



**SHEFFIELD  
FORGEMASTERS**



**Technical  
Capabilities**



## Casting and Forging solutions for the World's most complex engineering challenges.

Sheffield Forgemasters can trace a history in steel back over 200 years but it is our forward thinking and innovative approach that has kept us as a leader in steel production since then.

Our integrated steel production facility is situated on a single site in Sheffield so we can take care of every step of the process, from preliminary design and R&D through melting, casting, forging, finish machining, testing and delivery.

### Contents

|                              |    |
|------------------------------|----|
| Introduction                 | 3  |
| <hr/>                        |    |
| Preliminary Design           | 5  |
| Melt Shop                    | 7  |
| Forge                        | 9  |
| Foundry                      | 11 |
| Heat Treatment               | 13 |
| Machining                    | 15 |
| NDT                          | 17 |
| Test House                   | 19 |
| Research & Development       | 21 |
| Project & Quality Management | 23 |

# Introduction

**Sheffield Forgemasters can trace a history in steel back over 200 years on a single site in Sheffield.**

## ORIGINS

---

The origins of Sheffield Forgemasters date back to the 1750s as a small blacksmith forge. It was Edward Vickers, a traditional mill owner, who began the foundations for the business as a commercial steelworks in 1805.



Vickers Steel Works in 1830

## HISTORY

---

Sheffield Forgemasters has transitioned through many famous names in Steel including such as English Steel, Firth Brown, British Steel and River Don Castings. Throughout that time the company has always been at the leading edge of steel engineering and design.



