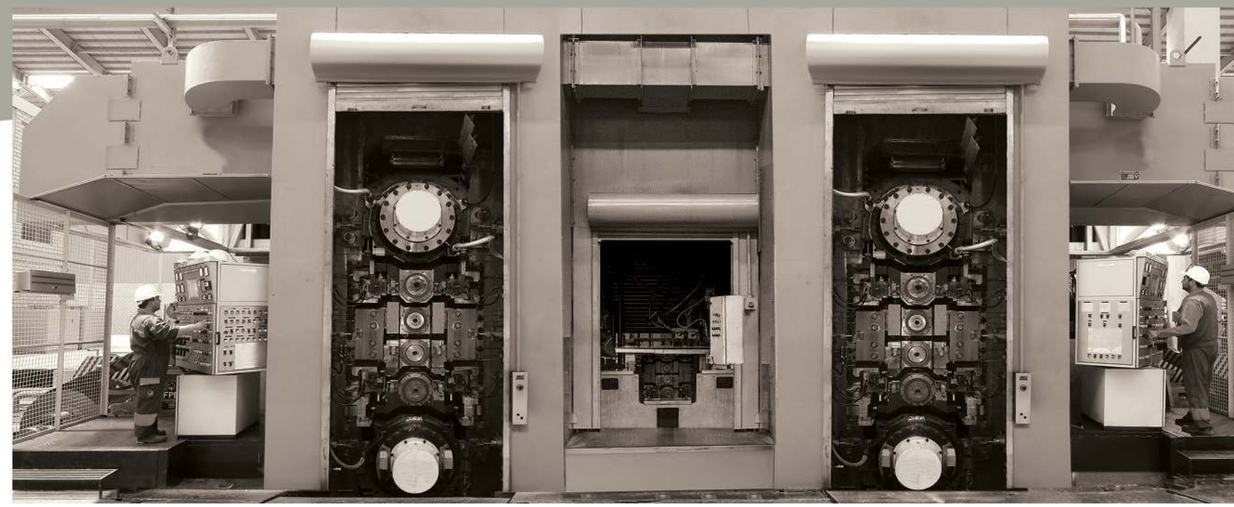
Cold Rolling Mill

In metalworking, rolling is a metal forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness and to make the thickness uniform. The concept is similar to the rolling of dough. Rolling is classified according to the temperature of the metal rolled. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. In terms of usage, hot rolling processes more tonnage than any other manufacturing process, and cold rolling processes the most tonnage out of all cold working processes. Roll stands holding pairs of rolls are grouped together into rolling mills that can quickly process metal, typically steel, into products such as structural steel (I-beams, angle stock, channel stock, and so on), bar stock, and rails. Most steel mills have rolling mill divisions that convert the semi-finished casting products into finished products.



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Pickling Line

Cold Rolling Mill

This plant has an annual production capacity of 500.000 tons, and produces its products as per the following international standards for the following uses.

A) Standards;

Hot rolled products are produced as per the standards listed below,
ASTM, DIN,JIS,AFNOR,UNI,B S & En (Euro Norm), Full details are available in the tables below.

B) Uses

- General and structural
- Automotive industry
- Home appliances
- Pipes
- Metal forming and deep drawing, etc…

Dimensional and Weight specifications

Product	Inside Diameter (mm)	Thickness (mm)	Width (mm)	Weight (Ton)
Pickled coils	760	1.25 to 5	600 to 1650	5 to 30
Cold rolled*	610	0.17 to 4	600 to 1650	

*Cold rolled products include full hard products.

