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## ALUMINUM EXTRUSION TOTAL SOLUTION

- A leader of high strength Aluminum alloy extrusion industry



## » Greeting



**Changsung Metal** offers outstanding products based on continuous technical development to meet the demands from various aluminum required industry fields.

Our products have been widely applied for a variety range of industry including:

- ☑ Automotive and machinery parts
- ☑ Defense & Electronics
- ☑ Medical equipment
- ☑ Leisure

For more than two decade, we have been making a continuous effort on developing process technology for high strength alloy extrusion to guarantee the production of qualified products under its well organized production system. As consequent, we can equip a wide range of extruding, drawing and other related processing facilities. It allows us to manufacture and supply products with various requirements from customers at an increasing volume of production.

Under reinforced production capacity and quality assurance system, we can assure our valuable customers to consistently provide an integrated solution to aluminum alloy product.



Head office & Factory #1



Factory #2 A



Factory #2 B

## » Company History

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| <p><b>2020</b></p> <p><b>2019</b></p> <p><b>2018</b></p> <p><b>2016</b></p> <p><b>2014</b></p> <p><b>2013</b></p> <p><b>2012</b></p> <p><b>2010</b></p> <p><b>2007</b></p> <p><b>2003</b></p> <p><b>2002</b></p> <p><b>2001</b></p> <p><b>1999</b></p> <p><b>1998</b></p> <p><b>1997</b></p> <p><b>1996</b></p> <p><b>1995</b></p> | <p>12 Start of operation of Auto Solution heat treatment M/C, Selection of POSCO Smart Factory Support Project</p> <p>08 Selection for project to support automation and advanced development of root companies (Korea National Ppuri Industry Center)</p> <p>05 Start of operation of Auto drawing M/C</p> <p>04 Selection as family company of Korea institution of Energy Resaarch</p> <p>12 Start of operation of 4 automation equipments (Auto swaging M/C etc.)</p> <p>12 Participation of government project titled "Development of energy-saving type constant-speed extrusion system for high strength Al alloys" (~2020.3.31)</p> <p>06 Development of tail wing of shell</p> <p>07 Development of tail wing of mortar shell</p> <p>02 Operation of 1650 UST direct extruder</p> <p>12 Completion of 2nd site</p> <p>05 Certification of enterprise specialized in component &amp; material [Ministry of Trade, Industry and Energy]</p> <p>08 Acqusition of technical innovation type of medium and small enterprise certification (Inno-Biz)</p> <p>05 Establishment of affiliated research institute (Korean Industrial Technology Association)</p> <p>01 Acquisition of ISO 9001 :2008 certification</p> <p>08 Development and production of spools for transmission</p> <p>05 Development and production of free-cutting alloy with Pb free</p> <p>04 Developments and productions of drum for photocapier and wire-type alminium fuze for missiles</p> <p>02 Development and production of hiking sticks and other parts for leisure-purpose</p> <p>03 Development of LBP Drum Tube and production</p> <p>12 Relocation (Current location)</p> <p>12 incorporation of going business</p> <p>10 Relocation plan set-up</p> <p>03 Development of wire-type alminium fuze for missiles with Hanhwa and Agency for Defense Development, ADD</p> <p>01 Development and production of tube for laser printer</p> <p>03 Export of free cutting aluminium alloy for electronic parts</p> <p>03 Localization of Al alloys for free cutting (Import substitution)</p> <p>11 Establishment of Changsung metal Co., Ltd (Kimpo-Si, Kyungki-Do)</p> |
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## » Certification



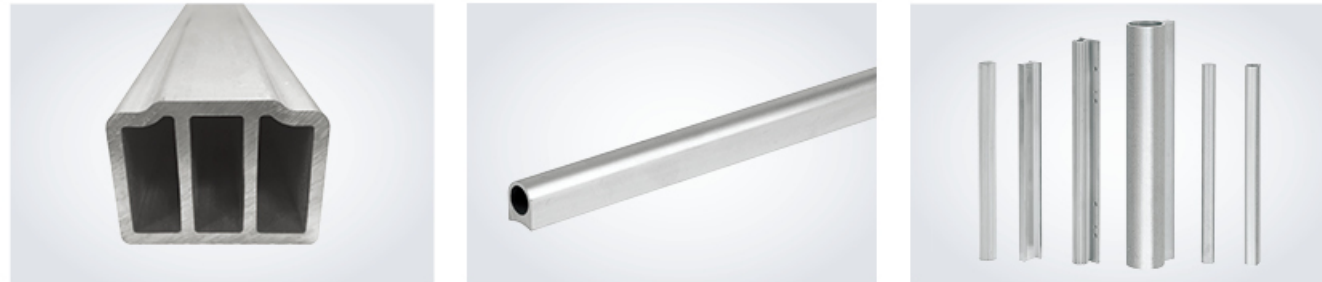


## » Business domain

### Automotive & Machinery

Aluminum alloys provide high strength, light weight, corrosion resistance, and flexibility, which facilitate the ultimate goal of weight reduction. In addition, aluminum is a technically versatile material for great variety of shape and contour with superior characteristic of free-cutting. Therefore, precision part made from aluminum alloys have been widely applied for automotive and machinery industries.

