

Company Profile **ON**

The first partner “ILJIN Steel Corporation”



Steel



“The loves from our customers are made from the business minds on behalf of the customer satisfaction and customer affection.”

CEO Message
CEO Message

Dear ILJIN customers!

Thank you for taking the time to read our company profile. I sincerely hope that you will understand our company and products. In recent years, ILJIN has experienced tremendous growth, establishing a global management and quality improvement system, based on our mid-and long-term vision of “World top Company”.


ILJIN Steel Corporation has given considerable contribution on the development of industries in Korea repeating steady up growing in a field of metal plastic working for the past 20 years.

However, ILJIN Steel Corporation is doing our best to advance toward the company of: concentrating on technical priority leading the state-of-the-art precision industries of highly additional values; concentrating on human resources to support the challengeable employees of capability; and concentrating on global standard for the world top company.

Afterward, we promise that ILJIN Steel Corporation will be the global best enterprise leading the world market in the field of metal precision forming based on sound financial structure and drastic investment on R&D.

We ask of you for everlasting interests and advices, and also hope that your families and companies have always happiness and good health.

Thank you.

CEO Hee-won Jung 

■ CORE PURPOSE

Through always creating of new values, we will implement the world of happiness for all the parts of customers, employees, stockholders, investors, and partners that are related with ILJIN Steel Corporation.

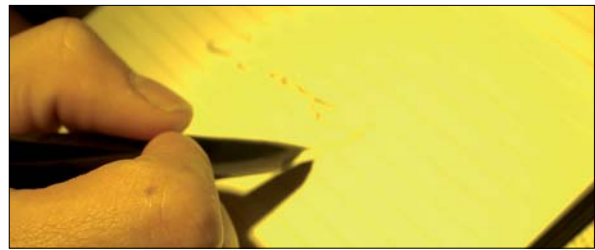
■ CORE VALUE

Emphasizing on technology



We will take the main role of the future growing industries through the specialization of high technology. The development technology of ILJIN Steel Corporation is the firm basis of the future competitiveness fostering that is commanding also worldwide.

Respect for talented people



ILJIN Steel Corporation will lead the future together with the human resources of high capabilities, of new ideas as well as new values continuously and of deep understanding on the core value of the company.

Mind of challenge



New challenger required in 21st century! potential power to pioneer new fields with distinguished perspectives! Those will be essential for the up growing of the new ILJIN Steel Corporation

Honesty and faithfulness



The honest management demeanor that is made in transparent communication is the core values that are pursuit by ILJIN Steel Corporation.

■ ENVISIONED FUTURE

We will switchover the company from the simple manufacturer of part materials to the system component manufacturer where high tech material, processing technology and designing are intergrated each other's; accordingly we are aiming at being the superior global enterprise in the fields.

■ VISION STATEMENT

We will be the superior enterprise in the near future manufacturing the system component where high technologies are integrated by challenging to a new field and creating new values through unceasing technology development and innovation. In addition, We will be the representative enterprise in Korea, being respected from many people, where the excellent talented people are gathered, by doing our best for our social responsibility as well as managing the company based in morality.

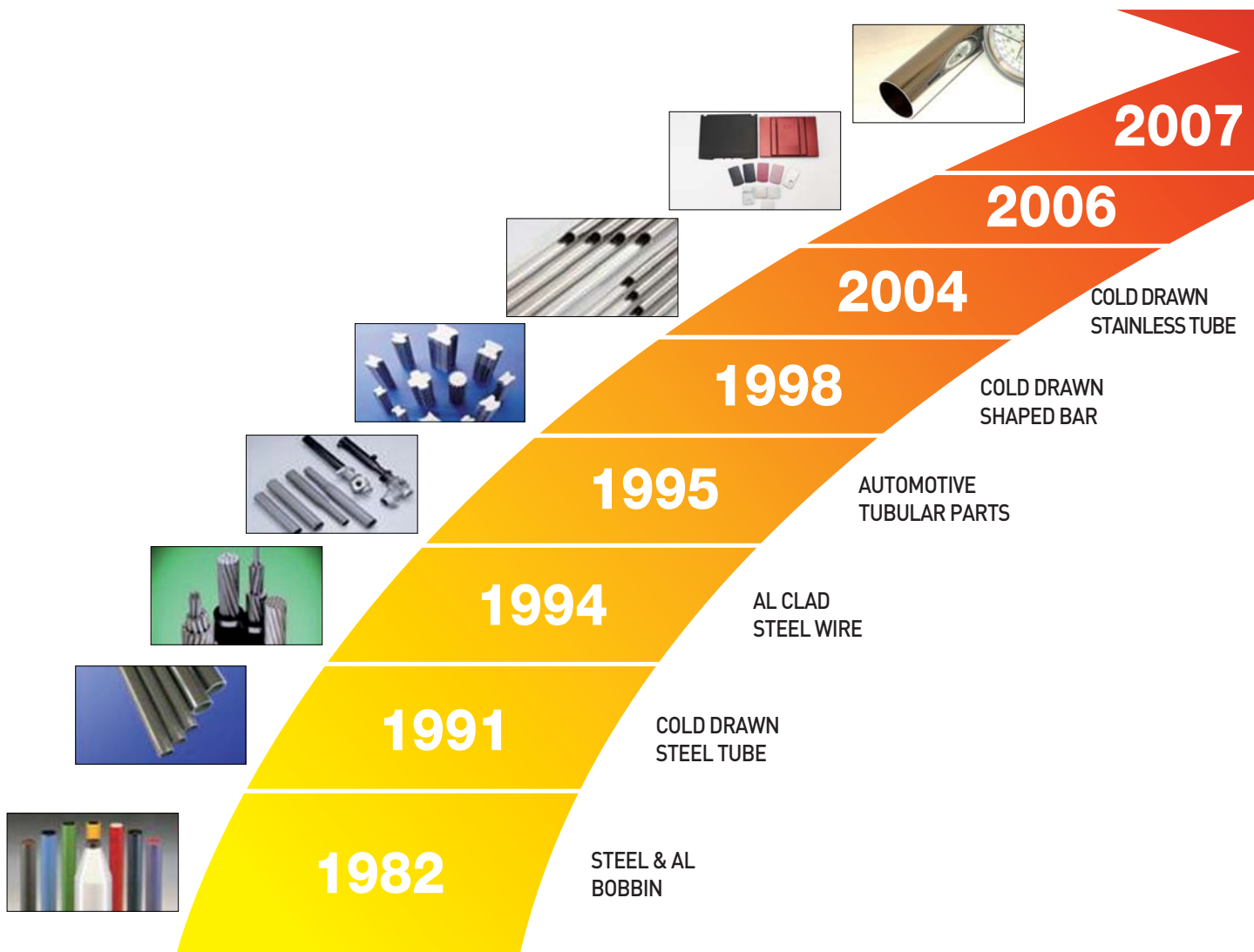
■ The Company Overview In Brief

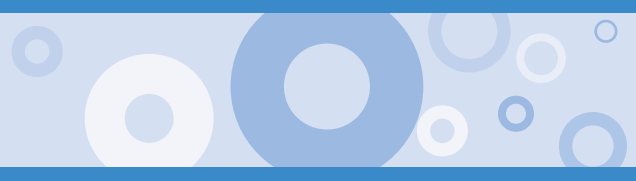
Found in 1982 as a Steel and aluminum bobbin supplier for synthetic fiber winding, ILJIN has been leading the market as unique supplier for high strength and precision bobbin. In the early of 1990' s on the basis of precision tube technology, ILJIN launched new business, cold drawn tube, aluminium clad steel wire and cold drawn shaped bar drawing step by step.

ILJIN' s creativities have made it one of the technological leaders from raw material to new product innovation. By developing core competencies in cold drawing and metal forming technologies, ILJIN maintains its edge through accelerated expansion in diversified products and consistent quality improvement.

ILJIN' s ' s policy is to build a lasting relationship with customers with on time delivery and high quality in product and service. In order to reach the goal of total customer satisfaction, ILJIN has built a worldwide service network channel to provide customers a real time service.

■ Products Milestone





■ Quality policy

AS a company of TS16949 & ISO14001 certified, ILJIN's quality policies are as below.

[CUSTOMER SATISFACTION]

We satisfy our customers with implied requirement as well as explicitly stated requirement

[PURSUIT OF CEASELESS INNOVATION]

We supply our customers with much competitive price products timely by continuous improvement of manufacturing process & administration and management innovation.

[CREATIVE THINKING]

We supply better quality products by persistent R&D of new technology and new manufacturing process

2008

COLD DRAWN
ALUMINUM TUBE

MOBILE CASE
PRESS FORMING

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History ●

- May. 1982. Established ILJIN steel corporation
- Nov. 1982. Development & Production Al / Steel Bobbin
- Apr. 1984. Expansion with Anyang Factory
- Mar. 1991. Established R&D Center
- Mar. 1992. Established Suwon Factory
- Jun. 1992. Development & Production of Cold Drawn Tube
- Feb. 1993. Development & Production of Al Clad Steel Wire
- Jun. 1995. Addition of Tube Forming Products
- Jan. 1998. Development & Production of Cold Drawn Shapes
- Dec. 1999. Acquired ISO 9002 Certification
- Dec. 2000. Received Ten Million Dollar Export Award
- Oct. 2004. Development of Mg Press Forming Products
- Aug. 2005. Development of Precision Cold Drawn Al Tube
- Sep. 2005. Acquired TS 16949, ISO 9001, ISO 14001
- Jul. 2006. Development & Production of Stainless Steel Tube
- Dec. 2007. Development & Production of Heat Exchanger Tube
- Dec. 2007. Development & Production of Aluminum Tube
- Jan. 2008. Introduced ERP & MES System
- Mar. 2008. Installed 300ton Jumbo Draw Bench and Full-body U.S.T

Precision Steel tubes

■ Global Standard Quality

ILJIN tubes have been supplied many countries such as, North & South America, Europe, Middle east, as well as Asia and our sales of abroad area is more than 60%.

