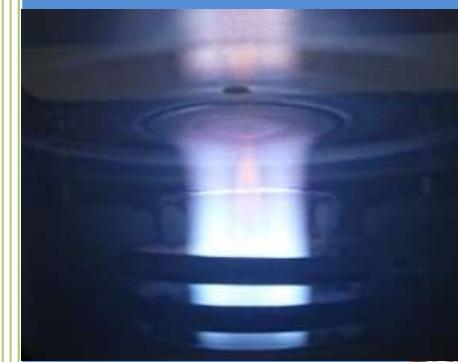


Certified Reference Materials 2023



Jernkontoret

 NAREMA

Contents

	Page		Page
Introduction	3		
1. LOW ALLOYED STEEL		Iron ores/powders	
JK 21	4	ECRM 688-1	11
ECRM 196-2	4	ECRM 689-1	11
Carbon Steel		JK 29A	12
ECRM 197-1	4	JK 42A	12
JK 3B	5	JK 47A	12
JK 20A	5	JK 55	12
2. HIGH ALLOYED STEEL		4. STEEL WITH SPECIAL ELEMENT SPECIFICATION	
ECRM 270-1	6	High alloyed steel	
ECRM 379-1	6	JK 25 (cerium)	13
Vanadium Steel		JK 36 (carbon, sulphur, nitrogen)	13
ECRM 274-1	7	JK 54 (carbon, sulphur, nitrogen, oxygen)	13
Duplex Stainless Steel		JK 31 (oxygen)	13
ECRM 298-2	7	JK 32 (oxygen)	13
Chromium - nickel - molybdenum alloyed steel		JK 34 (oxygen)	13
JK 7B	8		
Tool steel		5. FERRO ALLOYS	
JK 12A	8	Ferrosilicon	
ECRM 268-1	8	JK 39	14
Austenitic Stainless Steel		6. FLOURSPARS	
JK 27B	9	JK D	14
3. SLAGS, INDUSTRIAL FLY ASHES and IRON ORES/POWDERS		7. SETTING UP SAMPLES	
Slags		Ceramics	
ECRM 883-1	9	CE 650A	15
JK S10	10	Steel plate with a layer of electroless nickel (NiP alloy)	
JK S11	10	JK SUS NiP-1	15
Industrial fly ashes		Zinc discs	
ECRM 882-1	10	JK SUS Zn-1	15
JK 43	10	JK SUS Zn-2	15
JK 44	10	JK SUS Zn-5	15
JK 45	10	Participating laboratories	16
		CRM Ordering Procedure	20

Introduction

The production of reference materials in the ECRM- and JK-series is directed by the Nordic CRM Working Group (NCRMWG), with representatives from the Nordic Steel and Iron industry. In 2023 the members are:

C. Wichardt	AB Sandvik Materials Technology, Sandviken, Sweden	L. Lindqvist	Kanthal AB, Hallstahammar, Sweden
R. Eriksson	Jernkontoret, Stockholm, Sweden	H. Ekström	SSAB Europe, Sweden
A. Henrich	Höganäs Sweden AB, Höganäs, Sweden	P. Larnesjö	SSAB Special Steels, Oxelösund, Sweden
M. Didic	LKAB, Malmberget, Sweden	M. Granfors	Swerim AB, Kista, Sweden
W. Hemmings	Outokumpu Stainless AB, Avesta, Sweden	D. Cadario	Sandvik Tooling, Stockholm, Sweden
S. Rahmn	Vargön Alloys AB, Sweden	A. Norberg	Uddeholms AB, Hagfors, Sweden
A Carlström-Wängelin	AB Sandvik Materials Technology, Sandviken, Sweden	M. Granfors	Oy Narema Ab, Närpiö, Finland

In 1938, the production of certified reference materials (CRMs) in the JK-series was initiated in a close co-operation between Jernkontoret (The Swedish Steel Producers' Association) and Metallografiska Institutet (The Metallographic Institute), and four years later in 1942 seven steel CRMs became commercially available. It was also decided that every CRM produced should be given a prefix, namely JK, the abbreviation of Jernkontoret.