Changsung metal has an outstanding experience and expertise on producing diverse type of precision products such as round bar, rectangular, tube etc for automotive and machinery parts requiring precision processing.



### Applications

Parts of engine, Bumper,  
Aircraft structure,  
Joint coupling nut & bolt etc



### Characteristics & Our merit

- ✓ Providing lead-free alloy alternative to 2011 with the identical mechanical properties and characteristics of free-cutting
- ✓ Superior precision in size and straightness

### Production Capability Range (Extrusion)

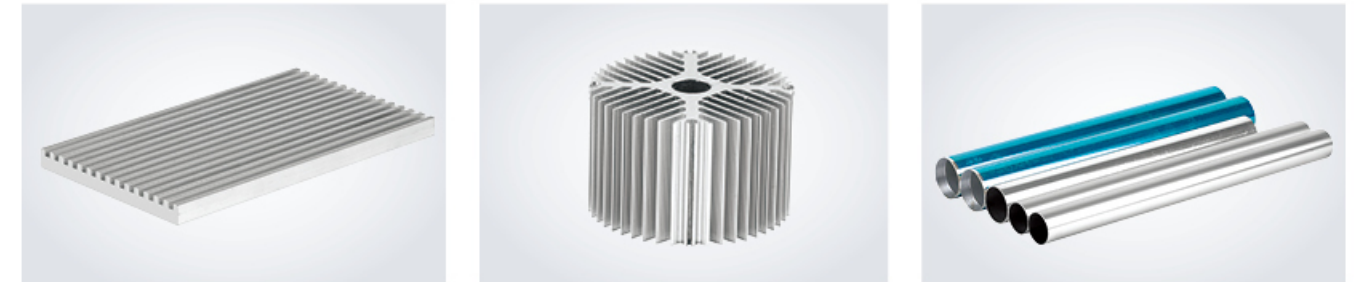
Size	Alloy
Rod : $\Phi$ 4.5 ~ $\Phi$ 45 Seam pipe : $\Phi$ 9x2T ~ $\Phi$ 60x4T Plate : W13x3.5T ~ W118x6T Hex : 4.9 mm ~ 35mm Bar : 5mm ~ 45mm Shape : As required (4.5mm ~ 120mm)	2011, 2012, 2017, 2024, 6061, 6063, 6110, 6262A, 7021, 7075

## » Business domain

### Electrical and Electronics part

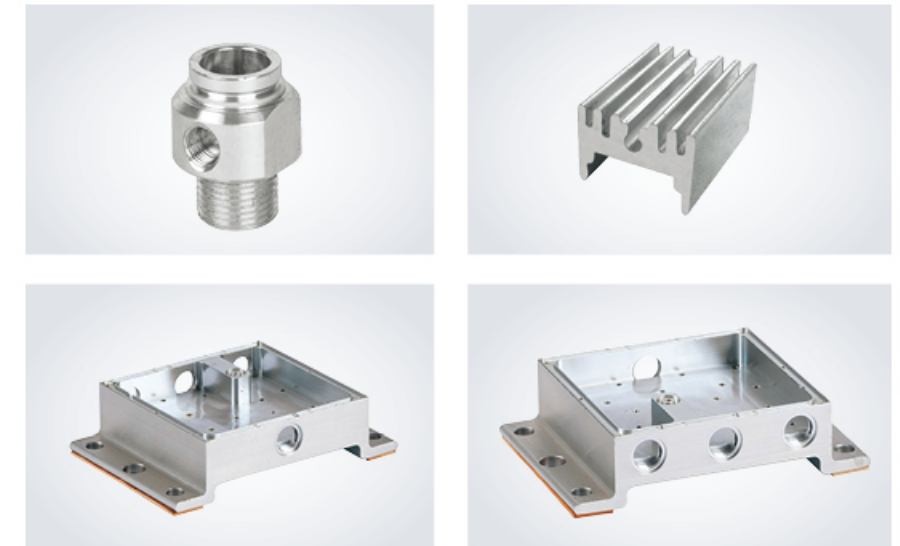
Aluminum extrusions have been increasingly considered as the most important process in the electronics industry. Electronics manufacturers have recently been implementing aluminum to replace steel and plastic. Aluminum is stronger and more reliable than plastic yet lighter than steel, which, combined with its innate ability to absorb and dissipate heat, leads to an increase in aluminum usage in this field

Changsung metal can fit request from customers by providing total solution including quality, customized shape & size, shortening delivery time, etc .