As the qualified company from global customer ILJIN has certified T.S16949 & ISO9001 and we recently introduced the ERP & MES system in order to enhancing competitiveness of company, managing production, delivery and total cost. For more net-working to world customer we have been participated in many international tube exhibition such as Dusseldorf tube show.

■ Designed according to best performance

Our precision steel tubes manufactured by ERW and Seamless mother tubes are designed to all application purpose endowing toughness, strength, homogenous formability, roughness and cost saving.

■ High Quality Materials

ILJIN precision steel tubes are used in almost all industrial sectors, for examples machine and tools, vehicles, petro - chemical plant, heavy machine industry, furniture and textile machine.



[Shock absorber tube]



[Bright annealed tube]



[Special shaped tube]



[Hydraulic cylinder tube]



[Heat exchanger tube]



■ Strengths of ILJIN's Cold drawn tubes

Mirror surface Cold Drawing Technology

ILJIN can produce the S.S.I.D Tube, Ready to Use Cylinder tube. Through our special cold drawing technology and raw material quality control.

Total Solution provider for tubular parts

ILJIN have integrated process with cold drawing and tube forming. It is possible to provide a better serve to customer, quick delivery, technical improvement, value engineering, prompt feed-back for quality improvement.

Wide Size range and steel material

Since ILJIN has many kinds of draw benches and straightening M/C, our size range is able to cover outside diameter from 6mm to 308mm. Covering heat-treatment range 400 °C~1200 °C, we are able to produce almost all kinds of steel grade, bearing steel, alloy steel, carbon steel and stainless steel.

Perfect inspection system

Our multiple inspection can detect all kinds of defect on tube. In mother tube stage, all tubes should be inspected by U.T & ECT and after finish cold drawing, we conduct full body U.T or ECT one more time.



[Ready to use tube]



[Internal Finned tube]



[Air bag Inflater tube]



[Steering Rack tube]



[Large Diameter tube]



[Rocker Arm Shaft tube]

Precision Steel tubes

Tube For Heat Exchanger

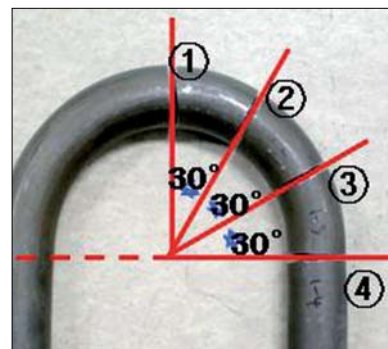
Usage of Products	Heat exchanger, Boiler, Super heater, Condenser			
Main Facilities	<ul style="list-style-type: none"> - 22m length Draw Bench & Pickling Tank, - Normalizing Furnace, Precision Cutting & Chamfering - Eddy current tester, Hydro static tester 			
Material	<ul style="list-style-type: none"> - Carbon steel - Alloy Steel (Ni, Mo, Cr) - Stainless steel (Ferritic, Austenitic, Duplex) - Titanium alloy, etc. 			
Tube	<ul style="list-style-type: none"> - Seamless hot finished - Cold Drawn Seamless - Cold Drawn E.R.W 			
Finish Condition	<ul style="list-style-type: none"> - Normalized (NBK) - Annealed and pickled - Bright annealed (GBK) 			
Size Range	O.D.(mm)	10 ~ 300	Main	19.05 ~60.5
	W.T.(mm)	0.8 ~ 20.0	Main	1.65~2.77
	L' th(mm)	2,000 ~ 22,000	Main	6,000 ~ 18,000
Application	ASTM A106/ASME SA106 ASTM A161/ASME SA161 ASTM A178/ASME SA178 ASTM A179/ASME SA179 ASTM A192/ASME SA192 ASTM A199/ASME SA199 ASTM A209/ASME SA209 ASTM A210/ASME SA210 ASTM A213/ASME SA213		ASTM A214/ASME SA214 ASTM A226/ASME SA226 ASTM A249/ASME SA249 ASTM A269/ASME SA269 ASTM A556/ASME SA556 ASTM A557/ASME SA557 ASTM A688/ASME SA688 ASTM B338/ASME SB338 ASTM B359/ASME SB359	
	DIN 17175		EN10216-1-5	
	JIS G 3461, 3462		JISG 3456, 3458	



[Stainless Steel tube]



[Carbon Steel tube]



[U-Bend Test]



[Solution Heat treatment]

Tube For Hydraulic Cylinder



■ Ready To Honing

(Unit : mm)

Application	Supply Condition		Material Grade	Size Range
Double Acting Telescopic	ERW & Seamless (DOM, CDS)	Stress Relieved (BKS)	SAE1020, 1026 EN10305 E355(St52.3) STKM13C	O.D : 40 ~ 308 W.T : 4.0 ~ 25.0 L'th : 4~11,5m

■ Ready to Use

(Unit : mm)

Application	Supply Condition		Material Grade	Size Range
SSID Tube	Tube Condition	ERW & DOM (BK)	SAE1020, 1026 EN10305 E355(St52.3) STKM13C	O.D : 15.0 ~ 140 W.T : 1.0 ~ 12.5 L'th : 4~11,5m
	Dimension Tolerance	ISO H9 Grade		
	Inside Roughness	Rmax 5 μ m Max.		

※ SSID : Super Smooth Inside Diameter

■ Size Range

O.D.		W.T.	Wall Thickness (mm)													
			0.8	1.0	2.0	4.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	19.0	22.0
(in)	(mm)															
0.25	6.4	○	○	■												
0.5	12.7	○	○	○	○											
1	25.4	○	○	○	○	○	○	○	○	○						
1.5	38.1	○	○	○	○	○	○	○	○	○						
2	50.8	○	○	○	○	○	○	○	○	○	○					
2.5	63.5	○	○	○	○	○	○	○	○	○	○	○				
3	76.2		○	○	○	○	○	○	○	○	○	○				
4	101.6			○	○	○	○	○	○	○	○	○	○			
5	127.0			○	○	○	○	○	○	○	○	○	○			
6	152.4				○	○	○	○	○	○	○	○	○	○		
7	190.7				○	○	○	○	○	○	○	○	○	○		
8	216.3					○	○	○	○	○	○	○	○	○		
9	228.6					○	○	○	○	○	○	○	○	○		
10	254.0						○	○	○	○	○	○	○	○		
11	279.4						○	○	○	○	○	○	○	○		
12	304.8						○	○	○	○	○	○	○	○		

○ : ERW Cold Drawn (DOM)
 ■ : Seamless Cold Drawn (CDS)

※ It is possible to review when the required size is out of above range.

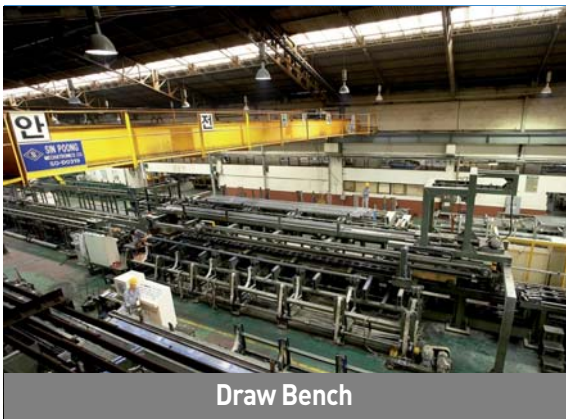
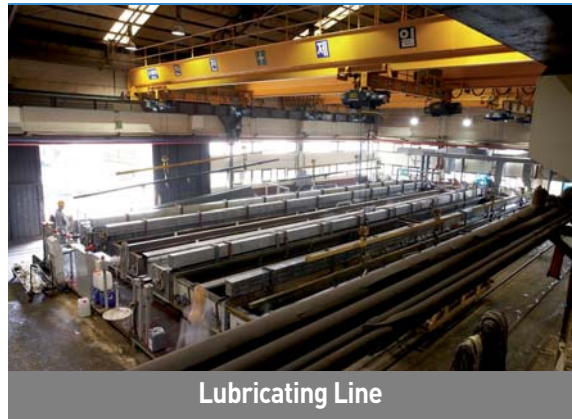
■ Material

International Standard		Material	
		Seamless	ERW
ASTM	ASTM A 512, 513, 519 ASTM A 500, A 501 ASTM A 210, 214, 226	SAE 1008 ~ SAE 1026 SAE 1045, SAE 1530, SAE 1536 SAE 4115 ~ 4140	SAE 1008 ~ SAE 1026 SAE 1040, SAE 1526, 1530 SAE 1536
JIS	JIS G 3441, 3444, 3445 JIS G 3461, 3462 JIS G 3472, 3473 JIS G 3454, 3455, 3456 JOHS-102 OST1, OST2	STKM 11A ~ 16C STAM 290 ~ 540 STK 490, 590 SCM 415 ~ 440	STKM 11A ~ 16C STAM 290 ~ 540 STK 490, 590
DIN	DIN 1720 ~ 1724 DIN 1626, 1629, 1628 DIN 17175, 17177 DIN 2393, 2391, 2445	St 30Si, St 30Al, St 35, St 45, St 52 16Mn, 16CrMo, 20CrMo	RSt 34-2, RSt 37-2, St 44-2, St 52-3, 16Mn
EN	10305 - 1 ~ 6, 10297 10216 - 1 ~ 4	E 355, E 235, E 195 P235GH, P265GH	E 355, E 235, E 195 P235GH, P265GH

※ Although the required material is not shown in above table, it is possible to review the spec.