A boiler drum being forged at Brightside Lane

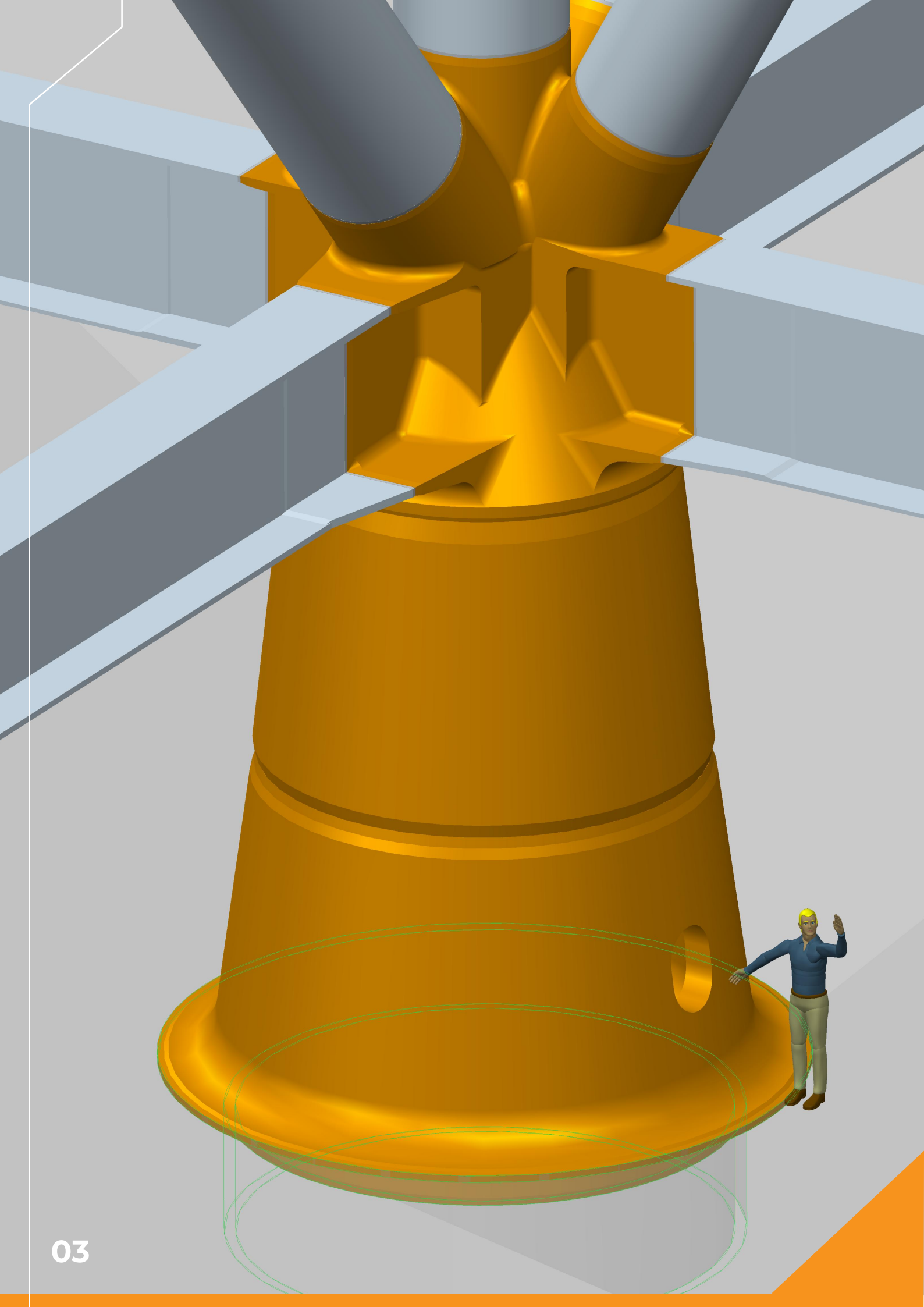
## NOW

---

Sheffield Forgemasters now produces some of the most complex steel forgings and castings in the World. Our components are used in the most extreme environments from Nuclear Reactors to Petrochemical plants.



5-Axis Machining of an Ultra-Large Component





# Preliminary Design

**Our experienced teams at Sheffield Forgemasters use preliminary design software and hardware tools for steel melting, casting and forging prediction and analysis.**

Preliminary design services can reduce the risks and costs involved in various steps of a steel making process, converting heavily stressed and safety critical fabricated components into an optimal cast or forged steel solution.

## Preliminary Design Capabilities

- Design for manufacture
- Residual stress prediction
- Forging & shaping simulation
- Liquid metal flow simulation
- Segregation prediction modelling
- Fabrication & welding simulation
- Structural stress modelling
- Heat treatment & cooling simulation
- Mechanical properties prediction
- 3D CAD modelling
- 3D Printing
- Ingot mould design



### Design Facts

- Dedicated R&D department
- Advanced prediction simulation and design software and skills
- Design optimisation
- Combination of existing designs
- Reduced cost, risk and through life support requirements







# Melt Shop

**At the heart of our steel melt shop is a 105 tonne furnace, which produces liquid steel in a wide range of grades.**

Liquid steel is supplied directly to our foundry for steel castings or poured into ingot moulds. Ingots are then forged in one of our open die presses or supplied to our customers as a material for further processing. Ingots can be air cast from 1.5 up to 84 tonne and vacuum cast up to 300 tonne.

## Melt Shop Capabilities

- Thousands of cast and forged steel grades available including complex grades such as NQ1, HY80 and HY100
- 105 tonne capacity Electric Arc Furnace (EAF)
- 105 tonne Vacuum Arc Degasser (VAD)
- Ladle Furnace (LF)
- 80 tonne Vacuum Oxygen Decarburisation unit (VOD)
- 300 tonne Vacuum Stream Degas Pits
- Lifting capacity 400 tonnes



## Melt Facts

- The most agile steel melt facilities in the world with single melts from 35 - 105 tonnes
- Integrated melt facilities onsite
- Ultra-clean steel
- Over 600 tonne liquid steel capacity at a single time
- Numerous ingot sizes and shapes available up to 300 tonnes







# Forge

**Sheffield Forgemasters can trace its first forges back to the late 1800's when Tom Vickers introduced the first heavy forging press.**

The company has advanced significantly from this point and now includes two open die forging presses, 4,500 tonne and 10,000 tonne which are capable of handling ingots up to 300 tonnes.