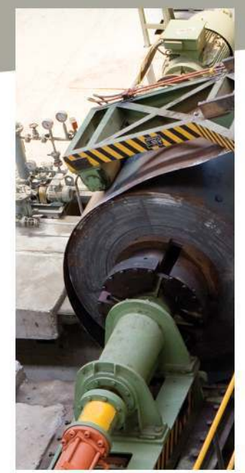
The Variety Of Qualities
Being Produced at Ferro Gilan Complex

Pickled Products

Table: 14

Standard / Application	DIN	JIS	AFNOR	BS	SAE/AISI	A S T M	UNI	EURO NORM
Drawing	(1614) StW22 RRStW23 StW24	(3131) SPHC SPHD SPHE	(36-301) 1C 2C 3C	(1449) HR3 HR2 HR1 HR1	1008 1006	A283 A621 A621 A621	(5867) Fep11 FeP12 FeP13	
Auto Chassis & Auto Wheel Ring		(1313) SAPH310 SAPH370 SAPH400 SAPH440		(1449) HR 37/23				
Pressure Vessels		(1316) SG 255		(36-211) BS 1	1012 1015	A414D A414E	Fe E 235KR Fe E 265KR	Fe E 235KR Fe E 265KR
Pipe		(1332) SPHT - 1 SPHT - 2 SPHT - 3 SPHT - 4						

Table Of Comparison Of Flat Products
Standards With Refrence To End Use



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The Variety Of Qualities
Being Produced at Ferro Gilan Complex

Pickled Products

Table: 15

Standard / Application	DIN	JIS	AFNOR	BS	SAE/AISI	A S T M	UNI	EURO NORM
General and Application Structural	(17100) St33		(A35-501) AB33		1006/1008	A283/A	(7070) Fe 320	(25) Fe 310
		S5330	A34-2		1006-1008	A283/B	Fe 330	
	RSt 37 (2-3)	S5400	E 24 (2-3-4)	(4360) 40 (A-B-C-D)	1008-1009 1010-1015	A 283/C A573/58	Fe 360 (2-3-4)	Fe 360 (A-B-C-D)
		(G3106) CLASS 1 SM 400 (A-B-C)			1009-1010 1015-1016 1018-1019	A 283/D A 36 A284/C-D	Fe 410 (B-C-D)	
	St 44 (2-3)		E 28 (2-3-4)	A3 (A-B-C-D-E)	1009-1010 1015-1016 1018-1019	A572-42 A573/65	Fe 430 (B-C-D)	Fe 430 (A-B-C-D)

Table Of Comparison Of Flat Products
Standards With Refrence To End Use

Pickled Products
Dimensional Specification

Table: 16

Thickness (mm)		Width (mm)		
			Max	
Min	Max	Min	Un Trimmed Edge	Trimmed Edge
1.25	2.49	700	1250	1230
2.5	2.99	700	1500	1470
3	3.99	700	1600	1570
4	5	700	1700	1670

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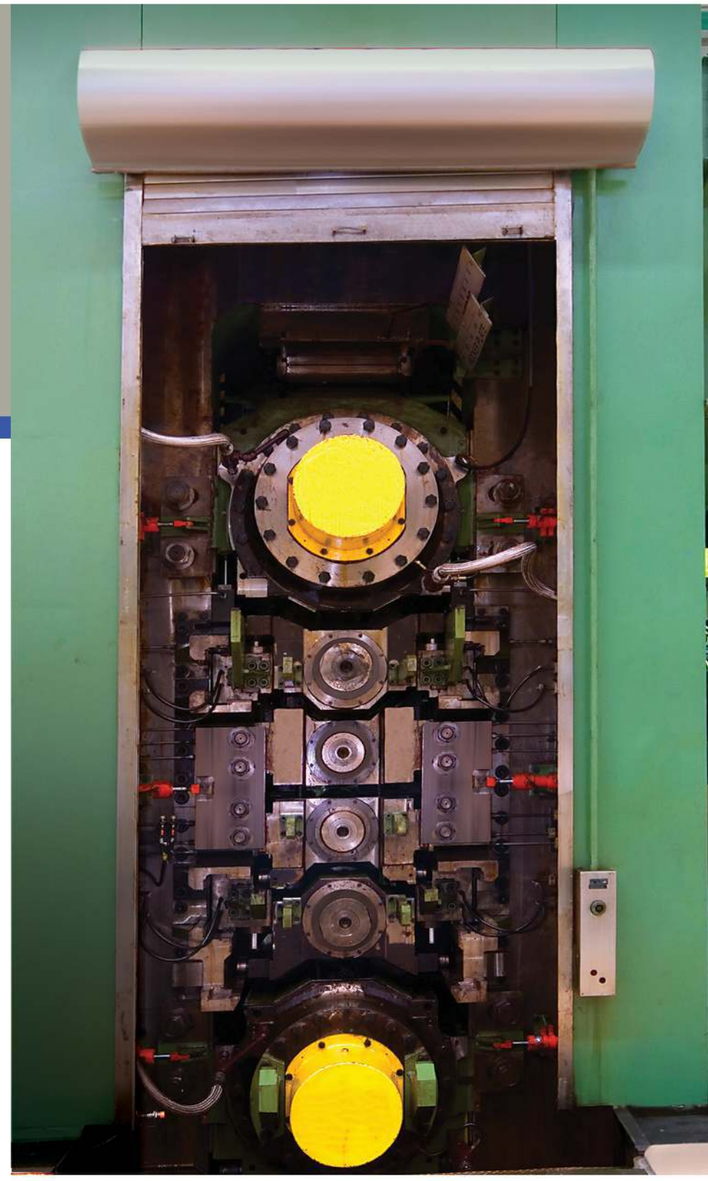