■ Manufacturing Process



○ Precision Cold Drawn Shapes

■ Precision Cold Drawn Shapes

Precision Cold drawn shapes mean the product that has complicating geometry manufactured by drawing process under temperature. As this is made closely to the Final geometry, it is possible to minimize machining processing and to control the mechanical propertise and surface quality fitting to the use of customers. Accordingly, the effectiveness of cost cut down is increased more by reducing the material loss and processing time.

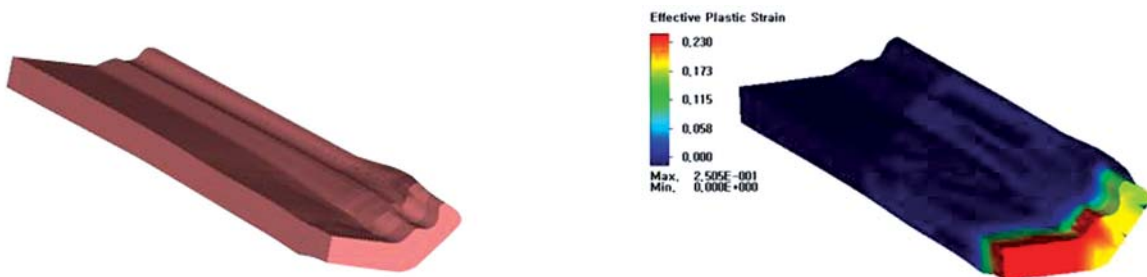
■ Advantages of Pricision Cold Drawn Shapes

- Minimization of Material Scrap
- Homogeneous Microstructures
- Reducing of Processing time
- Precise dimensional tolerance
- Smooth and fine Surface
- High Strength
- Small quantity delivery



■ 3D Simulation Technology

For optimum process design, our process and molds are designed by computer simulation prior to actual working.



[Drawing Pass design by 3D Simulation]

■ Applications



[Steering Shaft & Joint]



[Impeller]






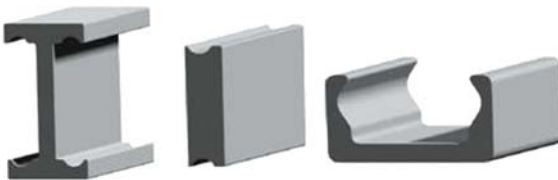
[Compact Rail]



[Linear Guide]



■ Full Line-Up of L / M Guide System

Item	Figure	Model No.	Size (W×H, mm)
L/M RAIL		No. 15 ~ 85	15 × 15 ~ 85 × 80
L/M BLOCK		FL Type No. 15 ~ 35	45 × 25 ~ 110 × 55
		SL Type No. 15 ~ 45	30 × 20 ~ 100 × 60
MINIATURE RAIL		Normal Type No. 9 ~ 15	9 × 6~15 × 10
		Wide Type No. 9 ~ 15	20 × 6~45 × 10
SLIDER		No. 28 ~ 63	30 × 15~85 × 40

■ Available Specification

Spec.	Normal	Special
Dimension	± 0.1 mm	± 0.05 mm
Straightness	0.8 mm / m	0.3 mm / m
Twist	0.5 mm / m	0.1 mm / m
Decarburization	0.15 mm max.	0.05 mm max.
Surface Defect	0.15 mm max.	0.05 mm max.

■ Profile Size Range

Item	Range
Width	6 - 180mm
Thickness	3 - 60mm
O.D (Tube)	10 ~ 250mm
Length (m)	2 - 11
C.S.A	25 - 8,000mm ²

CSA : Cross Section Area

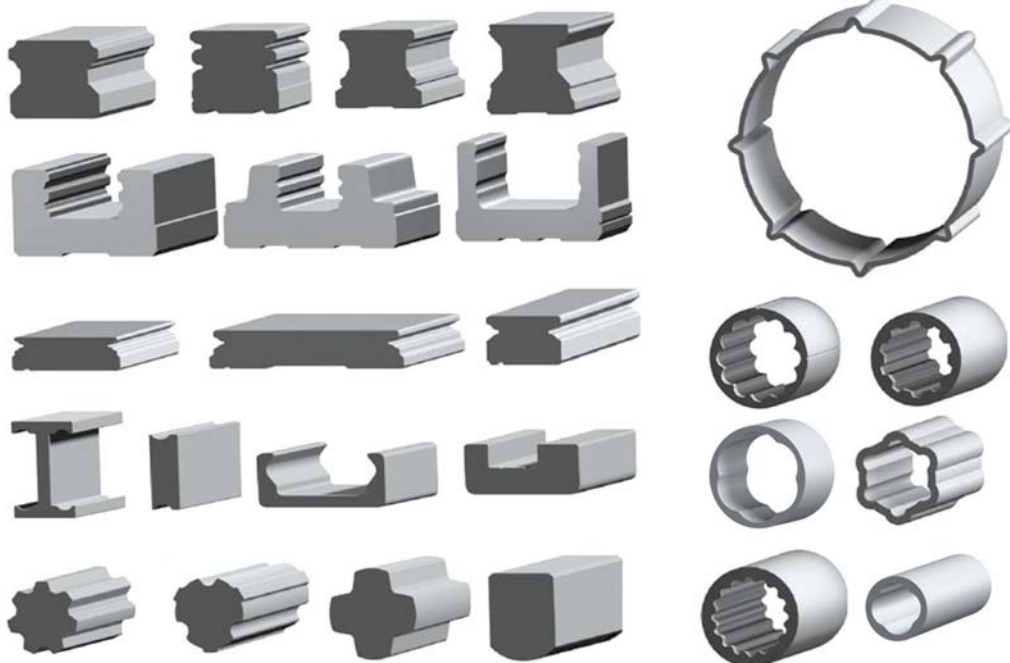
Precision Cold Drawn Shapes

Available Materials

(Unit : wt%)

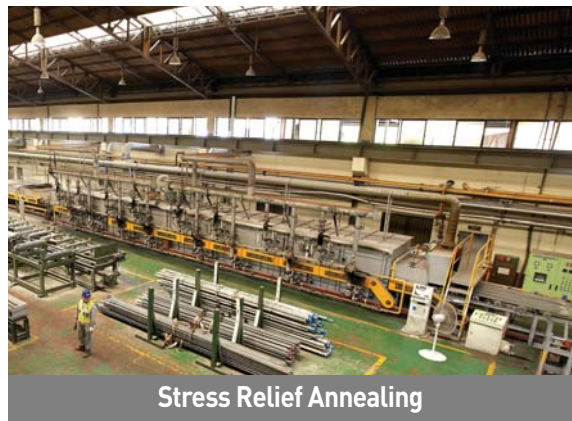
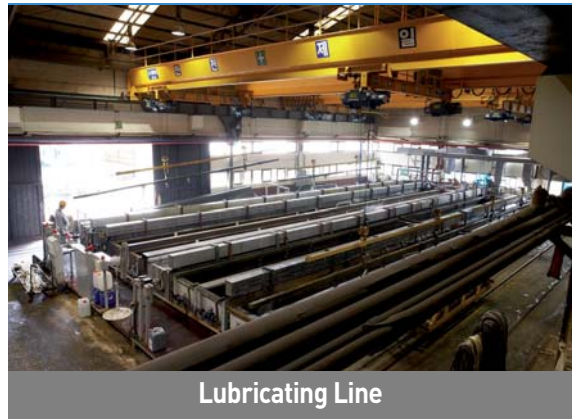
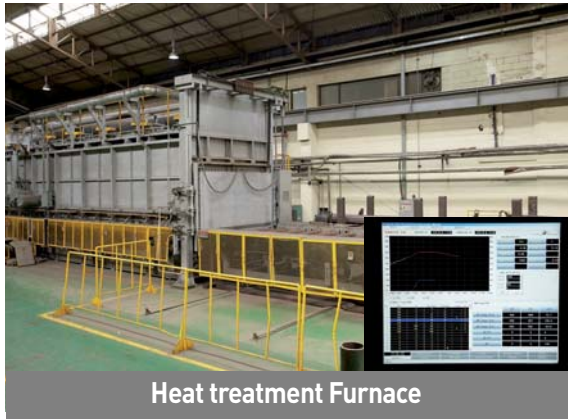
ITEM	Material Grade		C	Si	Mn	P	S	Cr	Mo	V	Remark
L/M Rail	ILM-0	Min.	0.52	0.15	0.60						S55C, SAE 1055
		Max.	0.58	0.30	0.90	0.030	0.035				
	ILM-1	Min.	0.55	0.15	0.75			0.10			Modified ILM-1
		Max.	0.60	0.30	1.00	0.025	0.025	0.40			
	ILM-2	Min.	0.56	0.15	0.75			0.90	0.15	0.10	58CDV4
		Max.	0.62	0.35	1.00	0.025	0.025	1.05	0.20	0.15	
	ILM-3	Min.	0.53	0.15	1.35		0.005	0.10			55C-Mn
		Max.	0.57	0.35	1.65	0.025	0.030	0.35			
L/M Block	SCM415H	Min.	0.12	0.15	0.55			0.85	0.15		16CrMo
		Max.	0.18	0.35	0.95	0.030	0.030	1.25	0.30		
	SCM420H	Min.	0.17	0.15	0.55			0.85	0.15		20CrMo
		Max.	0.23	0.35	0.95	0.030	0.030	1.25	0.30		
Miniature Rail	SUS440A	Min.	0.60					16.00			X65CrMo14
		Max.	0.75	1.00	1.00	0.040	0.030	18.00	0.75		
	SHP4A	Min.	0.55					12.00	1.00		X60CrMo15
		Max.	0.65	1.00	1.00	0.040	0.030	14.00	2.00		
	DSR7	Min.	0.56					12.50	0.15		X60CrMo14
		Max.	0.62	1.00	1.00	0.040	0.030	13.50	0.30		

Sections For Example





■ Manufacturing Process



Stainless Steel Tubes

■ Bright Annealed Stainless Steel tubes

B.A(Bright annealed) STS tubes are mainly used for super clean gas pipe line. And surface roughness, dimension tolerance and mechanical properties are controlled by cold drawing process. With high corrosive resistant properties ILJIN clean BA tubes are manufactured by specialty production process.