Since its foundation back in 1747, Jernkontoret (JK) has been owned jointly by the Swedish steel companies. Jernkontoret represents Sweden's steel industry on issues that relate to education, trade policy, research and development, standardisation, energy and environment as well as taxes and levies. Jernkontoret also manages the joint Nordic research in the steel industry. In addition, Jernkontoret draws up statistical information relating to the industry and carries on research into the history of mining and metallurgy.

Oy Narema Ab was founded in 2019, as a consultancy agency and chemical analys laboratory primarily supporting companies in the Nordic countries in the iron, steel and metal industries as well as mechanical industries. As of 1st of January 2020 the responsibility of the certification of Jernkontoret's reference materials were transferred from Swerim AB to Oy Narema Ab. Certification analyses are carried out in accordance with principles in the ISO Guides 30-35 and ISO 17034. In 1998 the Nordic CRM Working Group became a member of EURONORM CRM Producers Group.

Further information can be found on: www.narema.fi

Oy Narema Ab, Närpiöntie 2, FIN-64200 Närpiö, Finland
crm@narema.fi

Euronorm CRM (ECRM) and CRM in the JK Series

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

1. LOW ALLOYED STEEL

JK 21 – chips, NW 150g

	C	Si	Mn	P	S	Cr	Ni	Mo	Co	V	Ti	Cu	AlAcid Sol	AlNon-acid Sol	Sn	Nb	N
JK 21	0.1741	0.36	1.46	0.0148	0.011	0.024	0.035	0.004	0.008	0.002	0.0008	0.045	0.032	0.005	0.006	0.0175	0.008
	As	Cd	Pb	Sb	Ta	W	Zn	Zr									
JK 21	<i>100</i>	<i>1</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>6</i>	<i>7</i>	<i>10</i>									

ECRM 196-2 – chips, NW 100g, discs 38 mm dia.

	C	Si	Mn	P	S	Cr	Mo	Ni	Al _{tot}	As	B	Co	Cu			
ECRM 196-2	0.0060	1.808	0.364	0.00369	0.00065	0.0282	0.0142	0.0401	0.2167	0.00033	0.00014	0.0138	0.0057			
	N	Sn	Ti	V	Ca	Mg	Zn									
ECRM 196-2	0.00178	0.00047	0.00253	0.00368	0.00071	0.00075	0.00019									

Carbon Steel

ECRM 197-1 – chips, NW 100g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	N	Al _{tot}	As	Co	Sn	Ti
ECRM 197-1	0.219	0.275	0.792	0.0073	0.0232	0.451	0.402	0.148	0.152	0.0114	0,0313	0.0083	0.0135	0.0097	0.0005
	V	Bi	Sb	Pb	Alacid sol										
ECRM 197-1	50	0.1	18	3	0.027										

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

1. LOW ALLOYED STEEL (continued)

Carbon Steel (continued)

JK 3B – chips, NW 150g

	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Co	Al _{tot}	Sn
JK 3B	0.742	0.251	0.803	0.0101	0.0071	0.0529	0.0591	0.0051	0.0054	0.0175	0.0048	0.0036	0.0044

	Pb	Ti	Sb	As	Ca	Zn	O	Mg	Ag	Bi	V	
JK 3B	2	20	7	20	5	3	180	1	0.2	1	20	

JK 20A – chips, NW 150g

	C	S	N	V	W	Pb
JK 20A	1.263	0.0094	0.0027	0.161	1.75	0.160

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

2. HIGH ALLOYED STEEL

ECRM 270-1 – chips, NW 100g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	Co	Cu	N	V	Ce	La
ECRM 270-1	0.0742	1.517	0.540	0.0196	0.0007	20.88	0.2099	10.86	0.0685	0.1076	0.1417	0.0256	0.0487	0.0154

	Al	As	Ba	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho	Ir	Lu	Mg	Nd	Os	Pr	Pt	Rb
ECRM 270-1	23	34	1.8	0.013	0.0045	< 0.01	21	< 1.3	6	0.02	< 0.002	0.2	< 0.002	9	76	0.4	29.5	0.1	6

	Re	Rh	Ru	Sb	Sc	Sm	Sn	Ta	Tb	Th	Ti	Tl	Tm	U	W	Y	Yb	Zn	Zr
ECRM 270-1	0.4	0.2	2	7	< 0.02	< 0.1	35	0.1	< 0.045	0.002	19	0.006	< 0.002	0.01	244	< 0.18	< 0.003	7.4	2