The Variety Of Qualities
Being Produced at Ferro Gilan Complex

Table: 17

Cold Rolled Products

Standard / Application	DIN	JIS	AFNOR	BS	SAE/AISI	A S T M	UNI	EURO NORM	EN	ISIRI
House Appliencel Car Body Drawing	(1623-1) St12 PRSt 13 St 14	(G3141) SPCC SPCD SPCE	(A36-401) C E ES	(1449-1) CRSP 4 CRSP 3 CRSP1	1008 1006	A366 A619 A620	(5866) Fe P01 Fe P02 Fe P03	(130) Fe P01 Fe P02 Fe p03 Fe p04	(10133) DC01 DC03 DC04	(5723) Cold Rolled 1 Cold Rolled 2 Cold Rolled 3 Cold Rolled 4
Enameling	EK 2 EK 4		EME	CRSP 3VE	1008		FeP02	Fe p01		
Pipes Furniture	(1623-1) St 12	SPCC	C	CRSP4			FeP01	Fe p02		
Radiators & Drums	St 12 RRSt 13	SPCC SPCD	C E	CRSP 4 CRSP3	1008	A 366 A 619	Fe P01 Fe P02	Fe P01 Fe P02		
Industrial & Light Structures	(1623-2) St 37-3G St 44-3G					(A 611) GRADE B GRADE C GRADE D1 GRADE D2	(7958) Fe 330 Fe 360 Fe 410			5722 Cold Rolled 220 2 And 3 Cold Rolled 2 And 3

Full hard Coil Will Be Delivered Based On Order By
Customer And Chemical Composition Will Be Guaranteed

Table: 18

DIN EN 10130		Material Specification For Cold Rolled Products												Surface Quality	Absence Of Stretcher Strain Marks
Designation		Mat Number	Method Of Dioxidation	Chemical Composition max				Tensile Properties							
								d	m			n 90 % min	Validity Of Mechanical Properties		
				C %	Mn %	p %	S %	N/mm²	N/mm²						
St12	DC01	1.033	At The Manufacturer Describition	0.12	0.6	0.045	0.045	(-/280)	270-410	28	------	------	------	A B	---------- 3 Month
St13	DC03	1.0347	Fully Killed	0.1	0.045	0.035	0.035	(-/240)	270-370	34	------	------	------	A B	6 Month
St14	DD04	1.0338	Fully Killed	0.08	0.4	0.03	0.03	(-/210)	270-350	38	1.6	0.18	------	A B	6 Month
-------	DC05	1.0312	Fully Killed	0.08	0.35	0.025	0.025	(-/180)	270-330	40	1.9	0.2	------	A B	6 Month

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Coil Weight Range:
Coils Can Be Produced With The Following Weights.