### Applications

Sensor bracket, Laser printer,  
Small size motor, Heat sink etc



### Characteristics & Our merit

- ✓ Capability to produce complex shaped design

### Production Capability Range (Extrusion)

Size	Alloy
Rod : $\Phi$ 4.5 ~ $\Phi$ 45 Seam pipe : $\Phi$ 9x2T ~ $\Phi$ 60x4T Plate : W13x3.5T ~ W118x6T Hex : 4.9 mm ~ 35mm Bar : 5mm ~ 45mm Shape : As required (4.5mm ~ 120mm)	2011, 2012, 2017, 2024, 6061, 6063, 6110, 6262A, 7075

## » Business domain

### Leisure

Aluminium is an excellent choice of frame material for outdoor furniture due to its elegant appearance, low maintenance requirements, ease of manufacture and competitive cost with great strength-to-weight ratio allowing it easy to be handled and transferred.

In addition, superior resistant to corrosion makes aluminum versatile as a right material which stands rigidly in the marine condition. Its naturally corrosion and rust resistance providing long-last usage life time.



### Applications

Tent, Hiking tools, Safety devices (Harness, Carabiner), Bicycle etc



### Characteristics & Our merit

- ✓ Control operation condition to suppress any surface defects like grain growth, pick-up, die line, orange-peel, tearing
- ✓ Superior precision in size and straightness
- ✓ Possible to form complex shaped design

### Production Capability Range (Extrusion)

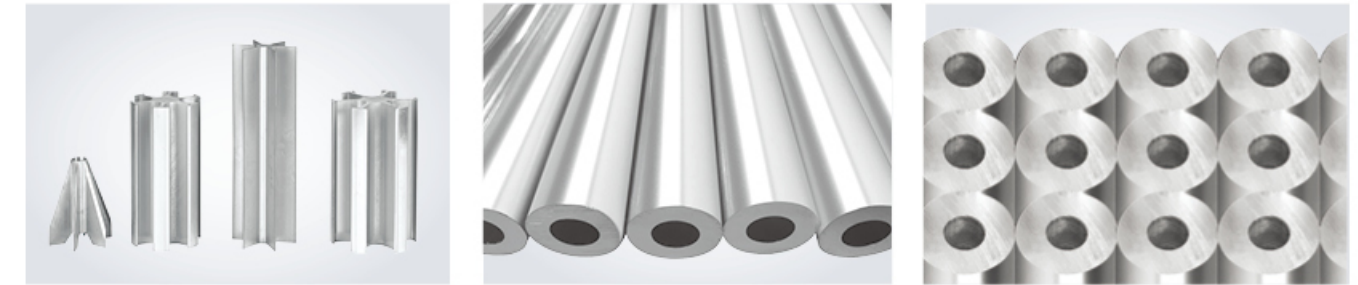
Size	Alloy
Seam pipe : $\Phi 12 \times 1.3T \sim \Phi 40 \times 1T$ Seamless pipe : $\Phi 12 \sim \Phi 34$ Plate : $W13 \times 3.5T \sim W118 \times 6T$ Rod : $\Phi 4.5 \sim \Phi 45$	6061, 6063, 6110A

## » Business domain

### Defense

Aluminum is lighter, more malleable and elastic in comparison of steel. Among many advantages, aluminum's superior strength-to-weight ratio makes it the ideal material for the military purpose. So its versatile ability to engineer a wide range of functionality into components provides a certain solution for defense and military fields.

Changsung metal can offer a full range of aluminum alloys from soft to hard alloys of 1xxx alloys, 2xxx alloys, 3xxx alloys, 5xxx alloys, 6xxx alloys and 7xxx alloys in the form of bar, rod, shape and pipe with seam and seamless type.



### Applications

Fuze (missile & shell),  
tail wing (Mortar shell),  
Any military purpose components



### Characteristics & Our merit

- ✓ Thorough quality and process monitoring
- ✓ Superior precision in size and straightness

### Production Capability Range (Extrusion)

Size	Alloy
Rod : $\Phi 4 \sim \Phi 8$ Seamless pipe : $\Phi 14 \times 2T \sim \Phi 38 \times 1T$ Shape : As required	1070, 2017, 6061, 7075, Pb