## Forge Capabilities

### 10,000 tonne Open Die Hydraulic Forging Press

- Capable of complex forgings up to 300 tonnes.
- Max Dias - Discs – Ø5080mm  
Tubes – 3050mmOD x 1900mmID  
Rings 5560mmOD x 4900mmID  
Shafts Ø2100mm | Collars Ø3048mm
- Min Dia - Ø355mm
- Max Length - 19800mm

### 4,500 tonne Open Die Hydraulic Forging Press

- Typical weights from 6 up to 40 tonnes.
- Max Dias - Rolls – Ø915mm | Bars – Ø660mm
- Min Dia - Ø270mm
- Max Length - 12000mm



## Forge Facts

- The most diverse forging capabilities in the UK ranging from weights of 1 tonne up to 300 tonnes
- The largest open die press in the UK
- Forgings from 1 tonne up to 300 tonnes
- Complex step forgings
- Quench facilities in close proximity to forge







# Foundry

**Sheffield Forgemasters produces the largest and most technically demanding castings in the World.**

Our foundry is one of the most agile in the world and can produce finish machined steel components from 1 tonne up to 350 tonnes. The foundry is capable of handling liquid steel volumes of over 600 tonnes at a single time.

## Foundry Capabilities

- Finish machined castings available up to 350 tonnes
- Maximum casting weight of 650 tonnes
- A wide range of steel grades including low alloy, stainless and precipitation hardened steel.
- Complex grades such as HY80, HY100 and NQ1 all available.
- Heat treatment furnaces with ancillary water quench facility
- Annual capacity of 10,000 tonne delivered product
- Pattern and mould making



## Foundry Facts

- One of the most diverse foundries in the the world offering castings from 1 tonne up to 350 tonnes finished weight
- Over 600 tonne pour capacity
- Advanced prediction, simulation and flow software capabilities







# Heat Treatment

**Sheffield Forgemasters offer a comprehensive range of heat treatment, cryogenic treatment and quenching facilities.**

Our wide range of traditional and vertical heat treatment facilities are designed to produce optimal metallurgical properties of castings and forgings.

## Heat Treatment Capabilities

- 16 Bogie Hearth Gas Fired Furnaces
  - Capacity of 7,600 x 5,000 x 17,500mm (w x h x l)
- 4 Top Hat Gas Fired Furnaces
  - Capacity of 3,500 x 2,500 x 20,000mm (w x h x l)
- 2 Vertical Electric Induction Furnaces
  - Capacity Ø3,700 x 20,000mm (d x l)
- Selsas furnace for differential hardening of Backup Roll products
- Computerised dual frequency induction stands for work rolls
- Cryogenic Treatment
  - Two cryogenic tanks available for cooling to -130°C



### Heat Facts

- A wide variety of heat treatment facilities are available onsite including some of the largest in the World
- Centrally computer controlled for accurate treatment
- Full water and oil quench options in close proximity to heat treatment facilities







# Machining

**Our state of the art machining facilities offer rough and finish machining as well as specialist services such as cladding and liner fitting.**

**Our facilities include a vast array of milling, turning, boring and finishing machinery including the UK's largest Vertical Turning Lathe and Horizontal Floor Borer.**

## Machining Capabilities

- Milling up to 17,000mm, 5,500mm x 5,500mm (l x w x h)
- Boring up to Ø2,200mm x 21,000mm (d x l)
- Turning up to Ø8,500mm x 23,000mm (d x l)
- Linishing and grinding
- Pressure testing up to 80,000 Psi
- Assembly and production fitting
- Dynamic balancing
- Epoxy coating and fibreglass wrapping
- Cladding and liner fitting



### Machining Facts

- Integrated machining facilities
- Most advanced 5-axis machining facilities in Europe
- Capable of machining small to ultra-large components
- Complex profiles, lengths, sizes and weights can all be accommodated







# Non-Destructive Testing (NDT)

**Proud to offer the most capable Non-Destructive Testing facilities and personnel in the World.**

Our Level III and Level II industry certified NDT engineering team is trained in conventional and advanced techniques including radiography, ultrasonic, dye penetrant & magnetic particle to evaluate the material properties of a component without damage.