■ Most advanced production facilities

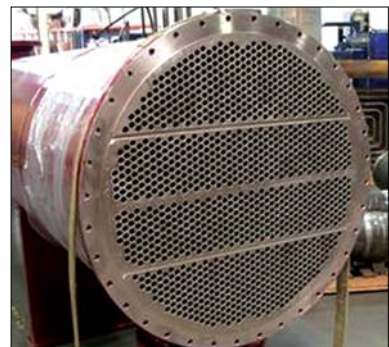
Our production process is focused on best quality products. Newly constructed plant is very clean and all machines are controlled by automation system. For the more the heat treatment furnace and cleaning line are adapted most advanced system and are very proud of ILJIN.



[Pipe Line]

■ Application

- Toxic and high purity gas supply line for semi-conductor and LCD manufacturing
- Instrument tube for oil & gas
- Painting & Sanitary use(beverage, drink, Medical)
- Damper & Gas spring
- Power plant Heat exchanger and Boiler
- Automobile parts (Engine fuel rail, Exhaustion system)
- Precision Roller Shaft
- Tube fitting & Elbow



[Heat Exchanger]



[Damper & Gas Spring]



[Auto body Painting]



[Fuel Tube]



■ Product Features

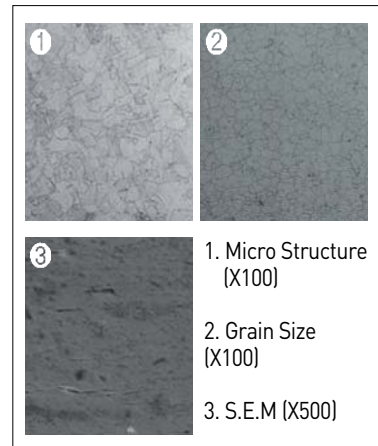


- Special Surface Control (Roughness, surface treatment)
- Special Tolerance Control
- Flexible Production (Mechanical properties control)
- Wide Size Range (O.D:6.35~60.5mm)

• Surface roughness

Size [mm]	Ry (μm)	Ra (μinch)
$0.D \leq 12.7$	3.0 Max.	10 Max.
$12.7 \leq 0.D \leq 25.4$	3.5 Max.	15 Max.
$25.4 < 0.D$	4.5 Max.	20 Max.

• Micrograph

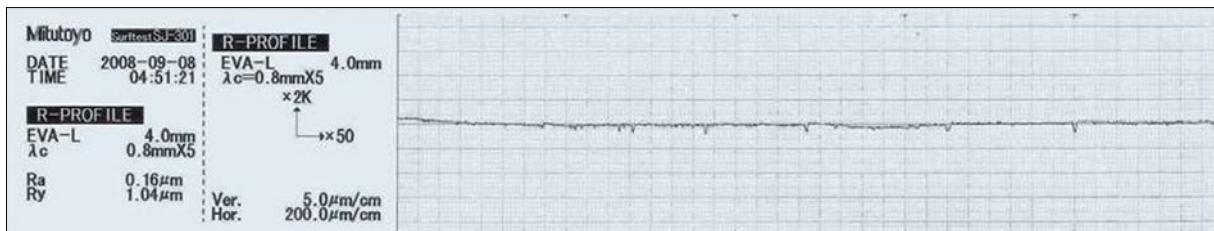


• Mechanical properties

※ Spec (Actual result)

Alloy	Y.S (MPa)	T.S (MPa)	E.L (%)
AISI304, 316	205min (280)	515min (610)	35min (51)
AISI304L, 316L	170min (260)	485min (590)	35min (53)

• Roughness test example



• High corrosion resistance

Improved B.A Condition
[Pure H₂ Gas Atmosphere]

Surface Passivation
[Formation of Cr₂O₃ Layer]



Passed
Inter-granular attacking test.
(ASTM A262)

Stainless Steel Tubes

International Standard

Seamless Tube				Welded Tube			
ASTM/ASME	DIN	EN	JIS	ASTM/ASME	DIN	EN	JIS
A213/SA213	17458	10216-5	G3463	A249/SA249	17457	10216-7	G3463
A312/SA312				A312/SA312			
A269/SA269			A269/SA269	G3459 (Special)			
A632			A632				
A270			A270	G3447			

Chemical Composition

(Unit : wt.%)

Spec.	Alloy	C	Si	Mn	P	S	Ni	Cr	Mo	
ASTM	TP304	Min.					8	18		
		Max.	0.08	1.00	2.00	0.045	0.03	11	20	
	TP304L	Min.						8	18	
		Max.	0.035	1.00	2.00	0.045	0.03	12	20	
	TP316	Min.						10	16	2
		Max.	0.08	1.00	2.00	0.045	0.03	14	18	3
	TP316L	Min.						10	16	2
		Max.	0.035	1.00	2.00	0.045	0.03	15	18	3
Special	TP316L-LS	Min.					12	16	2	
		Max.	0.025	0.60	0.80	0.040	0.005	15	18	3
	TP316L-HS	Min.					0.005	10	16	2
		Max.	0.035	0.75	1.80	0.040	0.012	14	18	3

※ Although the required material is not shown in above table, it is possible to review the spec.

Size range

Wall thickness →

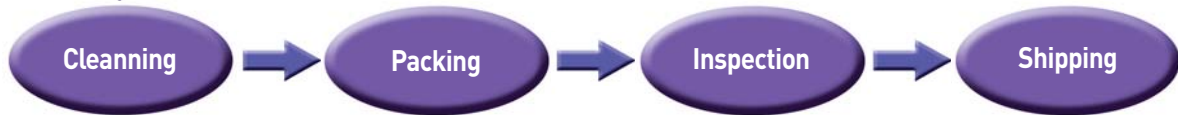
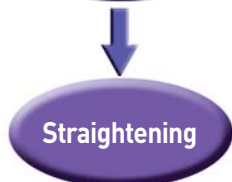
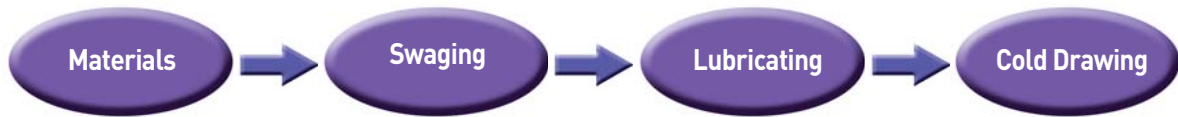
	inch	0.031	0.035	0.039	0.049	0.065	0.083	0.098	0.110	0.118
	mm	0.8	0.89	1.00	1.24	1.65	2.1	2.5	2.8	3.0
Outer diameter ↓	1/4	o	o	o						
	3/8	o	o	o	o					
	1/2	o	o	o	o					
	3/4	o	o	o	o	o	o			
	7/8	o	o	o	o	o	o	o		
	1	o	o	o	o	o	o	o	o	
	1 1/4	o	o	o	o	o	o	o	o	
	1 3/8		o	o	o	o	o	o	o	
	1 1/2		o	o	o	o	o	o	o	o
	1 3/4				o	o	o	o	o	o
	2					o	o	o	o	o
	2 1/2						o	o	o	o

○ Seamless tube
■ Welded tube

※ It is possible to review when the required size is out of above range.



■ Manufacturing Process (BA Tube)



○ Precision Cold Drawn Aluminum Tubes

■ Cold Drawn Aluminum Tube

ILJIN Precision Cold Drawn Aluminum Tubes are manufactured by using cold drawing technology on the basis of our accumulated know-how to ensure the precise dimension control and smooth surface roughness. Anodized products are also prepared for the application to the OPC drums.

■ Dimension Control

ILJIN Aluminum Tubes have excellent geometrical shape such as inner & outer diameter, wall thickness, run out, roundness and concentricity.