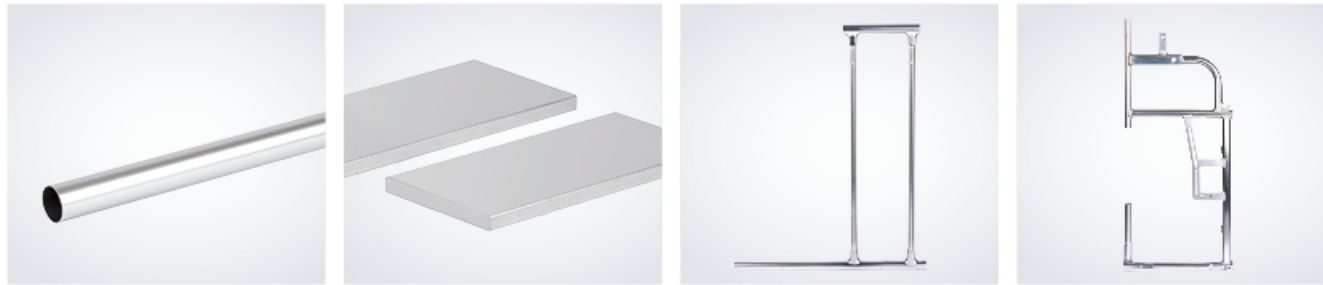


## Business domain

### Medical equipment

Many of benefits making aluminum highly desirable in modern industrial fields plays also a primary role in the medical industry. As well known, aluminum shows lighter than steel, but better strength-to-weight ratio allowing medical equipment thinner, durable and transfer flexible. Only limited materials can fit those advantages of aluminum.

There must be no mistake on quality when aluminum comes to medical equipment.



### Applications

Wheel chair, Walker, Crutches, Hand rail



### Characteristics & Our merit

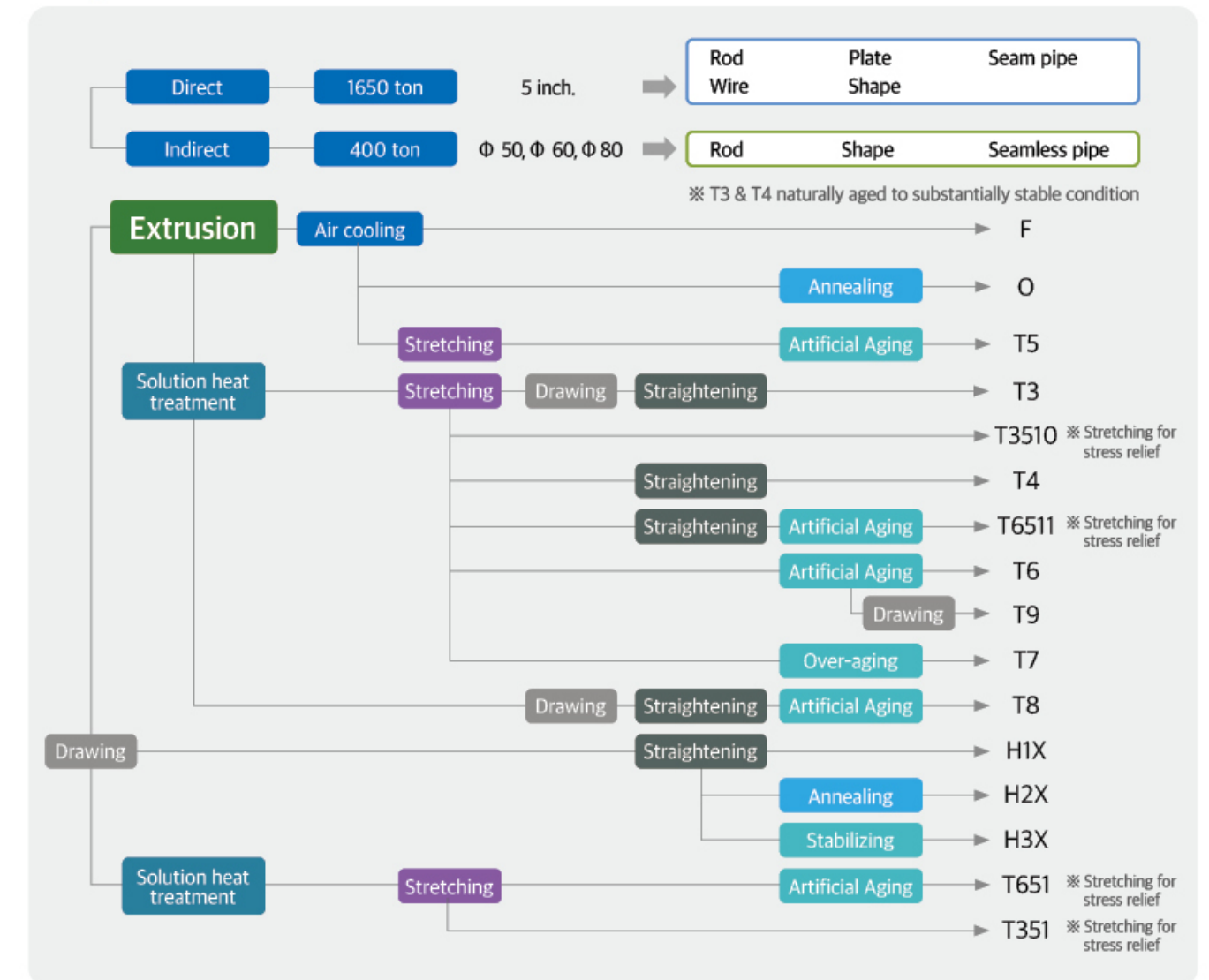
- ✓ Lightening & customized design
- ✓ Excellent quality control & precise extrusion