## NDT Capabilities

- All NDT personnel are PCN and SNT-TC-1A qualified and certified in Non-Destructive Testing to level 2 or 3.
- Our Level 3 engineers develop specialised techniques, methods and procedures for the inspection of all forgings, castings and weldments.
- Volumetric and surface inspections:
  - Visual inspections – Direct and Indirect
  - Magnetic particle
  - Dye penetrant – Visible and Fluorescent
  - Ultra-sonic testing
  - Radiography



### NDT Facts

- The most capable NDT facilities and personnel in the World
- All forms of volumetric and surface inspections can be offered in line with customer requirements
- Quality is guaranteed with the addition of advanced prediction and real-time monitoring services







# Test House

**Our independent test house provides mechanical and metallurgical testing services to the steel industry.**

Equipped with a range of preparation techniques for metallurgical examination of metals and alloys for steel foundries, forges, rolling mills and steel stockholders. These techniques are supported by comprehensive photographic and digital imaging capabilities.

## Test House Capabilities

### Mechanical Tests

Tensile test (ambient)  
(Forces up to 250kN)

Impact:  
Charpy (U and V-notches)  
(-196°C to +250°C)  
Including % crystallinity and lateral expansion

Impact:  
Charpy (V-notch)  
Pellini drop weight

### Fracture Toughness

(Temperature range from -180°C to 350°C)

### Fracture Toughness

(CT Geometry - Single and Multi Specimen - CTOD, J1c and JR Curve)  
Fracture Toughness  
(CT Geometry - Reference  
Temperature to determination)

### Hardness

Brinell (5/750 HBW, 10/3000 HBW)  
Rockwell (B & C Scales)  
Vickers (HV 10 & HV30)



## Test House Facts

- Our Test House offers a full range of metallurgical, machine and laboratory test services
- The Test House is independently UKAS accredited to maintain quality and assurance
- All services are available for third party hire







# Research & Development

**Our dedicated R&D team carry out full new concept design and design optimisation for our customers using expert capabilities.**

The team's intimate knowledge of the manufacturing process, combined with experience and design skills, allows Sheffield Forgemasters to solve the engineering challenges posed to us by our customers. R&D services are also available for customer projects as an integrated service.

## Research & Development Capabilities

- Design and innovation
  - 2D drafting
  - 3D solid modelling
  - Full finite element analysis
  - Solidification (casting) simulation
  - Forging simulation
  - Detailed hand calculations, loading analysis and fatigue assessments
  - Portable large volume & high precision metrology
  - Digital image correlation
  - Infrared thermography
  - Augmented reality
- Consultancy
  - Collaborative research projects
  - ASME consulting
  - Technology transfer
  - Safety case support
  - Design for manufacture
  - Plant and process development
  - Technical trials



### R&D Facts

- Dedicated Research and Development department offering support to Sheffield Forgemasters projects and to external contracts
- Highly experienced
- Advanced prediction and simulation techniques means a 'right first time' solution for our customers
- A combination of experience and capabilities allows Sheffield Forgemasters to solve the most complex engineering challenges







# Project & Quality Management

**Quality is at the heart of every project we undertake and as such we have dedicated Projects and Quality team who manage the process from initial order through to final delivery.**

**Our internal quality assurance in each area of our organisation monitors day to day activities while a central quality function carries out a comprehensive internal audit programme.**

Over the years, Sheffield Forgemasters has developed Quality Management Systems and gained accreditation to national and international standards, showing commitment to providing the best possible products and service to our customers and a promise of continual development and improvement. Just some of the accreditations we have gained are listed below:

## **Accreditations & Approvals**

- American Bureau of Shipping
- ASME Material Organisation – QSC-557
- BSEN OH SAS 18001
- Bureau Veritas
- Def Stan 02-736 Part 2 and 3 approval to manufacture thick section Q1N Castings and Forgings
- DNV-GL
- ISO 9001:2015
- ISO 14001:2015
- JOSCAR
- Lloyds Register – Castings, Forgings & steelmaking
- Made In Sheffield
- Ministry of Defence
- NAVSEA T9074-BD-GIB-010/0300 Approval to manufacture thick section HY80 Castings and Forgings
- Roll Royce Nuclear Submarines sector - Castings, forgings, heat treatment & finish machining
- ISO/IEC 17025 Test Laboratory UKAS 4355

# Steel Grades

## Sheffield Forgemasters Casting Production Grades

### Carbon Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN | Other         |
|---------------|---------|--------------------|---------------|---------------|
| 1.0420        | J03000  | A27 Grade 60-30    | GE200         | SC 360 (JIS)  |
| 1.0449        | J03001  | A27 Grade 65-35    | GS240         | SC450 (JIS)   |
| 1.0446        | J03001  | A27 Grade 65-35    | GE240         | SC450 (JIS)   |
| 1.0455        | J03001  | A27 Grade 65-35    | GS240         | SC450 (JIS)   |
| 1.0454        | J02501  | A27 Grade 70-40    | GE270         | SC480 (JIS)   |
| 1.0558        | -       | A148 Grade 80-40   | GE300         | SCC5A (JIS)   |
| 1.0591        | -       | A148 Grade 80-50   | GE320         | SCW550 (JIS)  |
| 1.0597        | -       | -                  | GE360         | SCMn1B (JIS)  |
| 1.1131        | J03003  | A352 Grade LCB     | G17Mn5        | SCPL 1 (JIS)  |
| 1.6220        | J02505  | A352 Grade LCC     | G20Mn5        | -             |
| 1.1118        | -       | -                  | G24Mn6        | -             |
| 1.1165        | -       | -                  | G28Mn6        | -             |
| 1.5419        | J12524  | A217 Grade WC1     | G20Mo5        | SCPH 11 (JIS) |
| 1.0619        | J03001  | A27 Grade 65-35    | GP240GH       | SC450 (JIS)   |
| 1.0625        | J02501  | A27 Grade 70-40    | GP280GH       | SC480 (JIS)   |
| 1.5422        | K12821  | A352 Grade LC1     | G18Mo5        | SCPL 11 (JIS) |
| 1.0552        | J03501  | A27 Grade 70-36    | GS-52         | SB450M (JIS)  |
| -             | J31575  | A148 Grade 105-85  | -             | SCMn 5B (JIS) |
| 1.0619        | J02502  | A216 Grade WCA     | GP240GH       | SCPH 1 (JIS)  |
| 1.0625        | J03002  | A216 Grade WCB     | GP280GH       | SCPH 2 (JIS)  |
| 1.0625        | J02503  | A216 Grade WCC     | GP280GH       | SCPH 2 (JIS)  |
| 1.1131        | J02504  | A352 Grade LCA     | G17Mn5        | SCPL 1 (JIS)  |
| 1.1131        | J03002  | A757 Grade AIQ     | G17Mn5        | SCPL 1 (JIS)  |
| 1.6220        | J02505  | A757 Grade A2Q     | G20Mn5        | -             |