Table: 21

Coil Width (mm)		Coil Weight (ton)	
Min	Max	Min	Max
600	740	3.2	11.5
741	840	4	13
841	940	4.5	14.5
941	1040	5	16
1041	1140	5.5	17.5
1141	1240	6	19.5
1241	1335	6.5	21
1336	1435	7	22
1436	1553	7.5	24
1536	1650	8	27

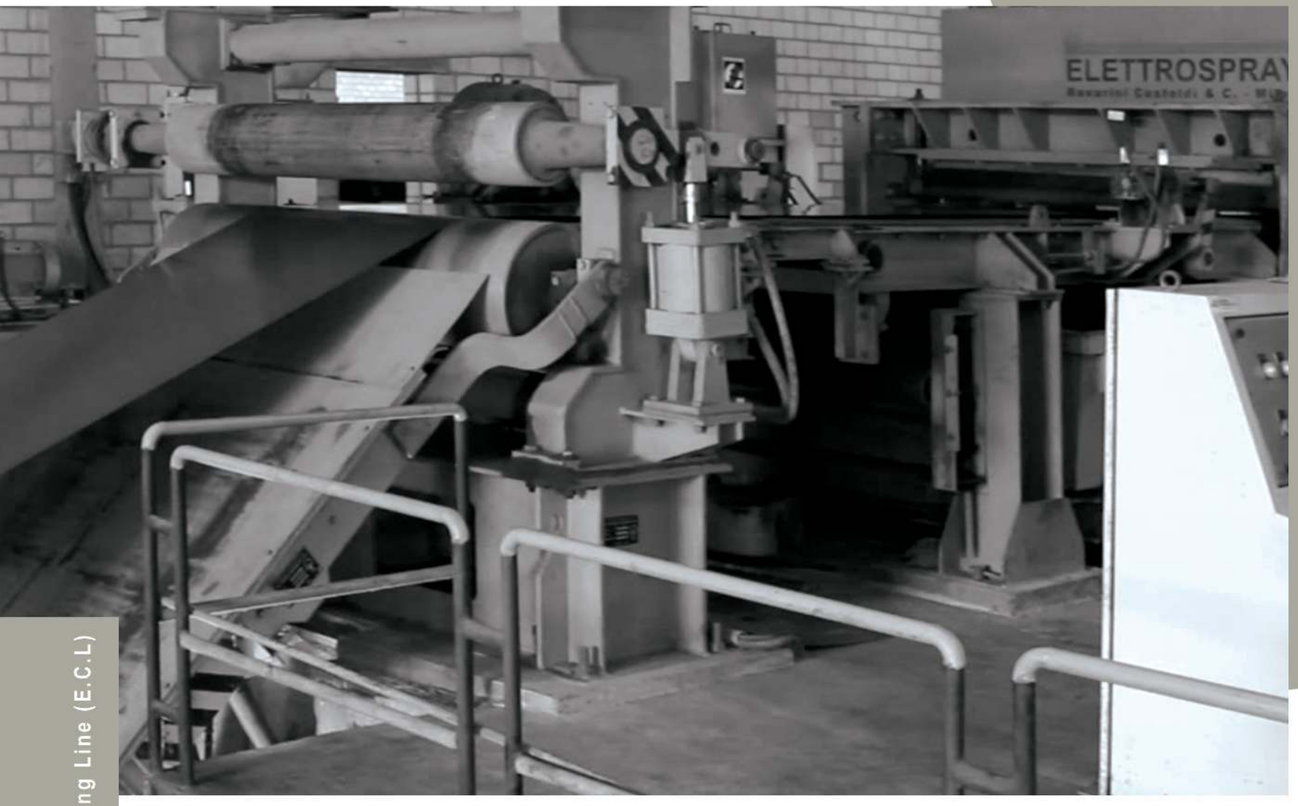

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Table: 19

EN 10131	Tolerances On Thickness For Cold Rolled Products					
Nominal Thickness	Normal Tolerances For A Nominal Width Of			Special Tolarance For A Nominal Width Of		
	< 1200	> 1200 to < 1500	< 1500	< 1200	> 1200 to < 1500	> 1500
> 0.35 > 0.4	±0.04	±0.05	------	±0.025	±0.035	------
> 0.4 > 0.6	±0.05	±0.06	±0.07	±0.035	±0.045	±0.05
> 0.6 > 0.8	±0.06	±0.07	±0.08	±0.04	±0.05	±0.05
> 0.8 > 1.00	±0.07	±0.08	0.09	±0.045	±0.06	±0.06
> 1.00 > 1.20	±0.08	±0.09	±0.10	±0.055	±0.07	±0.07
> 1.20 > 1.60	±0.1	±0.11	±0.11	±0.07	±0.08	±0.08
> 1.60 > 2.00	±0.12	±0.13	±0.13	±0.08	±0.09	±0.09
> 2.00 > 2.5	±0.14	±0.15	±0.15	±0.10	±0.11	±0.11
> 2.5 < 3.00	±0.16	±0.17	±0.17	±0.11	±0.12	±0.12

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Elecrolytic cleaning Line (E.C.L)

Cold rolled coils processed in cold rolling mills have a thin film of residual rolling oil on the surface rolling. The alkaline cleaning of cold rolled coils totally clean surface of the strip before annealing. This electro-chemical cleaning process is called Electrolytic Cleaning and the processing line the Electrolytic line.

The Technology

An ECL line cleans the strip surface of oil and dirt by chemical action, using an alkaline solution. The strip passes between electrodes which are immersed in tanks containing the electrolyte. This technique is more effective in cleaning cold rolled steel than conventional cleaning processes used on high speed electro tinning and alkaline cleaning lines.

Fact Sheet
Following Figures Have Been Achieved:

Contaminants	Incoming Strip	Outgoing Clean Strip
Oil And Dirt	500 mg / sq. per side Max	15 mg / sq. per side Max
Iron Fines	250 mg / sq. per side Max	10 mg / sq. per side Max

Input Material	Cold Rolled Steel (Full Hard)	Strip Thickness	0.20 mm (min) - 1.50 mm (max)
Yield Strength	250 to 420 Mpc	Type Of Line	Electrolitic Cleaning, Coil To Coil Process.
Coil Size	I.D610 mm OD.900 mm (min) / 1900 mm (max)	Line Speed	Process: 200 mpm max Threading: 30 mpm
Coil Weight	3000 Kgs max	Surface Roughness	0.8 to Ra
