

ECISS  
EUROPEAN COMMITTEE FOR IRON AND STEEL STANDARDISATION  
COMITÉ EUROPÉEN DE NORMALISATION DU FER ET DE L'ACIER  
EUROPÄISCHES KOMITEE FÜR EISEN- UND STAHLNORMUNG

EUROPEAN CERTIFIED REFERENCE MATERIAL (EURONORM – CRM)  
CERTIFICATE OF CHEMICAL ANALYSIS

**EURONORM – CRM No. 056-2 0.8% Carbon Steel**

LABORATORY MEANS (4 Values)  
mass content in %

Line No	C	Si	Mn	P	S	Cr	Ni	Al (Acid sol)	Cu	Al (Tot)
1	0.8087	—	—	—	0.0083	0.0139	—	0.00010	0.0120	<0.0001
2	0.8126	0.1901	0.5028	0.0090	0.0084	0.0140	0.0202	0.00010	0.0121	0.0002
3	0.8130	0.1948	0.5040	0.0094	0.0084	0.0141	0.0206	0.00015	0.0124	0.0002
4	0.8133	0.1963	0.5043	0.0099	0.0085	0.0142	0.0208	0.00019	0.0125	0.0003
5	0.8146	0.1980	0.5046	0.0100	0.0089	0.0142	0.0211	0.00020	0.0128	0.0003
6	0.8148	0.1982	0.5061	0.0100	0.0090	0.0143	0.0213	0.00024	0.0129	0.0005
7	0.8157	0.1983	0.5066	0.0100	0.0091	—	0.0214	0.00026	0.0129	0.0006
8	0.8175	0.1996	0.5067	0.0103	0.0092	0.0145	0.0216	0.00030	0.0130	0.0008
9	0.8192	0.2010	0.5072	0.0103	0.0094	0.0145	0.0217	0.00033	0.0130	0.0008
10	0.8194	0.2015	—	0.0103	0.0095	0.0145	0.0219	0.00035	0.0130	0.0009
11	0.8196	0.2017	0.5077	0.0104	0.0096	0.0145	0.0220	0.00040	0.0131	
12	0.8205	0.2026	0.5079	0.0105	0.0096	0.0146	0.0221	—	0.0131	
13	0.8211	0.2027	0.5082	0.0105	0.0098	0.0146	0.0221		0.0132	
14	0.8229	0.2041	0.5089	0.0107	0.0099	0.0149	0.0222		0.0132	
15	0.8237	0.2043	0.5097	0.0107	0.0099	0.0150	0.0222		0.0133	
16	0.8259	0.2045	0.5111	0.0109	0.0100	0.0152	0.0223		0.0133	
17	0.8260	0.2048	0.5133	0.0114	0.0103	0.0152	0.0224		0.0133	
18		0.2079	—	—		0.0153	0.0225		0.0133	
19				0.0115		0.0156	0.0235		—	
M <sub>M</sub>	<b>0.8181</b>	<b>0.2006</b>	<b>0.5073</b>	<b>0.0103</b>	<b>0.0093</b>	<b>0.0146</b>	<b>0.0218</b>	<b>0.00024</b>	<b>0.0129</b>	
S <sub>M</sub>	0.0050	0.0044	0.0029	0.0007	0.0007	0.0005	0.0008	0.00011	0.0005	
S <sub>W</sub>	0.0025	0.0024	0.0021	0.0004	0.0002	0.0003	0.0003	0.00004	0.0003	

M<sub>M</sub>: Mean of the intralaboratory means, s<sub>M</sub>: standard deviation of the intralaboratory means, s<sub>W</sub>: Intralaboratory standard deviation

The laboratory mean values have been examined statistically to eliminate outlying values. Where a "—" appears in the table it indicates that an outlying value has been eliminated by either the Cochran or Grubbs Test.

