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# THE IMPORTANCE OF MATERIAL CERTIFICATION

Ensuring quality and traceability - what to look for in material certificates.



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# WHAT IS A MATERIAL CERTIFICATE?

A material certificate, also known as a mill test report (MTR) or mill test certificate (MTC), is a crucial quality assurance document used in the metals industry. It certifies a material's technical parameters, such as its chemical composition, mechanical or physical properties, manufacturing routes, heat treatment details, testing results, and compliance with international or local standards.

Material certification serves as the unique identifier for a particular material heat and production batch. It provides information about the material's provenance, quality, and potential performance under real-life service conditions.

Several industry standards establish harmonized formats for material certificates, with ISO/EN 10204 being the most widely used. Among these, the 3.1 type certificate is the most common.



## Variability in Material Certificates

However, not all commercially available materials come with a material certificate. Moreover, the level of information and the traceability provided by these certificates can vary significantly. A certificate with vague details often indicates a lack of control and poor quality assurance procedures.

An example of a material certificate.

Customer

TEST CERTIFICATE IN ACCORDANCE WITH BS EN 10204 3.1/ISO 10474 3.1

Certificate No.	T60042	Product	Stainless steel bar
Order No.	Commitment	Cast No.	140889
Our Reference	Z11325P42468	Quantity	42 Kgs
Advice Note No.	DP909	Finish	Cold drawn
Heat Treatment	Fully solution treated and water quenched prior to cold sizing		

Chemical Analysis

C	0.018	Si	0.462	Mn	1.332	S	0.0298	P	0.0243
Bi	16.082	Cr	16.682	Mo	2.038	Ti		Nb	
Co		Cu	0.484	N	0.038	W		Ca	
Sn		Ita		V		Al		Fe	

Mechanical Properties

Tensile Strength	737 Mpa	0.2% Proof Stress	533 Mpa
Reduction of Area	71.0%	Elongation	36.0%
Hardness	214 HRC	Impact Tests	

Special Conditions / Processing Details

In accordance with BS EN 10088-3 1.4404	HCT No : 90M
In accordance with M01911	Part No : 7710568293
Conforming to MACC MS0175/MR0103	
Free from mercury and radioactive contamination	
ICC test to ASTM A213 'E'. Satisfactory	
Also conforming to ASTM A276/A479 Gr 316/316L	
Country of origin : France	

Manufacturers Test Cert No. \_\_\_\_\_ Concessions Agreed \_\_\_\_\_

\*Certified that the whole of the supplier detailed herein, unless otherwise stated, are covered by the Source Certificate of Conformity/ Test Certificate referenced hereon and has been subject to the Quality System requirements in accordance with the conditions of our ISO 9001:2015 registration.

\*Certified that the supplier/hours detailed herein have been inspected and tested in accordance with the requirements of the contract specifications and unless otherwise stated below, conforms to all aspects of the specifications/weight related thereto.

14/11/2019 \_\_\_\_\_  
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A certificate with vague details often indicates a lack of control and poor quality assurance procedures.

# GOOD VS. BAD EXAMPLES OF MATERIAL CERTIFICATES

Assesing the level of detail for quality and traceability.



## Example 1: Limited Information (Fig. 1)

In Fig. 1, we see a standardized 3.1 certificate with limited information, containing only the mandatory parameters prescribed by the standard. This includes basic chemical and mechanical properties, but it is insufficient for full traceability or determining the alloy's quality and final properties.

## Missing Critical Details

Critical missing details include:

- **Melting procedures**
- **Manufacturing route**
- **Material origin**
- **Heat treatment details**
- **Testing procedures**

## Concerns about Contamination

Furthermore, there is no assurance that the material is free from contaminants like mercury, or other hazardous substances, a common concern in an industry where a significant percentage of steel is recycled and re-melted.

Material Certificate														
In conformity with EN 10204-3.1/ISO 10474: 2013-3.1B														
Customer		Contract No.				Reference No.		File No.		Revision		Date		
		xxxxxxx				xxxxxxxx-xx-xxxx		xxxxxxxxxx		1		xx/xx/xxxx		
Item	Commodity	Part No.	Type	Standard	Tracking No.	Heat No.	Shape	Size (mm)	Quantity (PC)	Condition				
1	Male Connector	xxx-xxx-xxx-xx	316	ASTM A479	ME	S72-0614	11	17.46	5	S2				
2														
3														
Composition %														
Test	C	Si	Mn	P	S	Ni	Cr	Mo	Ti	N	V	CU		
Spec.	0.00	1.00	2.00	0.045	0.030	10.00	16.00	2.00	/	/	/	/	/	/
1	0.052	0.45	1.05	0.03	0.004	12.06	17.27	2.15	/	/	/	/	/	/
2														
3														
Test	Hardness (HB)		Tensile Strength (MPa)		Yield Strength (MPa)		Elongation (%)		Reduction of Area (%)		Flattening Test		Flaring Test	
Spec.														
1	230 300		655		515		25		40		/		/	
2	234		722		646		36		75		/		/	
3														
Conditions:			A - Annealed			Shape:			Remarks:					
S - Solution Treated			P - Polished			H - Hexagonal			1. Here we certify that the above mentioned products conform to the specifications of the order and the standards.					
HR - Hot Rolled			PL - Peeling			S - Square			2. This Certification only applies to the material used in the main body.					
CD - Cold Drawn			C - Cast			SR - Square-Round			3. Non-inspection items mark with "/".					
F - Forged			PI - Pickling			E - Ellipse			Inspected by: xxxxxxxxx					
CG - Centreless Grinding			S2 - Strain-Hardened level 2			FB - Rectangular			Approved by: xxxxxxxxxxxxxx					
BA - Annealed Brightness						R - Round								