Strip Width	750 mm (min) / 1650 mm (max)	Annual Production Capacity	200000 MT (Approx)

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Annealing Line

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Tension leveling lines (T.LL)

Tension Leveling
In many cases, the sheet metal flatness required of today's strip metal processors can only be achieved by the use of tension levelers. Precision flatness is obtained when the metal's fiber lengths are made uniform across the entire width of the strip by elongating the metal beyond its yield point. When the strip is passed through the leveler under tension internal stresses within the metal are eliminated, and flatness or shape correction to tolerances approaching zero "I" units can be achieved.

Tension Leveler
Consists of an un-driven leveler arrangement with entry and exit tension bridles. The degree of elongation required to level the strip is primarily determined by the differential in speed or tension generated between the two bridles. This is controlled automatically by a microprocessor based system. Bridles vary in configuration and complexity, depending on the type and dimensions of the strip metal to be processed. They can be equipped with several different drive system. These include closed-loop mechanical differential, all-electric drives and combination electro-mechanical drives.

Incoming Coil Data

Coil Size	I.D.610 mm OD.900 mm(min) / 1900 mm(max)
Coil Weight	30000 Kg max
Strip Width	750 mm(min) / 1650 mm(max)
Strip Thickness	0.15 - 0.70 mm (Full Hard) 0.3- 2.0 mm (Anrealed)

Outgoing Coil Data

Coil Size	I.D610 mm (With Rubber Sleeve) OD.900 mm(min) / mm(max)
Line Speed	250 mpm (TL Mode) 400 mpm (Trimming and Rewinding Mode)
Threading Speed	25 mpm
Suggested Tentative Product Mix	20 % Below Thickness 0.50 mm (Width 900 mm to 1250 mm) 40 % Thickness 0.50 to 1.0 mm (Width 900 mm to 1650 mm)
Annual Production Capacity	1/10 th Of Line Input Flatness OR 5.1 Units Whichever Is Maximum

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HICON/H2 ® bell annealers for steel strip

Both the mechnaical properties and the surface finish are important quality factors for cold-rolled strip. Both factors are influenced considerably by heat treatment. HICON/H2® annealing technology achieves excellent results at low cost per ton annealed.