ECRM 379-1 – chips, NW 100g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	B	Co	Cu	N	Sn	V	Ca	Sb
ECRM 379-1	0.0121	0.393	1.804	0.0166	0.0006	26.79	3.290	30.83	0.00190	0.0390	0.984	0.0550	0.0021	0.0663	0.0033	0.00057

	Al	As	Nb	O	Pb	Ti	Bi	Fe	Ag	Ce	Cs	Ga	Ir	Mg	Nd	Os
ECRM 379-1	246	28	28	27	0.38	14	0.01	356 000	0.7	0.1	0.01	23	0.1	6	0.6	0.07

	Pr	Pt	Rb	Re	Rh	Ru	Sm	Ta	W	Y	Zr
ECRM 379-1	0.2	0.04	4.3	2.4	0.4	1.4	0.6	0.04	91	0.1	3.3

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

2. HIGH ALLOYED STEEL (continued)

Vanadium Steel

ECRM 274-1 – chips, NW 100g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	N	V	W
ECRM 274-1	1.563	1.057	0.397	0.0148	0.0096	8.036	1.4551	0.077	0.0281	0.0769	4.010	0.0087

	O	Al _{tot}	Co	As	B	Pb	Sb	Sn	Ti
ECRM 274-1	26	25	230	13	5	0.64	2	10	11

Duplex Stainless Steel

ECRM 298-2 – chips, NW 100g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N
ECRM 298-2	0.0140	0.331	0.786	0.0210	0.0006	24.91	3.781	6.877	0.0148	0.0028	0.0024	0.0482	0.105	0.277

	Nb	Sn	Ti	V	W	Sb
ECRM 298-2	0.0011	0.0029	0.0023	0.0704	0.0094	0.0006

	Ga	Re	Pb	Zn	Zr
ECRM 298-2	40	3	<1	6	<1

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

2. HIGH ALLOYED STEEL (continued)

Chromium - nickel - molybdenum alloyed steel

JK 7B – chips, NW 150g

	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Al _{sol}	Al _{tot}	V
JK 7B	0.342	0.267	0.697	0.0057	0.0064	1.34	1.34	0.182	0.0050	0.021	0.010	0.014	0.004

Tool steel

JK 12A – chips, NW 150g

	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Co	V	W	Sn	Pb
JK 12A	0.886	0.30	0.312	0.020	0.023	4.04	0.191	4.85	0.0259	0.062	0.189	1.94	6.42	0.007	0.0004

ECRM 268-1 – chips, NW 150g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	As	B	Co	Cu	N	Sn	V
ECRM 268-1	1.134	0.373	0.293	0.0209	0.0154	4.578	3.208	0.1437	0.0062	0.0009	0.0290	0.1232	2.030	0.0078	8.478

	W	Sb	Nb	Ta
ECRM 268-1	3.707	0.0017	13	2

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

Austenitic Stainless Steel

JK 27B – chips, NW 150g and disc, 38d x 25mm

	C	Si	Mn	P	S	Cr	Mo	Ni	B	Co	Cu	N	Sn	V	W	Ca
JK 27B	0.0089	0.401	1.510	0.0298	0.0207	17.36	2.510	12.56	0.00072	0.142	0.265	0.0630	0.0068	0.057	0.031	0.0022

	Al	Pb	Ti	Zn	Ag	As	Ga	Re	Sb	Zr
JK 27B	<i>20</i>	<i>1</i>	<i>2</i>	<i>2</i>	<i>27</i>	<i>63</i>	<i>30</i>	<i>3</i>	<i>14</i>	<i>3</i>

3. SLAGS, INDUSTRIAL FLY ASHES and IRON ORES/POWDERS

Slags

ECRM 883-1 (blast furnace slag) - powder, NW 100g

In the following table, certified and non-certified concentrations are given in W/W %.