### Production Capability Range (Extrusion)

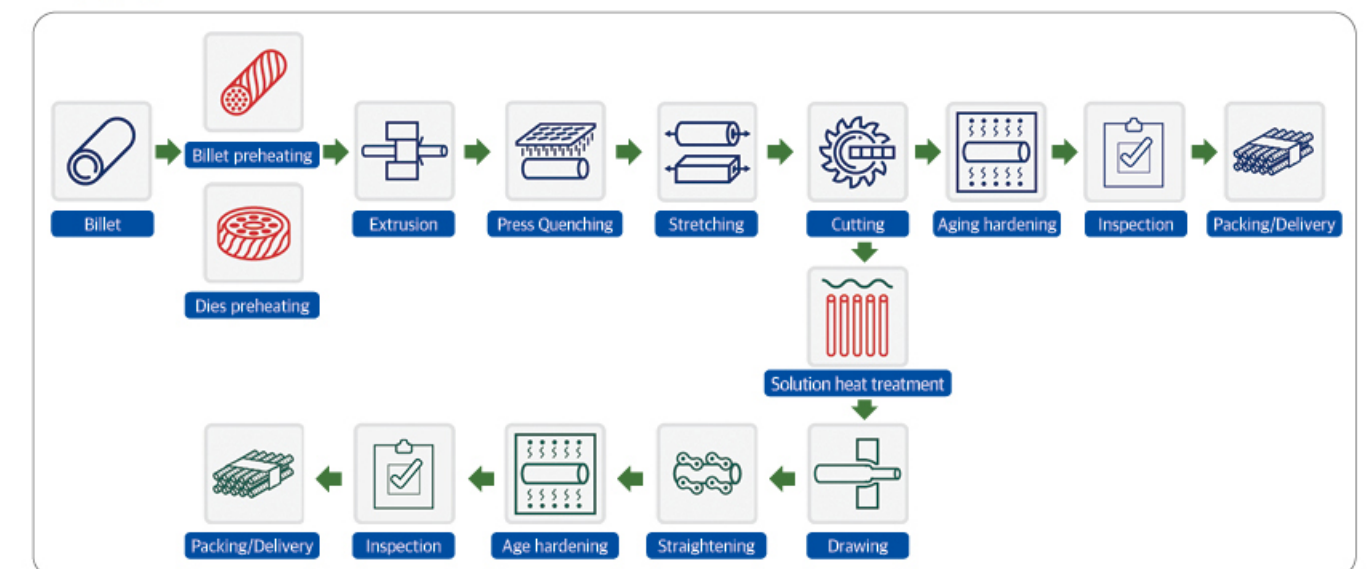
Size	Alloy
Seam pipe : $\Phi 17.5 \times 1.95T \sim \Phi 25 \times 2T$ Shape : As required (4.5mm ~ 120mm)	6061, 6063, 7003, 7075