■ Features

- Excellent Surface Roughness & Quality
- Specialized Cold Drawing Technology
- Precision Dimension Control
- Reduce Material Scrap & Processing Time

■ Applications

- OPC Drum
- Rollers for Laser Printer
- Optical Instrument
- Heat Exchanger
- Air Conditioner
- Communication Part
- Air Cylinder
- Brush Cutter
- Shock Absorber



[Mirror Surface Tube]





■ Cold Drawn Aluminum Tube

[ASTM 1070, 1050, 1100, 1200, 2017, 2024, 3003, 3203, 6061, 6063 7075]

(Unit : mm)

O.D	W.T	0.6	0.8	1.0	1.2	1.6	1.8	2.0	2.5	3	4	5	6	8	10
	15														
20															
25															
30															
35															
40															
45															
50															

※ It is possible to review when the required size is out of above range.

■ Cold Drawn and Anodized AL Tube for OPC Drum

[ASTM 1100,3003,6063]

(Unit : mm)

Item	O.D	Length	Anodizing Thickness	Voltage Resistance
Spec.	Ø24, Ø30	220~360	4.5±0.5 μ m	100V/60sec (0.5A)

※ It is possible to review when the required size is out of above range.

■ Dimensional Tolerance

(Unit : mm)

Characteristics	Spec.	Remark
Tolerance of O.D	± 0.05	For All Products
Tolerance of I.D	± 0.05	
Tolerance of W.T	± 0.10	
Roundness	≤ 0.05	
Tolerance of Length	± 0.10	For Special Products
Perpendicularity	≤ 0.05	
T.I.R (300mm)	≤ 0.05	
Roughness (Rmax/Ra)	Outer Surface Inner Surface	

※ T.I.R : Total Indicator Reading, Run-Out

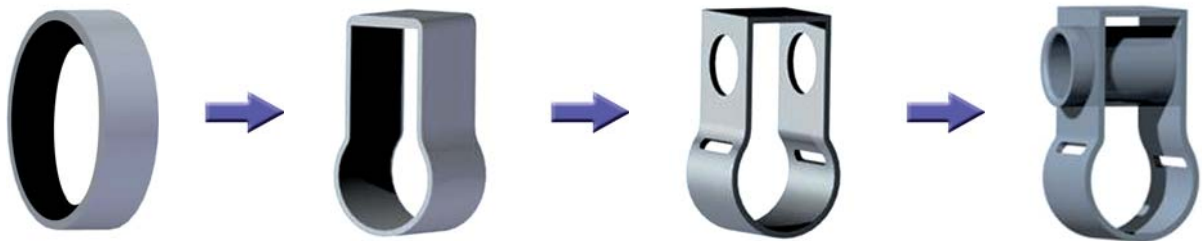
Automotive Tubular Parts

■ Total Solution for tubular parts

ILJIN is one of the best supplier to provide not only plain tube but also the tubular parts, many kinds of processed products. It is possible for us to suggest the best way to our customer for fabricating method of any kind of tubular parts. And our accumulated know-how for tube forming and designing the optimum process will be possible to cost reduction and value engineering.



[CNC Machining]



■ Tube Processing Technology

Our cold drawn tubes are used for tubular parts manufacturing and many kinds of process will be followed it. And main process of tubular part manufacturing are as followings.

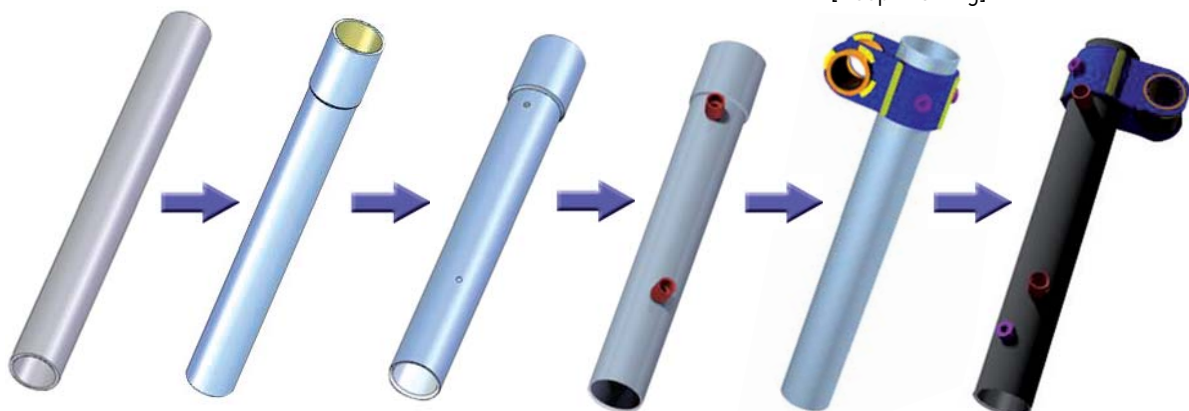
- Cutting & Chamfering
- Expanding, Swaging, Deep Drawing, Punching
- CNC Machining
- Projection Welding, CO₂ Welding
- Forging, Rolling
- E-Coating



[Projection Welding]



[Deep Drawing]

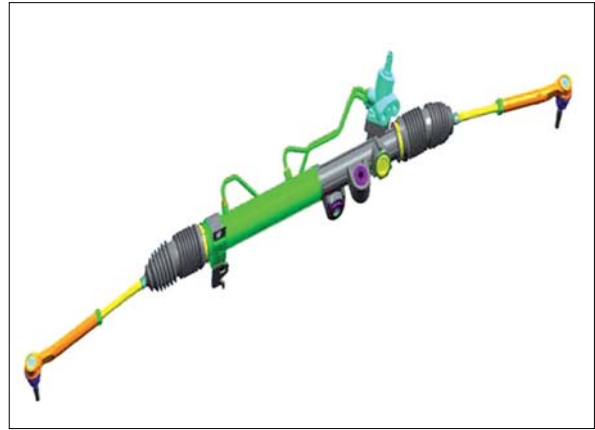




■ Steering Cylinder Tube Assembly



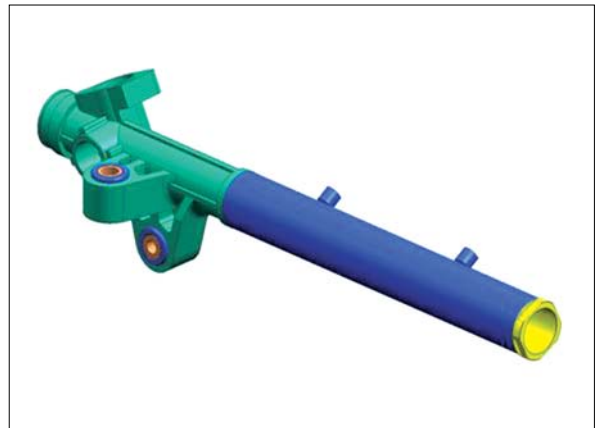
[Cylinder tube Assembly]



This is a main parts of power steer assembly (rack and pinion gear), which has superior advantages in view of precise dimensions, straightness, threshold, surface roughness, mechanical properties in tube forming, CNC processing and projection welding.

We are able to supply following types

- Hydraulic Rack housing
- CEPS
- Manual type Housing
- Full steel Housing



■ Propeller Shaft Tube Forming

This is a main parts of automobile propeller shaft, which is manufactured by precision cold drawing and hydraulic press forming machine. It is very important to straighten the tube and concentricity after end forming. We are able to keep the run-out 0.2mm max. in total length and the concentricity 0.05mm max..



[Propeller Shaft]

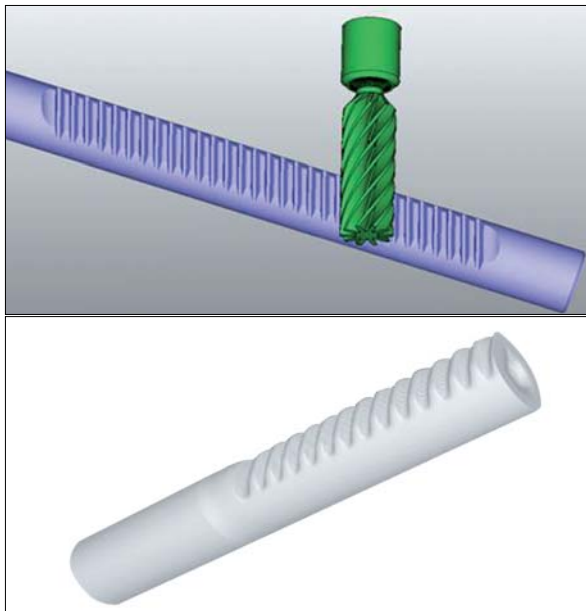


Automotive Tubular Parts

■ Forged Steering Rack Bar

ILJIN has developed the forged rack gear, both hollow and solid type. Since the rack gear tooth is formed by forging method, metal-flow is continuous and strength is increased. The advantages of forged rack gear are as below

- Weight & Cost reduction.
- Increased Gear strength and Life time.
- Possible to make Variable Gear Ratio (V.G.R).