	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	V
ECRM 883-1	0.9820	16.67	21.32	8.86	6.55	1.3331	0.546	0.0033	1.0885	0.316	0.393	0.122

	Cr	Ni	Mo	Ba	Sr	Zr
ECRM 883-1	0.0130	0.00053	< 0.001	0.0436	0.0380	0.0276

	As	B	Be	Bi	C	Cd	Ce	Co	Cs	Cu	F	Hf	Hg	Li
ECRM 883-1	<i>0.0001</i>	<i>0.0064</i>	<i>0.0006</i>	<i>0.000001</i>	<i>0.135</i>	<i>0.00002</i>	<i>0.014</i>	<i>0.00006</i>	<i>0.00003</i>	<i>0.0001</i>	<i>0.04</i>	<i>0.0008</i>	<i>0.000001</i>	<i>0.006</i>

	Nb	Pb	Rb	Sb	Sc	Se	Ta	Te	Th	U	W	Y	Zn
ECRM 883-1	<i>0.002</i>	<i>0.0001</i>	<i>0.001</i>	<i>0.000002</i>	<i>0.003</i>	<i>0.0004</i>	<i>0.0001</i>	<i>0.000003</i>	<i>0.008</i>	<i>0.001</i>	<i>0.00002</i>	<i>0.006</i>	<i>0.001</i>

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

JK S10 and JK S 11 – powder, NW 100g

		F	CaF ₂	Ca _{tot}	CaO	SiO ₂	Al ₂ O ₃	FeO	MnO	MgO	TiO ₂	V ₂ O ₅	C	P	P ₂ O ₅	Cr ₂ O ₃	S
JK S 10	<i>ESR-slag-low Al</i>	34.4	70.7	50.8	20.3	7.8	0.54	0.10	0.03	0.30	0.05	< 100	0.022	0.002	...	...	...
JK S 11	<i>AOD-slag</i>	7.9	...	...	60.0	26.8	2.85	0.2	0.12	4.7	0.95	< 100	...	...	< 50	0.17	0.30

Industrial fly ashes

ECRM 882-1 – powder, NW 100g

In the following table, certified and non-certified concentrations are given in W/W %.

	Fe	Ca	Al	Na	K	Zn	Pb	Cd	Cr	Ni	Cu	V	As	Bi	Sb	Hg
ECRM 882-1	22.20	10.11	0.375	0.697	0.960	28.49	1.324	0.0183	0.490	0.0263	0.218	0.0090	0.0054	0.0026	0.0116	0.000075
<hr/>																
	Sn	Si	Mn	Mg	Cl	C	S	F								
ECRM 882-1	0.02	1.05	2	0.48	2.35	1.0	0.5	0.07								

JK 43 and JK 45 – powder, NW 15g

JK 44 – powder, NW 25g

In the following table, certified and non-certified concentrations are given in W/W %.

	Zn	Pb	Cd	Hg	Fe	Cr	Ni	Ca	Na	K	Al	V	Cu
JK 43	4.96	0.21	0.0023	0.00039	20	8	2	12	0.5	0.3	0.2	0.02	0.2
JK 44	27.3	2.74	0.0469	0.00028	27	0.2	0.02	5	1	1.3	0.2	0.02	0.2
JK 45	1.53	0.11	0.0047	0.000025	40	0.3	0.05	7	7	0.4	0.1	0.1	0.01

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

Iron ores

ECRM 688-1 (magnetite) – powder, NW 100g

	Fe	Si	Ca	Mg	Al	Ti	Mn	P	Ni	Na	K	Co	Cu	V	Pb	Zn
ECRM 688-1	61.38	3.383	1.449	1.061	0.679	0.408	0.0457	0.337	0.0136	0.333	0.180	0.0096	0.0023	0.135	0.00025	0.0015

	As	B	Be	Ce	Cr	Ga	Gd	Hf	Hg	Ho	La	Lu	Nb	Nd	Pr	Rb	S	Sb	Sc	Se	Sm	Sn	Sr
ECRM 688-1	<i>11</i>	<i>5</i>	<i>1</i>	<i>55</i>	<i>21.7</i>	<i>36</i>	<i>3.5</i>	<i>0.4</i>	<i>0.5</i>	<i>0.7</i>	<i>26</i>	<i>0.3</i>	<i>1.6</i>	<i>26</i>	<i>7</i>	<i>9</i>	<i>468</i>	<i>0.1</i>	<i>7</i>	<i>0.7</i>	<i>4.6</i>	<i>3.3</i>	<i>19</i>