### Low Alloy Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI   | European - EN     | Other          |
|---------------|---------|----------------------|-------------------|----------------|
| 1.7357        | J12072  | A217 Grade WC6       | G17CrMo5-5        | SCPH 21 (JIS)  |
| 1.7379        | J22091  | A487 Grade 8         | G17CrMo9-10       | SCPH 32 (JIS)  |
| 1.7221        | -       | -                    | G26CrMo4          | -              |
| 1.5638        | J31550  | A352 Grade LC3       | G9Ni14            | SCPL 31 (JIS)  |
| 1.5681        | J41501  | A757 Grade B4Q       | GX9Ni5            | -              |
| 1.6750        | -       | -                    | G20NiMoCr4        | -              |
| 1.6781        | J42215  | A352 Grade LC2-1     | G17NiCrMo13-6     | -              |
| 1.6771        | -       | -                    | G30NiCrMo14       | -              |
| 1.5636        | J22500  | A352 Grade LC2       | G9Ni10            | SCPL 21 (JIS)  |
| 1.7365        | J42045  | A217 Grade C5        | GX15CrMo5         | SCPH 61 (JIS)  |
| 1.7218        | -       | -                    | GS25CrMo4         | SCCrM 1 (JIS)  |
| 1.6740        | -       | A958 Grade SC 4330   | GS33 CrNiMo 7 4 4 | SCNCRM 2 (JIS) |
| 1.7379        | J21890  | A217 grade WC9       | G17CrMo9-10       | SCPH 32 (JIS)  |
| 1.7379        | J22091  | A487 Grade 8         | G17CrMo9-10       | SCPH 32 (JIS)  |
| 1.7365        | J42045  | A217 Grade C5        | GX15CrMo5         | SCPH 61 (JIS)  |
| 1.4710        | J82090  | A217 Grade C12       | GX30CrSi7         | -              |
| 1.6781        | J42215  | A757 Grade E2N / E2Q | G17NiCrMo13-6     | -              |



## Stainless Steel – Ferritic & Martensitic

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN   | Other       |
|---------------|---------|--------------------|-----------------|-------------|
| 1.6982        | J91540  | A487 Grade CA6NM   | GX3CrNi13-4     | SCS 6 (JIS) |
| 1.4317        | J91540  | A487 Grade CA6NM   | GX4CrNi13-4     | SCS 6 (JIS) |
| 1.4421        | -       | -                  | GX4CrNi16-4     | -           |
| 1.4405        | -       | -                  | GX4CrNiMo16-5-1 | -           |
| 1.4107        | J91171  | A487 Grade CA15    | GX8CrNi12       | SCS 1 (JIS) |
| 1.4011        | J91150  | A743 Grade CA15    | GX12Cr12        | SCS 1 (JIS) |
| 1.4008        | J91151  | A743 Grade CA15M   | GX7CrNiMo12-1   | SCS 3 (JIS) |
| -             | J91153  | A743 Grade CA40    | -               | SCS 2 (JIS) |

Note – Minimum Carbon levels less than 0.06% may not be achievable for some grades – please ask for more information

## Stainless Steel – Austenitic & Duplex

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI      | European - EN        | Other        |
|---------------|---------|-------------------------|----------------------|--------------|
| 1.4309        | J92700  | A351 Grade CF3 / CF3A   | GX2CrNi19-11         | SCS 19 (JIS) |
| 1.4308        | J92600  | A351 Grade CF8 / CF8A   | GX5CrNi19-10         | SCS 13 (JIS) |
| 1.4552        | J92710  | A351 Grade CF8C         | GX5CrNiNb19-11       | SCS 21 (JIS) |
| 1.4409        | J92800  | A744 Grade CF3M / CF3MA | GX2CrNiMo19-11-2     | SCS 16 (JIS) |
| 1.4408        | J92900  | A351 Grade CF8M         | GX5CrNiMo 19-11-2    | SCS 14 (JIS) |
| 1.4581        | -       | -                       | GX5CrNiMoNb19-11-2   | SCS 22 (JIS) |
| 1.4458        | N08007  | A351 Grade CN7M         | GX2NiCrMo28-20-2     | -            |
| 1.4859        | -       | -                       | GX10NiCrSiNb32-20    | -            |
| 1.4470        | -       | -                       | GX2CrNiMoN22-5-3     | -            |
| 1.4517        | J93370  | A351 Grade CD-4MCu      | GX2CrNiMoCuN25-6-3-3 | -            |
| 1.4417        | -       | -                       | GX2CrNiMoN25-7-3     | -            |
| 1.4469        | -       | -                       | GX2CrNiMoN26-7-4     | -            |
| -             | J92602  | A743 Grade CF20         | -                    | SCS 12 (JIS) |
| 1.4446        | -       | A743 Grade CF3MN        | GX2CrNiMoN19-11-2    | -            |
| -             | J92999  | A743 Grade CG3M         | GX2CrNiMoN19-11-3    | -            |
| 1.4412        | J93000  | A743 Grade CG8M         | GX5CrNiMoN19-11-3    | -            |
| -             | J93402  | A743 Grade CH20         | -                    | SCS 17 (JIS) |
| 1.4527        | N08007  | A744 Grade CN7M         | GX4NiCrCuMo30-20-4   | SCS 23 (JIS) |
| 1.4416        | J94652  | A743 Grade CN3M         | GX2NiCrMoN25-20-5    | -            |
| 1.4588        | J94651  | A744 Grade CN3MN        | GX2NiCrMoN25-20-6    | -            |
| 1.4593        | J93254  | A744 Grade CK3MCuN      | GX2NiCrMoN20-18-6    | -            |