[Rack Bar]

■ TUBE CHART (BUCKLE TUBE)

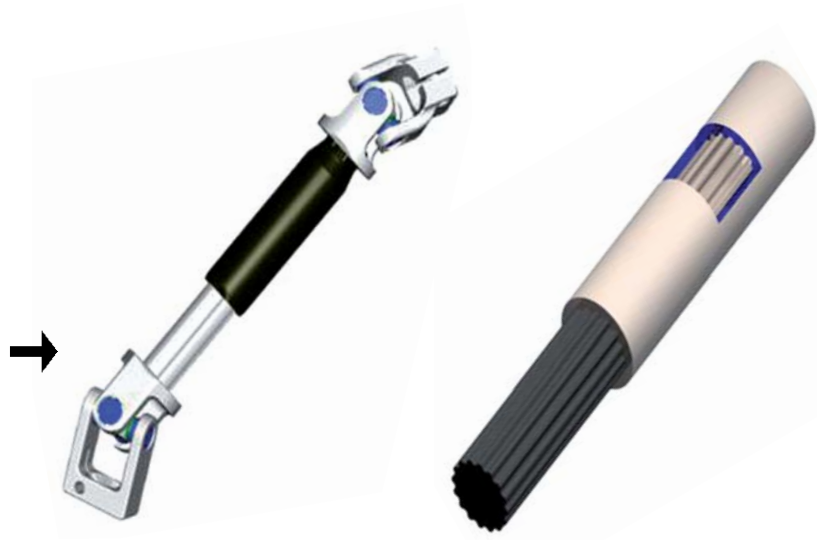
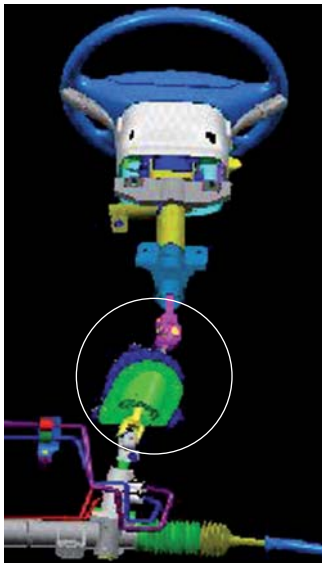
The buckle tube for Seat Belt free tension is introduced new forming method for high strength low elongation tube. Due to severe expanding the tube easily split. Therefore the material used for this parts is very special and difficult to get. But our forming technology breakthrough the problem and make easier to form the tube with general tube material. The buckle tube for Seat Belt free tension is introduced new forming method for high strength low elongation tube. Due to severe expanding the tube easily split. Therefore the material used for this parts is very special and difficult to get. But our forming technology breakthrough the problem and make easier to form the tube with general tube material.





■ Intermediate Shaft Assembly

This part has a function to absorbing the vibration from tire and conventional inside and outside gear manufacturing methods are broaching and machining. Non-machining type shaft and tubes were realized by our unique tube forming technology, cold drawing and forging.



Aluminium Clad Steel Wire

■ Better Strength To Weight Ratio

We learned that even half-emptied toothpaste tube in weight can mean a lot for climbers. We seriously examined whether we could reduce at least a couple of ounce without sacrificing strength.

■ Better Quality

In order to make new ACS Wire for more users such as OPGW & Transmission Cable manufacturer, we carefully considered whether we could come up with much stronger metallurgical bond at the aluminium-steel interface. As integration of state-of-the-art production facilities and ISO-9001 Quality Assurance Management, ILJIN ACS Wire guarantee better corrosion resistance, higher conductivity, lower weight and longlasting your cable.



Applications OF ILJIN ACS Wire

Aluminium Clad Steel Wire is one of the most innovation wire products introduced to the utility in modern time. Developed by ILJIN in 1994, ACS Wire consists of a highly conductive and corrosion resistant aluminium surface bonded to high strength carbone core.



■ Toughness (For OPGW)

Our goal id to make ACS Wire break-free, specially for the OPGW manufacturing, which this will maximize our customer's satisfaction. ILJIN ACS Wire is produced with a special heat treatment in order to increasing of Toughness.



■ Thermal Resistance (For STACTR)

We have great pride in developing the thermal resistant ACS Wire for the high voltage transmission cable (STACIR-Super Thermal Resistant Aluminium Conductor Invar Clad Steel Reinforced, 765KV0. This Will make your cable's voltage transmission maximize.



■ High Conductivity (For ACSR / AW & OHGW)

ILJIN ACS Wire is designed with various conductivity for our ccustomer's demanding from 14% up to 40% IACS. This thick CONCERNTRIC layer of aluminium is used to provide much higher conductivity. formability and excellent corrosion resistance in combination with good tensile strength.



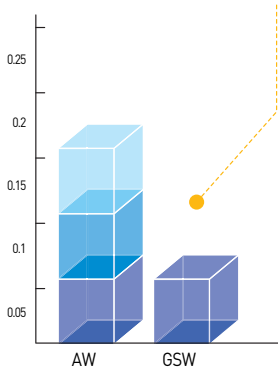
■ Come Closer To The Nature (For STAL - Fence & Net)

Our daily life is becoming increasingly dependant on the computer related technology. As this trend continues, out-door life becomes more inportant and envi ronment friendly . STAL -Fence(Aluminium Clad Steel Wire Fence) is our first development to meet our goal fr the Green Life by replacing the harmful nateral suce as Zn. Cd and so on to the light metal as like Aluminium.

■ Comparison Between ACS Wire & Galvanized Steel Wire (GSW)

Larger Thickness of AL

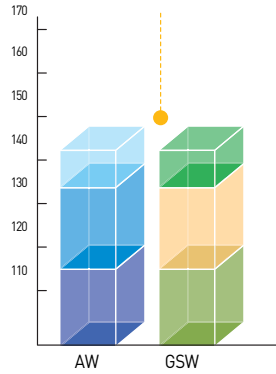
Better Corrosion Resistance



Minimm coating thickness (m)

Various T/S

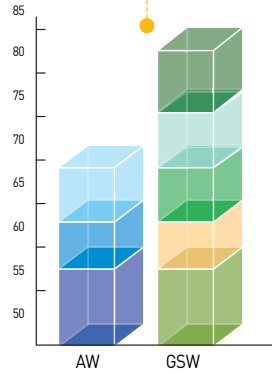
Various Application



Teneile strength (kgf/m)

Lighter

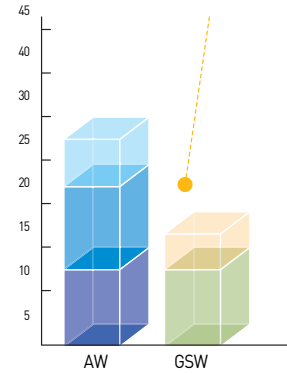
Less Installation Cost



Weight (kg/l)

Better Conductivity

Maximize Voltage Transmission

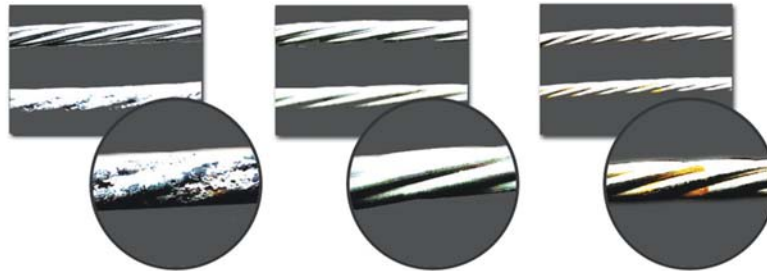


Ocndrivity (%)



■ Excellent Corrosion Resistance Of ACS Wire

Appearances of samples withdrawn from Salt Spray test (500hours)