	Ta	Tb	Th	Tm	U	Y	Yb	Zr
ECRM 688-1	<i>0.1</i>	<i>0.6</i>	<i>14</i>	<i>0.3</i>	<i>2</i>	<i>19</i>	<i>2</i>	<i>15</i>

ECRM 689-1 – powder, NW 100g

	Fe	Ca	Mg	Al	Ti	Mn	P	Na	K	V	Ni	Zn	Co	Cu
ECRM 689-1	57.05	1.183	0.980	1.185	0.3264	0.1196	0.0706	0.638	0.462	0.1020	0.0195	0.0042	0.0103	0.0068

	<i>Si</i>	<i>S</i>	<i>F</i>	<i>Cr</i>	<i>C</i>	<i>Sn</i>	<i>Cl</i>	<i>GoI</i>
ECRM 689-1	<i>5</i>	<i>0.06</i>	<i>0.07</i>	<i>0.003</i>	<i>0.25</i>	<i>0.0003</i>	<i>0.015</i>	<i>1.5</i>

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

Iron ores

JK 29A and JK 42A (magnetite) – powder, NW 100g

	Fe	SiO ₂	CaO	MgO	Al ₂ O ₃	TiO ₂	MnO	P	S	Na ₂ O	K ₂ O	V ₂ O ₅	Cr	Ni	Zn	Co	Cu
JK 29A	71.36	0.33	0.082	0.223	0.232	0.292	0.0632	0.0059	0.0059	0.015	0.0087	0.266	0.0057	0.0167	0.0016	0.0106	0.0007
JK 42A	70.66	0.800	0.199	0.382	0.278	0.385	0.0506	0.0247	0.0082	0.043	0.0157	0.251	0.0010	0.0129	0.0015	0.0105	0.0007

	F	Pb	As	Sn	Cl	Ba	Gol	Zr	Ag	Au	B	Be	Bi	Cd	Ce	Cs	Ga	Ge	Hf	Hg	I
JK 29A	<i>40</i>	<i>< 10</i>	<i>< 3</i>	<i>2</i>	<i>30</i>	<i>3</i>	<i>3.2%</i>	<i>2</i>	<i>< 0.1</i>	<i>< 0.1</i>	<i>0.4</i>	<i>0.1</i>	<i>< 0.1</i>	<i>< 0.1</i>	<i>0.7</i>	<i>< 0.1</i>	<i>41</i>	<i>0.7</i>	<i>0.1</i>	<i>< 0.1</i>	<i>< 0.1</i>
JK 42A	<i>117</i>	<i>< 10</i>	<i>< 3</i>	<i>3</i>	<i>100</i>	<i>4</i>	<i>3.3%</i>	<i>4</i>	<i>< 0.1</i>	<i>< 0.1</i>	<i>1</i>	<i>0.2</i>	<i>< 0.1</i>	<i>< 0.1</i>	<i>9</i>	<i>< 0.1</i>	<i>37</i>	<i>0.8</i>	<i>0.1</i>	<i>< 0.1</i>	<i>< 0.1</i>

	Ir	La	Li	Mo	Nb	Rb	Sb	Sc	Se	Ta	Th	Tl	U	W	Y	Re	Os
JK 29A	<i>< 0.1</i>	<i>3</i>	<i>1.4</i>	<i>0.8</i>	<i>0.3</i>	<i>0.3</i>	<i>< 0.1</i>	<i>1.3</i>	<i>< 0.2</i>	<i>0.1</i>	<i>6</i>	<i>< 0.1</i>	<i>1.1</i>	<i>0.2</i>	<i>1.0</i>	<i>< 0.1</i>	<i>< 0.1</i>
JK 42A	<i>< 0.1</i>	<i>5</i>	<i>1</i>	<i>0.3</i>	<i>0.8</i>	<i>0.6</i>	<i>< 0.1</i>	<i>2</i>	<i>< 0.2</i>	<i>0.1</i>	<i>11</i>	<i>< 0.1</i>	<i>2</i>	<i>0.1</i>	<i>2</i>	<i>< 0.1</i>	<i>< 0.1</i>

Iron powder

JK 47A – powder, NW 35g

In the following table, certified and non-certified concentrations are given in W/W %.