Wide range of applications

Low carbon steel
- soft steels
- CQ, DQ,DDQ,EDDQ,SEDDQ
- IF grades
- ULCN steels
- high tensile strength steels
- micro alloyed steels
- phosphor alloyed steels
- bake hardening grades
- high strength IF steels
- isotropic IF steels

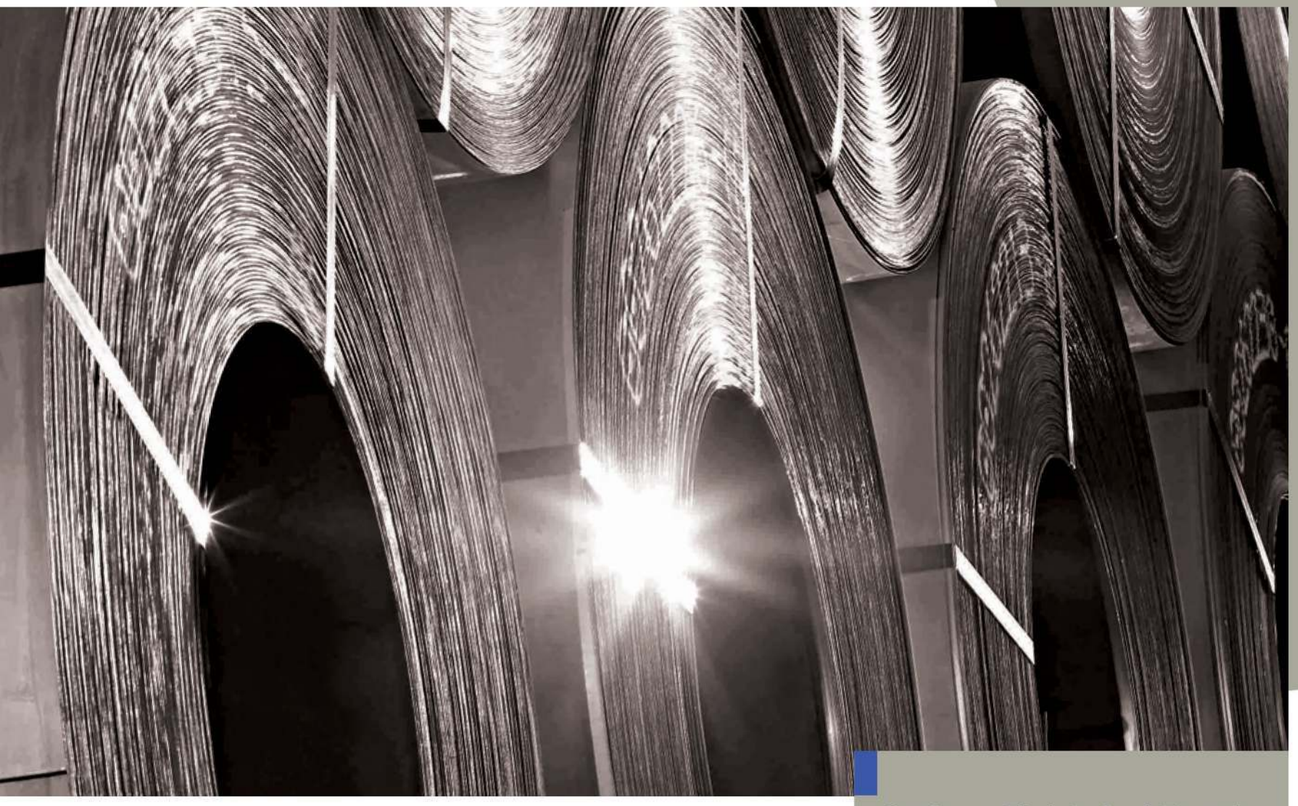
Tin plate
- T1 to T4

Silicon steels
- non - oriented steels
- oriented steels

Medium to high carbon steels
- non-alloyed steels
- low-alloyed steels
- high - alloyed steels (HSS etc.)