Fig. 1. An example of a 3.1 certificate with limited information on material traceability.

## Example 2: Comprehensive Information (Fig. 2)

In contrast, a certificate with a higher level of detail is usually indicative of high-quality materials and tightly controlled processes. Such certificates enable full traceability of the manufacturing cycle on any production batch, from melting to the finished component.

### Detailed Information Provided

Fig. 2 exemplifies a good certificate that offers extensive material traceability. It includes detailed information on:

- Melting processes
- Processing steps
- Heat treatment parameters (temperature, duration)
- Testing methods
- Compliance with industry standards
- Contamination status

This comprehensive data compilation allows for a fully controlled quality system, ensuring the material's reliability and safety in demanding applications.

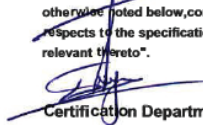
<b>Customer</b>				
<b>TEST CERTIFICATE IN ACCORDANCE WITH BS EN 10204 3.1/ISO 10474 3.1</b>				
<b>Certificate No.</b>	T60042	<b>Product</b>	Stainless steel bar	
<b>Order No.</b>	Consignment	<b>Cast No.</b>	148089	
<b>Our Reference</b>	Z111325/P42468	<b>Specification</b>	1.4404	
<b>Advice Note No.</b>	DP609	<b>Quantity</b>	42 Kgs	
<b>Heat Treatment</b>	Fully solution treated and water quenched prior to cold sizing		<b>Size</b>	.562" A/F Hex
<b>Finish</b>	Cold drawn			
<b>Chemical Analysis</b>				
<b>C</b>	0,018	<b>Si</b>	0,462	
<b>Ni</b>	10,082	<b>Cr</b>	16,682	
<b>Co</b>		<b>Cu</b>	0,484	
<b>Sn</b>		<b>Ta</b>		
<b>Mn</b>	1,332	<b>Mo</b>	2,038	
<b>S</b>	0,0298	<b>N</b>	0,038	
<b>P</b>	0,0243	<b>W</b>		
<b>Nb</b>		<b>V</b>		
<b>Ca</b>		<b>Al</b>		
<b>Fe</b>				
<b>Mechanical Properties</b>				
<b>Tensile Strength</b>	737 Mpa	<b>0.2% Proof Stress</b>	533 Mpa	
<b>Reduction of Area</b>	71,0%	<b>Elongation</b>	35,0%	
<b>Hardness</b>	21.4 HRC	<b>Impact Tests</b>		
<b>Special Conditions / Processing Details</b>				
In accordance with BS EN 10088-3 1.4404		HCT No : 90M		
In accordance with M019/1		Part No : 7710568203		
Conforming to NACE MR0175/MR0103				
Free from mercury and radioactive contamination				
ICC test to ASTM A262 'E' - Satisfactory				
Also conforming to ASTM A276/A479 Gr 316/316L				
Country of origin : France				
<b>Manufacturers Test Cert No.</b>		<b>Concessions Agreed</b>		
<p>"Certified that the whole of the supplied detailed hereon, unless otherwise stated", are covered by the Sources Certificate of Conformity/Test Certificate referenced hereon, and has been subject to the Quality System requirements in accordance with the conditions of our BS EN ISO 9001 2015 registration.</p>		<p>"Certified that the supplies/services detailed hereon have been inspected and tested in accordance with the conditions, requirements of the contract or purchase order and, unless otherwise noted below, conform in all respects to the specification(s)/drawing(s) relevant thereto".</p>		
14/11/2019		 <b>Certification Department</b>		

Fig. 2. An example of a certificate highlighting key parameters. This image shows only one page, additional details are provided on other pages.

## Conclusion

In industries, where material quality and traceability are paramount, the level of detail in material certificates can make a significant difference. High-quality certificates provide assurance of the material's provenance, processing history, and compliance with stringent standards, thus ensuring the integrity and performance of critical components.

### Parker's Commitment to Quality

At Parker, we pride ourselves on sourcing materials for our

components that come with comprehensive and detailed material certificates. These high-quality certificates ensure that our materials meet the highest standards of quality and traceability, providing our clients with the confidence they need for their demanding applications. With decades of experience in material science and thousands of successful applications, Parker is your trusted partner in ensuring the highest standards of material quality and performance.





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