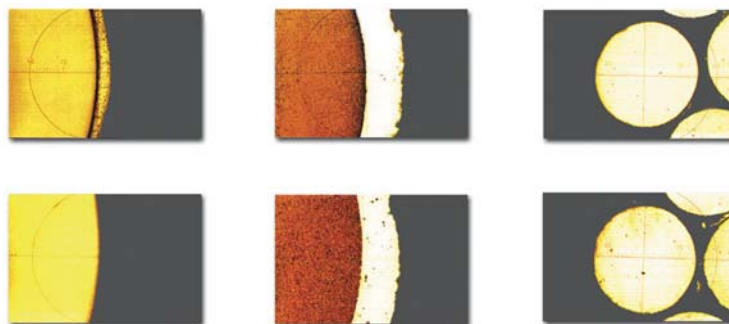


Galvanized Steel Wire

ACS Wire

Stainless Steel Wire

Enlarged Cross-section of the above samples



Galvanized Steel Wire

ACS Wire

Stainless Steel Wire

Zn was corroded



Aluminium Clad Steel Wire Specification

■ ACS Wire ASTM B415-98

Conductivity % IACS	Size AWG	Nominal Diameter		Ultimate tensile strength		Breaking strength		Calculated weight		Calculated resistance at 20 °C		Nominal Cross-section			
		in.	mm	psi	Mpa	lb	kN	lb/1,000ft	kg/km	Ω/1,000ft	Ω/km	cmils	in ²	mm ²	
20.3	4	0.2043	5.189	155,000	1,070	5,081	22.6	93.63	139.4	1.222	4.009	41,740	0.03278	21.15	
		0.1880	4.775	160,000	1,100	(4,441)	(19.7)	(79.32)	(118.0)	(1.443)	(4.735)	(35,340)	(0.02776)	(17.91)	
	5	0.1819	4.620	165,000	1,140	4,290	18.1	74.25	110.4	1.541	5.060	33,090	0.02599	16.76	
		0.1729	4.392	170,000	1,170	(3,991)	(17.1)	(67.09)	(99.84)	(1.706)	(5.597)	(29,900)	(0.02348)	(15.15)	
	6	0.1620	4.114	175,000	1,210	3,608	16.0	58.88	87.58	1.943	6.381	26,240	0.02061	13.29	
		0.1549	3.934	180,000	1,240	(3,392)	(15.1)	(53.83)	(80.13)	(2.126)	(6.974)	(24,000)	(0.01884)	(12.16)	
	27	7	0.1443	3.665	185,000	1,250	3,025	13.5	46.69	69.52	2.450	8.038	20,820	0.01635	10.55
			0.1369	3.477	190,000	1,310	(2,797)	(12.4)	(42.06)	(62.57)	(2.722)	(8.931)	(18,740)	(0.01472)	(9.495)
		8	0.1285	3.264	195,000	1,340	2,529	11.2	37.03	55.14	3.089	10.14	16,510	0.01297	8.367
			0.1144	2.906	195,000	1,340	2,005	8.92	29.37	43.71	3.896	12.78	13,090	0.01028	6.633
		10	0.1019	2.588	195,000	1,340	1,590	7.07	23.29	34.66	4.912	16.12	10,380	0.00816	5.260
			0.0907	2.304	195,000	1,340	1,261	5.61	18.47	27.47	6.194	20.34	8,230	0.00646	4.169
12		0.0808	2.052	195,000	1,340	1,000	4.45	14.65	21.79	7.811	25.64	6,530	0.00513	3.307	
		4	0.2043	5.189	125,000	862	4,098	18.2	84.00	125.0	0.920	3.019	41,740	0.03278	21.15
5			0.1880	4.775	129,000	889	(3,581)	(15.9)	(71.12)	(105.8)	(1.087)	(3,566)	(35,340)	(0.02776)	(17.91)
		6	0.1819	4.620	133,000	917	3,457	15.4	66.59	99.05	1.161	3.810	33,090	0.02599	16.76
7			0.1729	4.392	137,000	945	(3,217)	(14.3)	(60.16)	(89.54)	(1.285)	(4.215)	(29,900)	(0.02348)	(15.15)
		8	0.1620	4.114	141,000	972	2,906	12.9	52.80	78.54	1.464	4.805	26,240	0.02061	13.29
9	0.1549		3.934	145,000	1,000	(2,733)	(12.2)	(48.27)	(71.87)	(1.600)	(5.252)	(24,000)	(0.01884)	(12.16)	
	10	0.1443	3.665	150,000	1,034	2,453	10.9	41.89	62.35	1.845	6.053	20,820	0.01635	10.55	
11		0.1369	3.477	154,000	1,062	(2,267)	(10.1)	(37.71)	(56.12)	(2.050)	(6.726)	(18,740)	(0.01472)	(9.495)	
	12	0.1285	3.264	156,000	1,076	2,023	9.00	33.23	49.45	2.326	7.632	16,510	0.01297	8.367	
30		8	0.1144	2.906	156,000	1,076	1,604	7.13	26.34	39.20	2.934	9.628	13,090	0.01028	6.633
	0.1019		2.588	156,000	1,076	1,272	5.66	20.89	31.09	3.700	12.14	10,380	0.00816	5.260	
	9	0.0907	2.304	156,000	1,076	1,008	4.48	16.55	24.64	4.667	15.32	8,230	0.00646	4.169	
		0.0808	2.052	156,000	1,076	800	3.56	13.14	19.54	5.882	19.31	6,530	0.00513	3.307	
	10	0.2043	5.189	102,000	703	3,344	14.9	0.828	118.7	0.828	2.717	41,740	0.03278	21.15	
		0.1880	4.775	106,000	731	(2,942)	(13.1)	(0.978)	(100.5)	(0.978)	(3.209)	(35,340)	(0.02776)	(17.91)	
	11	0.1819	4.620	110,000	758	2,859	12.7	1.045	94.02	1.045	3.429	33,090	0.02599	16.76	
		0.1729	4.392	114,000	786	(2,677)	(11.9)	(1.156)	(84.99)	(1.156)	(3.793)	(29,900)	(0.02348)	(15.15)	
	12	0.1620	4.114	114,000	786	2,350	10.5	1.317	74.56	1.317	4.324	26,240	0.02061	13.29	
		0.1549	3.934	118,000	814	(2,224)	(9.89)	(1.440)	(68.22)	(1.440)	(4.726)	(24,000)	(0.01884)	(12.16)	
	40	13	0.1443	3.665	122,000	841	1,995	8.87	1.660	59.19	1.660	5.447	20,820	0.01635	10.55
			0.1369	3.477	126,000	869	(1,855)	(8.25)	(1.845)	(53.27)	(1.845)	(6.053)	(18,740)	(0.01472)	(9.495)
14		0.1285	3.264	128,000	883	1,660	7.38	2.094	46.94	2.094	6.869	16,510	0.01297	8.367	
		0.1144	2.906	128,000	883	1,316	5.86	2.642	37.21	2.642	8.664	13,090	0.01028	6.633	
15		0.1019	2.588	128,000	883	1,044	4.47	3.329	29.51	3.329	10.93	10,380	0.00816	5.260	
		0.0907	2.304	128,000	883	827	3.68	4.203	23.39	4.203	13.79	8,230	0.00646	4.169	
16		0.0808	2.052	128,000	883	657	2.92	5.295	18.55	5.295	17.38	6,530	0.00513	3.307	
		4	0.2043	5.189	80,000	552	2,622	11.7	0.621	98.14	0.621	2.038	41,740	0.03278	21.15
5			0.1880	4.775	84,000	579	(2,332)	(10.4)	(0.734)	(83.10)	(0.734)	(2.406)	(35,340)	(0.02776)	(17.91)
		6	0.1819	4.620	88,000	607	2,287	10.2	0.784	77.77	0.784	2.572	33,090	0.02599	16.76
7			0.1729	4.392	92,000	634	(2,160)	(9.61)	(0.857)	(70.30)	(0.857)	(2.845)	(29,900)	(0.02348)	(15.15)
		8	0.1620	4.114	96,000	662	1,979	8.80	0.988	61.67	0.988	3.243	26,240	0.02061	13.29
9	0.1549		3.934	96,000	662	(1,809)	(8.05)	(1.080)	(56.42)	(1.080)	(3.544)	(24,000)	(0.01884)	(12.16)	
	10	0.1443	3.665	98,000	676	1,602	7.13	1.245	48.95	1.245	4.085	20,820	0.01635	10.55	
11		0.1369	3.477	98,000	676	(1,443)	(6.42)	(1.384)	(53.27)	(1.384)	(4.539)	(18,740)	(0.01472)	(9.495)	
	12	0.1285	3.264	99,500	686	1,290	5.74	1.571	38.82	1.571	5.151	16,510	0.01297	8.367	
13		0.1144	2.906	99,500	686	1,023	4.55	1.981	30.78	1.981	6.498	13,090	0.01028	6.633	
	14	0.1019	2.588	99,500	686	811	3.61	2.498	24.41	2.498	8.194	10,380	0.00816	5.260	
15		0.0907	2.304	99,500	686	643	2.86	3.151	19.35	3.151	10.34	8,230	0.00646	4.169	
	16	0.0808	2.052	99,500	686	510	2.27	3.971	15.34	3.971	13.03	6,530	0.00513	3.307	

■ Physical Constants

Conductivity (%)	Density at 20 °C	Modulus of elasticity	Coefficient of linear expansion	Temperature coefficient of resistance
20.3	0.2381 lb/in ³ (6.59 g/cm ³)	23.5 × 10 ⁶ psi (162 GPa)	0.0000072/°F (12.6 × 10 ⁻⁴ /°C)	0.0020/°F (0.0036/°C)
27	0.2135 lb/in ³ (5.91 g/cm ³)	20.5 × 10 ⁶ psi (140 GPa)	0.0000077/°F (13.4 × 10 ⁻⁴ /°C)	0.0020/°F (0.0036/°C)
30	0.2027 lb/in ³ (5.61 g/cm ³)	19.1 × 10 ⁶ psi (132 GPa)	0.0000079/°F (13.8 × 10 ⁻⁴ /°C)	0.0021/°F (0.0038/°C)
40	0.1676 lb/in ³ (4.64 g/cm ³)	15.8 × 10 ⁶ psi (109 GPa)	0.0000089/°F (15.5 × 10 ⁻⁴ /°C)	0.0022/°F (0.0040/°C)

■ High Strength Aluminium Clad Invar Steel Wire (Thermal Resistant ACS Wire)

Nominal Diameter	Diameter Tolerance	Ultimate tensile strength	Elongation	Torsion	Conductivity	Aluminium Thickness		Calculated weight	Nominal Cross-section
						Min.	Ave.		
(mm)	(mm)	(Kgf/mm ²)	(%)	(times)	(%)	(mm)	(mm)	(kg/km)	(mm ²)
2.47	±0.05	125	1.5	20	14	0.06	0.15	34.02	4.792
3.10	±0.06	120	1.5	20	14	0.07	0.17	53.48	7.548
3.20	±0.06	120	1.5	20	14	0.07	0.17	57.10	8.042
3.50	±0.07	120	1.5	20	14	0.08	0.18	68.31	9.621

Physical Constants

Density: 7.1g/cm³

Coefficient of linear expansion: 3.7 × 10⁻⁴/°C at 15 °C ~230 °C, 10.8 × 10⁻⁴/°C at 230 °C ~290 °C