## Temper & Process

### Temper



### Process





## » Production capability

### Products

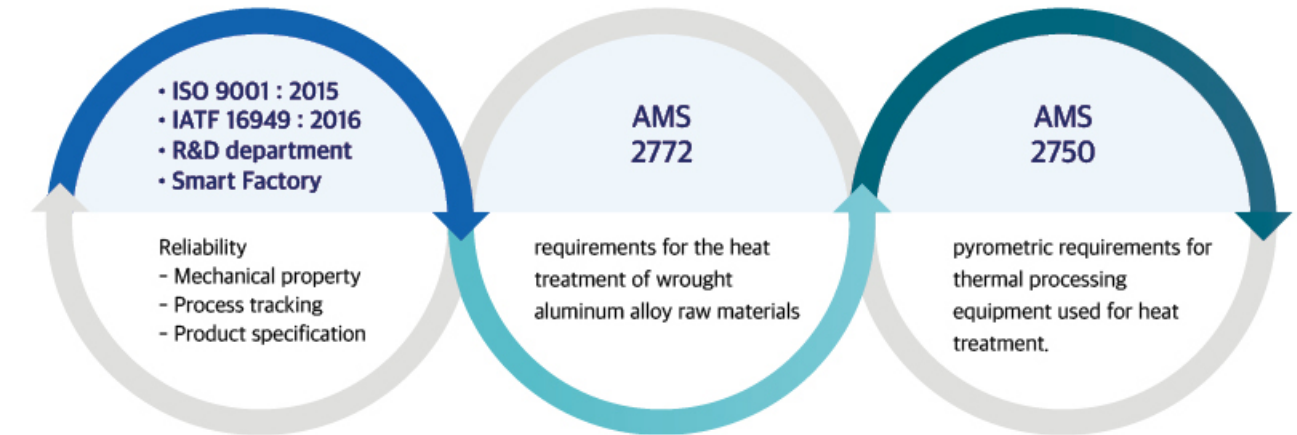
Product Type	Dimension Range	Typical Tolerance
Bar, Rod	Φ 4.5 ~ Φ 45	Straightness : under 1mm/1000mm OD: +0 / -0.1mm
Seamless pipe	Φ12 ~ Φ34	OD&ID : ±0.1mm Thickness : ±0.1mm
Seam pipe	Φ9 ~ Φ80	OD&ID : ±0.1mm
Plate	Max W 118	Width ±0.3mm Height ±0.2mm
Drawn rod & pipe	Rod : Φ 4.5 ~ Φ 45 Pipe : Φ 9 ~ Φ 80	Straightness : under 0.2mm/1000mm OD&ID : +0 / -0.04 mm Thickness : ±0.02 mm
Shaped	Made according to customer's requirements	Made according to customer's requirements

### Equipment & Capacity

Equipment	Quantity	Production Capacity	Process Capacity	Remarks
Direct extruder	1 EA	150 Ton/Month	5 inch (127mm) billet, Press Quenching	1650 TON
In-direct extruder	1 EA	30 Ton/Month	Φ 50, Φ 60, Φ 80 billet	400 TON (Seamless pipe)
Auto drilling/Turret MC	1 EA	20 Ton/Month		Solely used for in-direct extrusion
Stretcher MC	1 EA	150 Ton/Month	5 ~ 32 m length	Solely used for direct extrusion
Auto swaging MC	2 EA	100 Ton/Month	Φ 8 ~ Φ 45.5	Full automation 2EA
Drawing MC	4 EA	360 Ton/Month	Φ 8.8 ~ Φ 45	Full automation 1EA
Straightener MC	4 EA	600 Ton/Month	Φ 8.8 ~ Φ 45	Two-Roll & multi-Roll
Cutter MC	2 EA	300 Ton/Month	Up to 5 m length Max Φ 50	
Beveling MC	1 EA	250 Ton/Month	Φ 10 ~ Φ 45 2300mm ~ 3000mm	Full automation
Combined drawing MC	1 EA	25 Ton/Month	Φ 4.5 ~ Φ 10	Wire to straight rod
Quenching Furnace	2 EA	180 Ton/Month	Temp up to 600 °C	Up to 1 ton/Charge Auto charging MC
Annealing Furnace	1 EA	125 Ton/Month	Temp up to 600 °C	Up to 6 Ton/Charge
Aging Furnace	4 EA	600 Ton/Month	Temp up to 600 °C	Up to 3 Ton/Charge

## » Quality Management

Changsung Metal is making the best efforts to provide the best quality and services based on the thorough quality control. We have set very firm and systematic quality management protocol in following international standards like AMS 2772 and AMS 2750 while building smart factory system that all data retrieved from process records on real time and transformed into visualization.



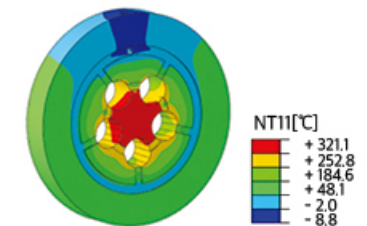
### Process parameter monitoring

To prevent products from deviating out of our quality reference, we perform monitoring a fluctuation in process parameters with continuous and discontinuous method as following:

- ✓ **Temperature of extruded product** : Temperature of extrusion acts a primary role in determining the surface quality of the extruded product. The higher the temperature, the worse the surface showing pick-up, grain growth, crack etc. So we simultaneously measure the temperature by using non-contact laser detector during extruding, and fit the real-time temperature into temperature measured by contact type pyrometer. Once the temperature hits the highest point of temperature allowed, pre-heating for billet or ram speed are adjusted.
- ✓ **Back-End defect inspection** : A general problem of extrusion is that defects tend to form in the interior of the extruded rod in the last part of the extrusion stroke. There is only a solution to remove the defect by wasting longer length of last end part of product or butt length. In order to inspect presence of the back-end defect in the product, we perform etching test before running extrusion, and make sure the surface of cross-sectioned is identical to reference surface. All cross-sectioned surface of products are taken photo and recorded in a time sequent order.