Note – Minimum Carbon levels less than 0.06% may not be achievable for some grades – please ask for more information

# Steel Grades

## Sheffield Forgemasters Forge Production Grades

### Carbon & Carbon Manganese Steel Grades

| Werkstoff No. | UNS No.         | US – ASTM/SAE/AISI | European - EN | Other         |
|---------------|-----------------|--------------------|---------------|---------------|
| 1.0038        | -               | SA105              | S235JR2       | -             |
| 1.0570        | -               | SA266              | S355J2G3      | E36-3 (AFNOR) |
| -             | -               | SA105              | C20           | 070M20 (UK)   |
| 1.0402        | G10200          | 1020               | C22           | -             |
| 1.0406        | G10250          | 1025               | C25           | -             |
| 1.0528        | G10300          | 1030               | C30           | -             |
| 1.0501        | G10350          | 1035               | C35           | -             |
| -             | G10380          | 1038               | -             | -             |
| 1.0511        | G10400          | 1040               | C40           | 080M40 (UK)   |
| 1.0503        | G10450          | 1045               | C45           | -             |
| 1.0540        | G10500          | 1050               | C50           | -             |
| 1.0535        | G10550          | 1055               | C55           | 070M55 (UK)   |
| 1.0601        | G10600          | 1060               | C60           | -             |
| 1.1170        | G13300          | 1330               | 28Mn6         | 30Mn2 (UK)    |
| 1.1133        | G15180 / G15220 | 1518 / 1522        | 28Mn5         | -             |
| -             | -               | -                  | -             | 20SiMn (UK)   |

### Low Alloy Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN | Other                          |
|---------------|---------|--------------------|---------------|--------------------------------|
| 1.7218        | G41300  | 4130               | 25CrMo4       | 25CD4 (UK)                     |
| 1.7225        | G41400  | 4140               | 42CrMo4       | 708M40 (UK)<br>42CD4 (AFNOR)   |
| -             | G41420  | 4142               | -             | -                              |
| -             | G41450  | 4145               | -             | -                              |
| -             | G41500  | 4150               | -             | -                              |
| 1.6511        | G98400  | 9840               | 36CrNiMo4     | 816M40 (UK)                    |
| 1.6580        | G43400  | 4340               | 30CrNiMo8     | 823M30 (UK)<br>30CND8 (AFNOR)  |
| -             | G43200  | 4320               | -             | -                              |
| -             | -       | 4330V              | -             | -                              |
| 1.6582        | -       | SA540/4340         | 34CrNiMo6     | 817M40 (UK)<br>35NCD16 (AFNOR) |
| -             | G86300  | 8630               | -             | -                              |
| -             | -       | A336 F11           | -             | -                              |
| -             | J21890  | A336 F22           | -             | -                              |
| -             | J22091  | A336 F22V          | -             | -                              |
| -             | J42045  | A707               | -             | -                              |
| -             | J82090  | HY80               | -             | Q1N (UK)                       |
| -             | J42215  | HY100              | -             | -                              |
| -             | -       | -                  | 30NiCrMo16-6  | 835M30 (UK)                    |
| -             | -       | -                  | 23CrMoNiWV88  | -                              |
| -             | -       | A668               | -             | -                              |
| -             | -       | SA350 LF2          | -             | -                              |
| -             | -       | SA350 LF3          | -             | -                              |
| 1.5622        | -       | SA350 LF5          | 14Ni6         | -                              |