Rust - resistant and acid - resistant steels

- martensitic Cr steels
- FERRITIC Cr steels



Surface Finish And Roughness Values

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Technical specification of products Hot, pickled and Cold Rolled products

- Hot Rolled Standards:

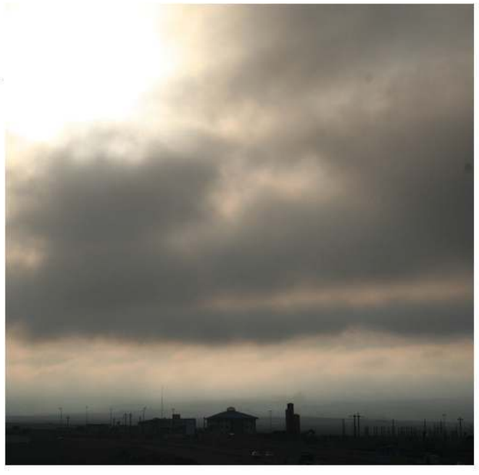
ISIRI 3693 JIS G 3132-90
ISIRI 3694 JIS G 3131-90
ASTM A 6-94 JIS G 3193-90
ASTM A 568-93 DIN 1543
ASTM A 365-93 DIN 1016
EB 10051-91

- Pickled standards

Width tolerance: Thickness tolerance:
ASTM A568 M/93a ASTM A568 M/93a
EU 51/82
EU 112/82 DIN 1543
AFNOR NF A46.51/84 DIN 1016
BS 1449/83 JIS G 3132/90
JIS G 3193/90 JIS G 3131/90
DIN 1543 JIS G3193/90
DIN 1016/72
EN 10051-91

- Cold Rolled standards:

EU 131/77 NORMAL
UNI 7958/79
UNI 6623/77 NORMAL
AFNOR NF 46402/81 NORMAL
BS 1449 18/89
JIS G 3141/90 (TOLLA A) NORMAL
DIN 1541/75 NORMAL
EN 10131 – 1991
ISIRI 5723
ISIRI 5722



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Surface Appearance

Table: 22

Standard Code	Standard
MA A 3 GP CLASS2 STD.JIS X UNXPOSE	UNI 5866.EU 130 EN10130-1999 DIN 1623 B.S 1449-1 ASTM, SAE/AISI JIS G 3141 AFNOR NF A 36 ,401 ISIRI 5723
MB B 5 FF CLASS1 7 EXPOSE	UNI 5866.EU 130 EN10130-1999 DIN 1623 B.S 1449-1 ASTM, SAE/AISI AFNOR NF A 36 ,401 ISIRI 5723