• Temperature of extruded product



• Extrusion simulation

Item	Capacity	Manufacturer	Quantity
UTM	100kN	Daekyung Tech (Korea)	1
Optical microscope	Resolution x50 ~ x 500	Olympus (Japan)	1
Microstructure analysis software	Grain analysis	Zotos (Korea)	1
Hardness tester(Rockwell)	Force : 60 ~ 150 kgf	Daekyung Tech (Korea)	1
Straightness analyzer	W3510 X D1325 X H1000 W3650 X D290 X H1000 Flatness : 0.006 - 0.012mm	TG ENC (Korea)	1
Real time laser temperature detector	Range : 100 ~ 1000°C	Mitsudoyo (Japan)	1



# Chemical composition & Characteristics

## Products

ALLOY GROUP	ALLOY DESIGNATION	CHEMICAL COMPOSITION LIMITS (wt %)										Others	TYPICAL TEMPER	MECHANICAL PROPERTIES			DENSITY (g/cm <sup>3</sup> )	WELDABILITY	MACHINABILITY	CORROSING RESISTANCE	CONDUCTIVITY	TYPICAL APPLICATIONS
		Cu	Si	Fe	Mn	Mg	Zn	Cr	Ti	Pb,Bi	Al			UTS (N/mm <sup>2</sup> )	YTS (N/mm <sup>2</sup> )	ELONGATION(%)						
Al	1050	0.05	0.05	0.40	0.05	0.05	0.05	-	-	-	99.50min	-	H14	95	-	-	2.71	A	D	A	A	Chemical equipment Sheet metal work Coiled tubing
	1100	0.05~0.20	Si+Fe 1.0 max		0.05	-	0.10	-	-	-	99.00min	-	H14	110	80	-	2.70	A	D	A	A	
Al-Cu	2011	5.0~6.0	0.40	0.70	-	-	0.30	-	-	0.2~0.6, each	Remaining	-	T3/T8	370	270	10	2.83	D	A	D	D	Screw machine products Truck frame Aircraft structure Jet engine impellers Aircraft engine cylinder heads
	2014	3.9~5.0	0.5~1.2	0.70	0.4~1.2	0.2~0.8	0.25	0.10	0.15	-	Remaining	-	T6	450	380	8	2.80	C	B	D	D	
	2017	3.5~4.5	0.2~0.8	0.70	0.4~1.0	0.4~0.8	0.25	0.10	0.15	-	Remaining	-	T4	380	225	12	2.79	B	B	D	D	
	2024	3.8~4.9	0.50	0.50	0.3~0.9	1.2~1.8	0.25	0.10	0.15	-	Remaining	-	T4	425	290	10	2.78	C	B	D	D	
	2218	3.5~4.5	0.90	1.00	0.2	1.2~1.8	0.25	0.10	-	-	Remaining	Ni 1.7~2.3	T72	331	225	11	2.80	C	B	D	D	
Al-Mn	3003	0.05~0.20	0.60	0.70	1.0~1.5	-	0.10	-	-	-	Remaining	-	H14	152	145	8~16	2.73	A	D	A	B	Cooking utensils, Chemical equipment
Al-Si	4032	0.5~1.3	11.0~13.5	1.00	-	0.8~1.3	0.25	0.10	-	-	Remaining	Ni 0.5~1.3	T6	379	317	9	2.68	B	B	C	D	Pistons
Al-Mg	5083	0.10	0.40	0.40	0.4~1.0	4.0~4.9	0.25	0.05~0.25	0.15	-	Remaining	-	H112	300	190	12	2.66	A	C	A	D	Architectural Transportation equipment Hydraulic tubes
	5086	0.10	0.40	0.50	0.20~0.7	3.5~4.5	0.25	0.05~0.25	0.15	-	Remaining	-	H32/H116	275	207	12	2.66	A	C	A	D	
Al-Mg-Si	6061	0.15~0.40	0.4~0.8	0.70	0.15	0.8~1.2	0.25	0.04~0.35	0.15	-	Remaining	-	T6	310	276	12	2.70	A	C	B	C	Heavy duty structure Furniture Architectural Heavy duty welded structure Pipe line
	6063	0.10	0.2~0.6	0.35	0.10	0.45~0.9	0.10	0.10	0.10	-	Remaining	-	T5	186	145	22	2.69	A	C	A	A	
	6070	0.15~0.40	1.0~1.7	0.50	0.4~1.0	0.50~0.12	0.25	0.10	0.15	-	Remaining	-	T6	379	352	10	2.71	A	C	B	C	
	6262	0.15~0.40	0.4~0.8	0.70	0.15	0.8~1.2	0.25	0.04~0.14	0.15	0.40~0.7, each	Remaining	-	T9	400	379	10	2.71	B	B	B	C	
	6351	0.10	0.7~1.3	0.50	0.40~0.8	0.40~0.8	0.20	-	0.20	-	Remaining	-	T6	310	283	14	2.71	A	D	A	C	
	6463	0.20	0.20~0.6	0.15	0.05	0.45~0.9	0.05	-	-	-	Remaining	-	T6	241	214	12	2.69	A	C	A	B	
Al-Zn	7001	1.6~2.6	0.35	0.40	0.20	2.6~3.4	6.8~8.0	0.18~0.35	0.20	-	Remaining	-	O	255	150	14	2.84	D	B	C	C	High strength structure Aircraft structure
	7003	0.20	0.30	0.35	0.30	0.50~1.0	5.0~6.5	0.20	0.20	-	Remaining	Zr 0.05~0.25	T5	310	260	10	2.77	A	C	B	B	
	7050	2.0~2.6	0.12	0.15	0.10	1.9~2.6	5.7~6.7	0.04	0.06	-	Remaining	Zr 0.08~0.15	T73	496	434	12	2.83	C	B	A	C	
	7075	1.2~2.0	0.40	0.50	0.30	2.1~2.9	5.1~6.1	0.18~0.28	0.20	-	Remaining	-	T6	572	503	6	2.80	D	B	C	C	
	7178	1.6~2.4	0.40	0.50	0.30	2.4~3.1	6.3~7.3	0.18~0.35	0.20	-	Remaining	-	T6	607	538	11	2.83	D	B	C	D	
	7475	1.2~1.9	0.10	0.12	0.06	1.9~2.6	5.2~6.2	0.18~0.25	0.06	-	Remaining	-	T61	565	490	12	2.80	D	B	C	C	