## Low Alloy Steel cont.

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN | Other                 |
|---------------|---------|--------------------|---------------|-----------------------|
| -             | -       | SA508 Gr 3         | -             | 16MnD5/20MnD5 (AFNOR) |
| -             | -       | SA508 Gr 4N        | -             | -                     |
| 1.6931        | -       | -                  | 26NiCrMoV8-5  | -                     |
| 1.6948        | -       | -                  | 27NiCrMoV11-6 | -                     |
| 1.6957        | -       | -                  | 27NiCrMoV15-6 | -                     |
| 1.6962        | -       | -                  | 25NiCrMoV12-7 | -                     |
| 1.6963        | -       | -                  | 27NiCrMoV16-7 | -                     |
| -             | -       | SA 723             | -             | -                     |

## Tool Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN | Other           |
|---------------|---------|--------------------|---------------|-----------------|
| 1.2343        | T30106  | A681 H11           | X37CrMoV5-1   | Z38CDV5 (AFNOR) |
| 1.2344        | T30106  | A681 H13           | X40CrMoV5-1   | Z40CDV5 (AFNOR) |
| 1.2714        | T61206  | L6                 | 55NiCrMoV7    | -               |
| 1.2362        | -       | -                  | X63CrMoV5-1   | -               |

## Stainless Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN    | Other       |
|---------------|---------|--------------------|------------------|-------------|
| 1.4301        | S30400  | SA965 F304         | X5CrNi18-10      | 304S15 (UK) |
| 1.4306        | S30403  | SA965 F304L        | X2CrNi19-11      | 304S11 (UK) |
| 1.4311        | S30453  | SA965 F304LN       | X2CrNi18-10      | 304S62 (UK) |
| 1.4401        | S31603  | SA965 F316         | X5CrNiMo17-12-2  | 316S16 (UK) |
| 1.4404        | S31603  | SA965 F316L        | X2CrNiMo17-12-2  | 316S12 (UK) |
| 1.4406        | S31653  | SA965 F316LN       | X2CrNiMoN17-11-2 | 316S61 (UK) |
| 1.4541        | S32100  | SA965 F321         | X10CrNiMoTi1810  | 321S12 (UK) |
| 1.4450        | S34700  | SA965 F347         | X6CrNiNb18-10    | 347S17 (UK) |

## Martensitic Stainless Steel

| Werkstoff No. | UNS No. | US – ASTM/SAE/AISI | European - EN      | Other        |
|---------------|---------|--------------------|--------------------|--------------|
| 1.4902        | -       | -                  | X14CrMoVNbN10      | COST F (UK)  |
| 1.4096        | -       | -                  | X12CrMoWVNbN10-1-1 | COST E (UK)  |
| -             | 1.4903  | A336 F 91          | -                  | -            |
| -             | -       | A336 F92           | -                  | -            |
| 1.4313        | -       | A336 F6NM          | -                  | -            |
| -             | 1.4594  | -                  | -                  | FV 520B (UK) |

# Casting and Forging solutions for the World's most complex engineering challenges

Sheffield Forgemasters International Ltd.  
Brightside Lane, Sheffield, S9 2RX.

**E:** [sales@sfel.com](mailto:sales@sfel.com) | **T:** + 44 (0)114 244 9071

**WEBSITE:** [www.sheffieldforgemasters.com](http://www.sheffieldforgemasters.com)