Cold Products

Surface Protection

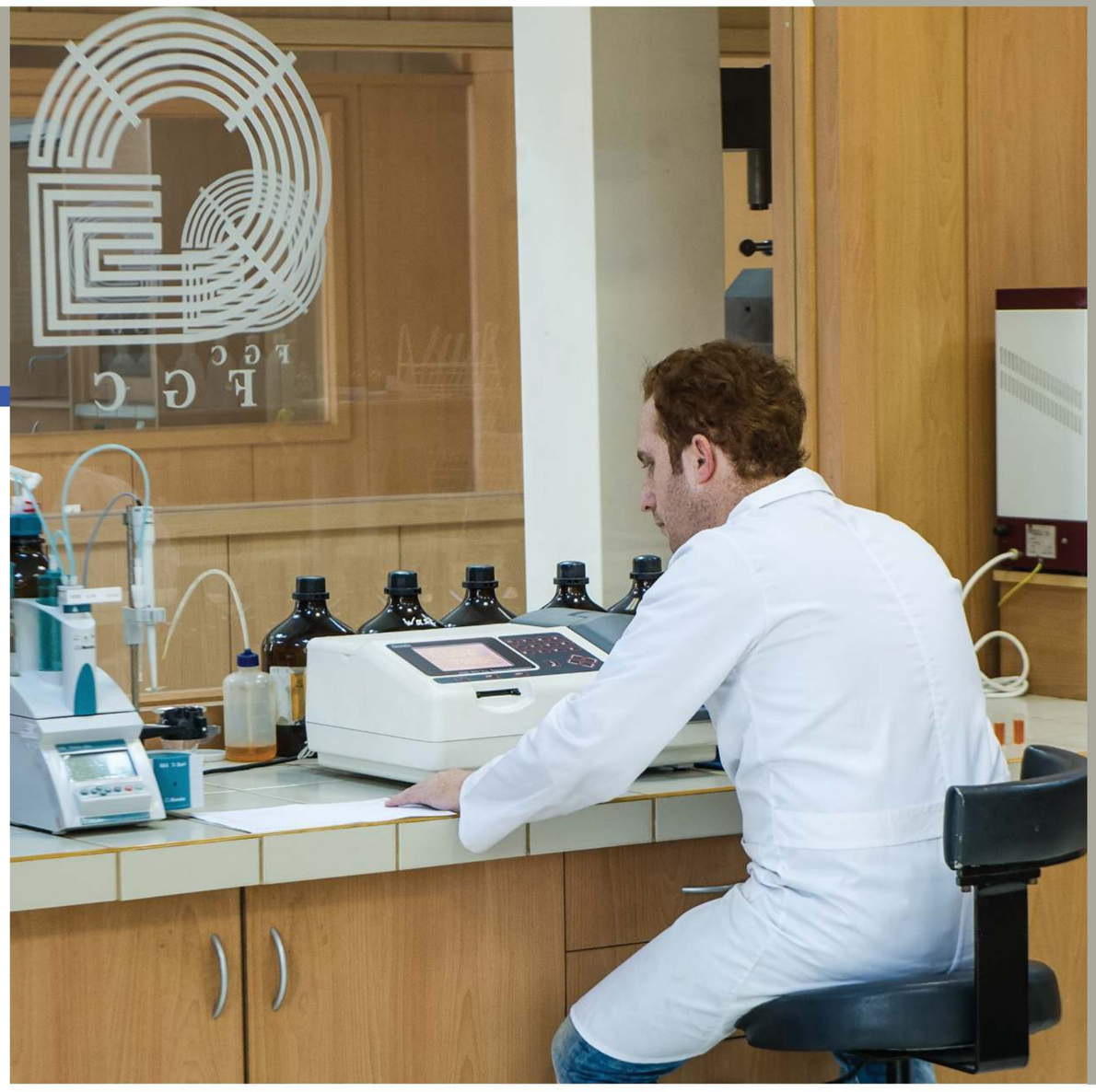
Depending on the type of product and also product quality required, the cold rolled are divided in to two groups shown on the table.

Group	Remarks
Not-Oiled	In this case, the surface of all products are oil - free according to customer requirements. Product with MB appearance should definitely be delivered Oil Free. Full - hard and annealed products are delivered in Oiled.
Oiled	Unles Specofied cases, dl products are Oiled The surface of products will be corrosion resistant. using a thin layer of oil.

Guaranty

A) Oiled Surface

In the case of usning steel straps and angles in order to protect the edge in packing. Our products are guaranteed against staining 2 month after delivery.



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Surface Finish And Roughness Values

Table: 23

Surface Finish	Roughness		EN	DIN	Code National Standard	END Use
	Micorn	Micorn Inch				
Bright	< 0.4	< 16	RB	b	< 0.4	A
Semi Bright	< 0.87	< 35	RL	g	< 0.87	A
Normal	0.62 - 1.87	75 - 25	RM	m	0.62 - 1.87	B
Matt	1.00 - 1.87	75 - 40	RM	m	1.00 - 1.87	C
Rough	1.50 - 2.55	90 - 60	RR	r	1.50 - 2.25	D

A: Furniture
B: House Appliances, Drums, Radiators, Structural And General Use
C: Automobile
D: Enamelling

Full Hard Products Are Presented With Following Roughness:

A: Less Than 0.27 Micorn
B: 0.35 to 0.55 Micorn
c: 0.75 to 1.1 Micorn