Additional Information from one laboratory: Mo: 0.0015%, Co: 0.0035%, N: 0.0045%

**CERTIFIED VALUES**  
Mass content in %

	C	Si	Mn	P	S	Cr	Ni	Al (Acid sol)	Cu
<b>M<sub>M</sub></b>	<b>0.8181</b>	<b>0.2006</b>	<b>0.5073</b>	<b>0.0103</b>	<b>0.0093</b>	<b>0.0146</b>	<b>0.0218</b>	<b>0.00024</b>	<b>0.0129</b>
C(95%)	0.0026	0.0023	0.0016	0.0004	0.0004	0.0003	0.0004	0.00007	0.0003

The half-width confidence interval C(95%) =  $\frac{t \times s_M}{\sqrt{n}}$  where "t" is the appropriate Student's t value and "n" is the number of acceptable mean values

For further information regarding the confidence interval for the certified value see ISO Guide 35:2006 sections 6.1 and 10.5.2

This reference material was prepared in accordance with the recommendations set out in  
ISO Guides 30 – 35 and issued by:

**BUREAU OF ANALYSED SAMPLES LIMITED**

Newham Hall, Middlesbrough, England TS8 9EA

On behalf of:- The Iron and Steel Nomenclature Co-ordinating Committee (COCOR) of the ECISS, after approval by all the participating laboratories and all the producing organizations.  
(France – IRSID/CTIF, Germany – Iron and Steel CRM Working Group: VDEh, BAM & MPI für Eisenforschung, Nordic Countries – Nordic CRM Working Group, UK – BAS Ltd.)



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## METHODS USED EURONORM – CRM No. 056-2

Element	Line Number	Methods
<b>C</b>	1-3-4-5-6-8-9-10-12-13-14-15-16-17	Combustion, infrared absorption
	2	Combustion, gravimetry
	7	Combustion, non-aqueous titration after absorption in organic solvent
	11	Combustion, thermal conductivity
<b>Si</b>	2-3-7-9-13-18	Inductively coupled plasma - optical emission spectrometry
	4-5-6-8-10-11-12-14-15	Gravimetry, dehydration with perchloric acid
	16-17	Spectrophotometry, molybdenum blue without extraction
<b>Mn</b>	2-7-8	Flame atomic absorption spectrometry
	3-6-12-13-16	Spectrophotometry, periodate oxidation
	4-5-9-11-14-15-17	Inductively coupled plasma - optical emission spectrometry
<b>P</b>	2-7-10-16	Spectrophotometry, molybdenum blue, without extraction
	3-4-6-8-13-17-19	Inductively coupled plasma - optical emission spectrometry
	5-9-11-12-14-15	Spectrophotometry, phosphovanadomolybdate, extraction
<b>S</b>	1-2-3-4-5-6-7-8-9-10-11-12-13-15-17	Combustion, infrared absorption
	14	Gravimetry as barium sulphate without separation
	16	Combustion, acidimetric titration, absorption in H <sub>2</sub> O <sub>2</sub> or AgNO <sub>3</sub>
<b>Cr</b>	1-2-3-15-16	Flame atomic absorption spectrometry
	4-5-6-8-9-10-11-12-13-14-17-18-19	Inductively coupled plasma - optical emission spectrometry
<b>Ni</b>	2-3-7-8-9-10-11-13-15-16-18-19	Inductively coupled plasma - optical emission spectrometry
	4-5-6-12-14	Flame atomic absorption spectrometry
	17	Spectrophotometry, dimethylglyoxime, without extraction
<b>Al (Acid sol)</b>	1-6	Inductively coupled plasma - mass spectrometry
	2-3-4-5-7-8-9-10-11	Inductively coupled plasma - optical emission spectrometry
<b>Cu</b>	1-5-6-7-9-10-12-17-18	Inductively coupled plasma - optical emission spectrometry
	2-3-4-8-11-13-14-16	Flame atomic absorption spectrometry
	15	Spectrophotometry, diethyldithiocarbamate, with extraction
<i>Al (Tot)</i>	1-3-4-5-6-8-9-10	<i>Inductively coupled plasma - optical emission spectrometry</i>
	2	<i>Glow discharge mass spectrometry</i>
	7	<i>Inductively coupled plasma - mass spectrometry</i>