※ Remark A Excellent B Good C Limited D Not recommended



## » Company Foreground & Equipment



Inside the Factory #1



Inside the Factory #2 A



Inside the Factory #2 B



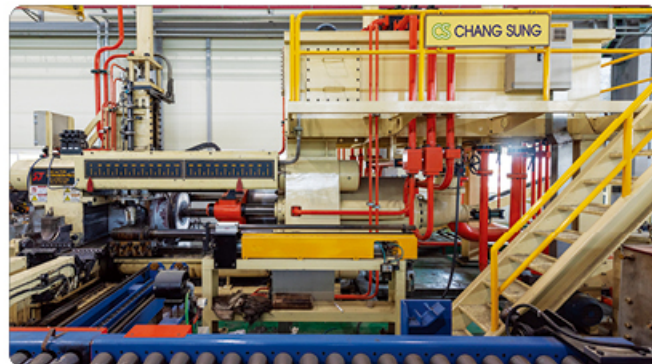
Inside the Factory #2 B



Inside the Factory #2 B



Inside the Factory #2 B



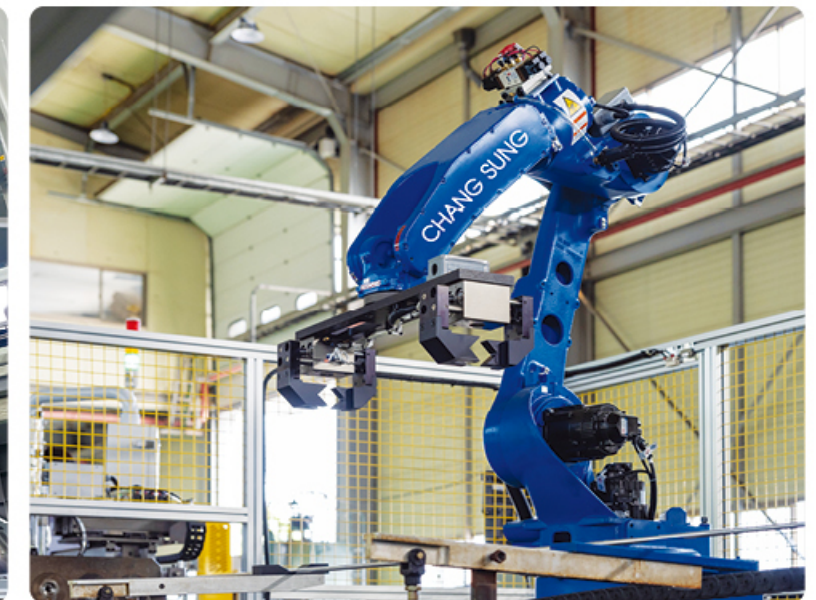
Extruder



Inside the Factory #2 B



Inside the Factory #1



Inside the Factory #1



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