Elastic Coefficient : 15,500kg/mm²



■ ASTM B416-98

Size Nos/AWG	Nominal diameter of wire		Stranded diameter		Breaking strength		Weight		Resistance at 20 °C		Nominal cross-section		
	in.	mm	in.	mm	lb	kN	lb/1,000ft	kg/km	Ω/1,000ft	Ω/km	cmils	in ²	mm ²
37/5	0.1819	4.620	1.27	32.34	142,800	636.2	2,802	4,168	0.04247	0.1395	1,225,000	0.9619	620.1
37/6	0.1620	4.115	1.13	28.80	120,200	535.9	2,222	3,308	0.05356	0.1758	971,300	0.7629	492.1
37/7	0.1443	3.665	1.01	25.66	100,700	449.7	1,762	2,624	0.06754	0.2216	770,300	0.6050	390.4
37/8	0.1285	3.264	0.899	22.85	84,200	373.4	1,398	2,081	0.08516	0.2794	610,900	0.4798	390.6
37/9	0.1144	2.906	0.801	20.34	66,770	296.0	1,108	1,650	0.1074	0.3525	484,400	0.3805	245.4
37/10	0.1019	2.588	0.713	18.12	52,950	234.7	879.0	1,308	0.1354	0.4445	384,200	0.3017	194.6
19/5	0.1819	4.620	0.910	23.10	73,350	326.7	1,430	2,128	0.08224	0.2701	628,900	0.4940	318.4
19/6	0.1620	4.115	0.810	20.57	61,700	275.2	1,134	1,689	0.1037	0.3403	498,800	0.3917	252.7
19/7	0.1443	3.665	0.721	18.33	51,730	230.9	899.5	1,339	0.1308	0.4289	395,500	0.3107	200.5
19/8	0.1285	3.264	0.642	16.32	43,240	191.7	713.5	1,062	0.1649	0.5408	313,700	0.2464	159.0
19/9	0.1144	2.906	0.572	14.53	34,290	152.0	565.8	842.1	0.2079	0.6824	248,800	0.1954	126.0
19/10	0.1019	2.588	0.509	12.94	27,190	120.5	448.7	667.8	0.2622	0.8604	197,300	0.1549	99.94
7/5	0.1819	4.620	0.546	13.86	27,030	120.4	524.9	780.9	0.2264	0.7302	231,700	0.1820	117.3
7/6	0.1620	4.115	0.486	12.34	22,730	101.4	416.3	619.7	0.2803	0.9200	183,800	0.1443	93.10
7/7	0.1443	3.665	0.433	11.00	19,060	85.1	330.0	491.5	0.3535	1.1598	145,700	0.1145	73.85
7/8	0.1285	3.264	0.385	9.792	15,930	70.6	261.8	389.8	0.4458	1.4623	115,600	0.09077	58.57
7/9	0.1144	2.906	0.343	8.717	12,630	56.0	207.6	309.0	0.5621	1.8447	91,650	0.07198	46.43
7/10	0.1019	2.588	0.306	7.765	10,020	44.4	164.7	245.1	0.7088	2.3261	72,680	0.05708	36.82
7/11	0.0907	2.304	0.272	6.911	7,945	35.2	130.6	194.2	0.8938	2.9352	57,590	0.04523	29.18
7/12	0.0808	2.052	0.242	6.156	6,301	27.9	103.6	154.1	1.127	3.6997	45,710	0.03590	23.15
3/5	0.1819	4.620	0.392	9.957	12,230	54.5	224.5	334.0	0.5177	1.7000	99,310	0.07800	50.28
3/6	0.1620	4.115	0.349	8.868	10,280	45.9	178.1	265.0	0.6528	2.1423	78,750	0.06185	39.90
3/7	0.1443	3.665	0.311	7.899	8,621	38.5	141.2	210.2	0.8232	2.7007	62,450	0.04905	31.65
3/8	0.1285	3.264	0.277	7.034	7,206	32.0	112.0	166.7	1.038	3.4055	49,530	0.03890	25.10
3/9	0.1144	2.906	0.247	6.263	5,715	25.3	88.81	132.2	1.309	4.2954	39,280	0.03085	19.90
3/10	0.1019	2.588	0.220	5.578	4,532	20.1	70.43	104.8	1.651	5.4169	31,150	0.02446	15.78

■ Aluminium Clad Mild Steel Wire(STALUME) KS D 7037-00

Nominal Diameter	Diameter Tolerance	Ultimate tensile strength	Torsion	Conductivity	Aluminium Thickness Min	Calculated weight	Nominal Cross-section
(mm)	(mm)	(Kgf/mm ²)	(times)	(%)	(mm)	(kg/km)	(mm ²)
1.60	±0.05	60-90	55	20.3	0.06	13.3	2.011
2.30	±0.07	60-90	38	20.3	0.12	27.4	4.155
3.20	±0.07	55-85	26	20.3	0.16	53.0	8.042
3.50	±0.08	50-80	24	20.3	0.18	63.5	9.621
4.00	±0.08	40-80	21	20.3	0.20	82.9	12.566
5.00	±0.10	40-80	17	20.3	0.25	130.0	19.635
6.00	±0.12	40-80	13	20.3	0.30	186.0	28.274

■ ACS Wire ASTM B502-98

Nominal cross-section		Stress at 1.0% extension		Ultimate tensile strength		Elongation	Resistivity at 20 °C
(mm)	in.	MPa	psi	MPa	psi	%	Ω · mm ² /m
1.956-3.274	0.0770-0.1289	1,206	175,000	1,344	195,000	1.5	0.08480
3.275-3.477	0.1290-0.1369	1,172	170,000	1,310	190,000	1.5	
3.478-3.665	0.1370-0.1443	1,137	165,000	1,275	185,000	1.5	
3.666-3.934	0.1444-0.1549	1,103	160,000	1,241	180,000	1.5	
3.935-4.115	0.1550-0.1620	1,103	160,000	1,206	175,000	1.5	
4.116-4.392	0.1621-0.1729	1,068	155,000	1,172	170,000	1.5	
4.393-4.620	0.1730-0.1819	1,034	150,000	1,137	165,000	1.5	
4.621-4.775	0.1820-0.1880	1,000	145,000	1,103	160,000	1.5	

Mobile Metal Case

■ Mobile Metal Case

Recently, mobile electrical devices are demanded to be smaller and thinner, and this results in the need of new material. Our company has developed forming technology for the new material to meet this demand.

- Sheet alloys our company can press-form are shown in below table.



[Non-ferrous Metal Press Forming]

■ Magnesium Speaker Diaphragm

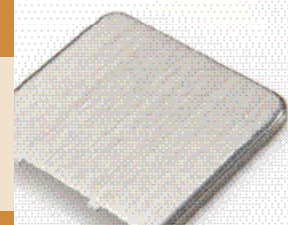


[Speaker Diaphragm]

Magnesium is ideal material for speaker diaphragm because of its high specific strength and high internal loss of sound. However, practicability was low due to difficulty in processing and weak corrosion resistance. Our company has developed speaker diaphragm using magnesium forming technology and surface treatment technology, and we can produce any forms of diaphragm as well.

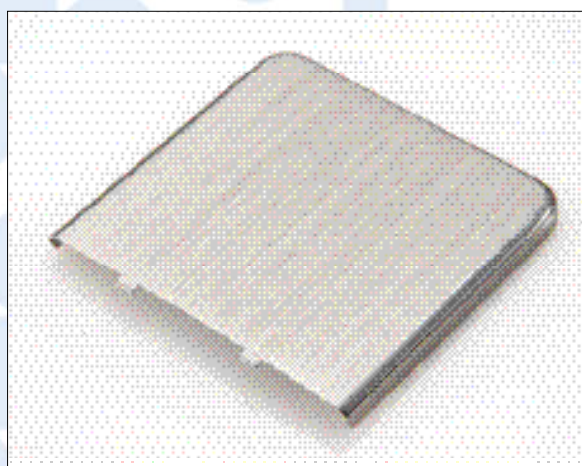
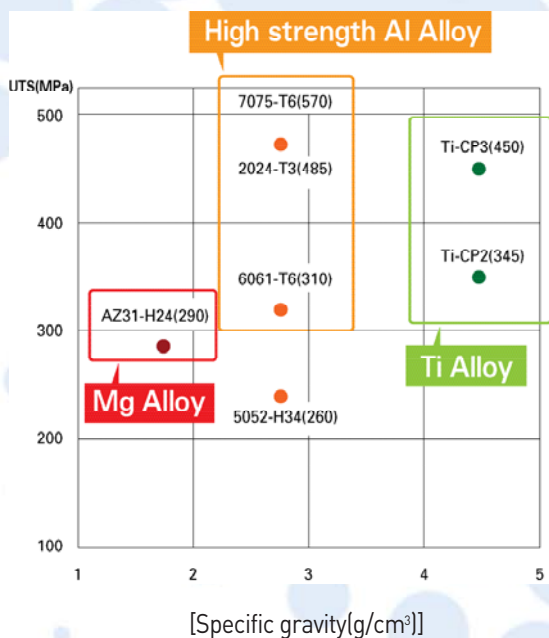
■ Manufacturing Specification

Material	Thickness	Ultimate	Application
AZ31	50 μm ~	290MPa	Diaphragm, Mobile Phone, Note PC
AA5052	0.3mm~	260MPa	Mobile Phone, Note PC, Navigation
AA6061-T6	0.5mm~	310MPa	"
AA2024-T4, T3	0.5mm~	485MPa	"
AA7075	0.5mm~	570MPa	"
Ti (grade1, 2, 3)	0.5mm~	450MPa	"



■ Press Forming Technology

We have locker forming technology using the high strength alloy without welding process



■ High Glossy and Anti-Corrosive Surface Treatment

Magnesium sheet alloy has advantage of showing metallic feeling and luster which cannot be implemented in diecasting products, while it has disadvantage of weak corrosion resistance. Although Magnesium sheet alloy can not maintain high corrosion resistance and high gloss at the same time, our company developed the high function surface treatment technology.





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