## PARTICIPATING LABORATORIES

AG der Dillinger Hüttenwerke, Dillingen, Germany  
 Allvac Ltd., Sheffield, UK.  
 ArcelorMittal, Dunkerque, France  
 ArcelorMittal, Florange, France  
 BAM Bundesanstalt für Materialforschung und -prüfung, Berlin, Germany  
 Böhler Edelstahl GmbH, Kapfenberg, Austria  
 Carsid S.A., Marcinelle, Belgium  
 Centro Nacional de Investigaciones Metalúrgicas (CENIM), Madrid, Spain  
 Corus Stahl, IJmuiden, Holland  
 Corus Strip Products, Llanwern, UK  
 Corus Testing Solutions, Scunthorpe, UK

Deutsche Edelstahlwerke GmbH, Siegen, Germany  
 Deutsche Edelstahlwerke GmbH, Witten, Germany  
 Gustavsson Consulting, Stockholm, Sweden  
 Kanthal AB, Hallsthammar, Sweden  
 Luxcontrol SA, Esch-sur-Alzette, Luxembourg  
 Ovako Steel AB, Hofors, Sweden  
 Pattinson and Stead (2005) Ltd., Middlesbrough, UK  
 Ridsdale & Co Ltd., Middlesbrough, UK  
 Swerea KIMAB, Stockholm, Sweden  
 Uppsala University, Uppsala, Sweden  
 voestalpine Stahl GmbH, Linz, Austria

## DESCRIPTION OF THE SAMPLE

The sample consists of chips passing a nominal 1700µm aperture sieve from which the fines passing a nominal 250µm sieve has been removed. It is supplied in bottles containing 100g, ref ECRM 056-2(C). It is also supplied in the form of 44mm dia. discs, ref ECRM 056-2(D)

## INTENDED USE & STABILITY

The chip sample, ECRM 056-2(C), is intended for the verification of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments in cases where the calibration with primary substances (pure metals or stoichiometric compounds) is not possible and for establishing values for secondary reference materials.

It will remain stable provided that the bottle remains sealed and is stored in a cool, dry atmosphere. When the bottle has been opened the lid should be secured immediately after use. If the contents should become discoloured (e.g. oxidised) by atmospheric contamination they should be discarded.

The disc sample, ECRM 056-2(D), is intended for establishing and checking the calibration of Optical Emission and X-Ray Spectrometers for the analysis of similar materials. The "as received" working surface of the sample should be finished before use to remove any protective coating. The disc will remain stable provided that it is not subject to excessive heat (e.g. during preparation of the working surface).

## TRACEABILITY

**The traceability of ECRM 056-2 has been established in accordance with principles of ISO Guides 30 – 35 and the International vocabulary of basic and general terms in metrology.**

The characterisation of this material has been achieved by inter-laboratory study, each laboratory using the method of their choice, details of which are given above. These methods are either stoichiometric analytical techniques or methods which are calibrated against pure metals or stoichiometric compounds. Most methods used were either international or national standard methods or methods which are technically equivalent.

## FURTHER INFORMATION

For information regarding the preparation, certification and supply of these European Certified Reference Materials (EURONORM-CRMs) and the use of the statistical information given on this certificate, please refer either to the producer of this Certified Reference Material or to CEN Report CR 10317 and ECISS Information Circular No. 5, both of which are available from the national standards body in your country or from CEN in Brussels. (In the UK this is the BSI, 389 Chiswick High Road, London W4 4AL).

Further information and advice on this or other Certified Reference Materials or Reference Materials produced by Bureau of Analysed Samples Ltd. may be obtained from the address below.

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