	O	N	C	S
JK 47A	0.69	0.0062	0.370	0.0090

JK 55 – powder, NW 100g

	Fe _{tot}	Fe _m	SiO ₂	CaO	MgO	Al ₂ O ₃	TiO ₂	MnO	P	K ₂ O	V ₂ O ₅	GOI
JK 55	92.47	84.15	1.0	1.2	0.86	0.21	0.17	0.084	0.036	0.032	0.27	36

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

4. STEEL WITH SPECIAL ELEMENT SPECIFICATION

High alloyed steel

JK 25 (cerium) – chips, NW 150g

	Ce	Cr	La	Mn	Mo	Nd	Ni	Pr
JK 25	0.096	22.3	<i>0.015</i>	<i>1.7</i>	<i>0.1</i>	<i>0.015</i>	<i>11.3</i>	<i>0.006</i>

JK 36, JK 54 (carbon, sulphur, nitrogen and oxygen) – JK 36-chips, NW 150g and JK 54-punched discs 100 pieces á 1.1g.

	C	S	N	O	H
JK 36	0.0125	0.0126	0.0337		
JK 54	0.0535	0.0007	0.0229	0.0046	0.00023

JK 31, JK 32 and JK 34 (oxygen) – rods, 10 x 400-500mm

In the following table, certified and non-certified concentrations are given in W/W %.

	O	C	Si	Mn	Cr	Ni	Alsol	Al _{tot}
JK 31	0.0015	<i>1.03</i>	<i>0.32</i>	<i>0.36</i>	<i>...</i>	<i>...</i>	<i>0.020</i>	<i>0.021</i>
JK 32	0.0028	<i>1.02</i>	<i>0.32</i>	<i>0.30</i>	<i>1.38</i>	<i>...</i>	<i>0.008</i>	<i>0.011</i>
JK 34	0.0068	<i>0.13</i>	<i>0.31</i>	<i>1.40</i>	<i>...</i>	<i>...</i>	<i>0.047</i>	<i>0.051</i>

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

5. FERRO ALLOYS

Ferrosilicon

JK 39 – powder, NW 50g

	C	Si	Mn	P	Fe	Ti	Cu	Al _{tot}	Ca
JK 39	0.105	75.9	0.165	0.018	21.6	0.116	0.013	1.45	0.24

	B	Mg	Cr	Ni	Co	V	As	Zn
JK 39	700	100	100	80	20	70	30	10

6. FLOURSPARS

JK D – powder, NW 100g

In the following table, certified and non-certified concentrations are given in W/W %.

	F	CaF ₂	SiO ₂	P	S	Al ₂ O ₃	Fe ₂ O ₃	Pb
JK D	47.24	97.07	1.5	0.035	0.004	0.04	0.20	<0.001

Certified concentrations are given in bold text and in W/W %. Non-certified elements, i.e. elements only given as supplemental information, are normally given in italics and in µg/g, if not stated otherwise. The number of values for the supplemental concentrations varies from 1 to 13 individual determinations. Please, order the certificate from crm@narema.fi for detailed information.

7. SETTING UP STANDARDS

Ceramics

CE 650A (high oxygen) – disc, 25d x 8mm

In the following table are the concentrations given in W/W %.

	O	Al	C _{tot}	Ti	Fe	W
CE 650A	30	34	6	21	2.1	0.8

Steel plate with a layer of electroless nickel (NiP alloy)

JK SUS NiP-1

This setting up standard is intended for calibration of depth profile measurements mainly by GD-OES. The layer has been applied on both sides of the steel plate.
In the following table are the concentrations given in W/W %.

	P	Pb	Ni
JK SUS NiP-1	5.8 ± 0.2	0.26 ± 0.02	balance

The layer thickness is given in µm

	Layer thickness
JK SUS NiP-1	8.7 ± 0.5

Zinc discs

JK SUS Zn-1, JK SUS Zn-2, JK SUS Zn-5 (zinc discs with impurities) - disc 40x40 mm, height 10mm

In the following table are the concentrations given in µg/g.

O	Ag	Al	Bi	Cd	Cr	Cu	Fe	Ga	In	Mn	Ni	Pb	Sb	Sn	Tl
JK SUS Zn-1	2	2024	0.2	14	55	14	273	0.4	...	6	43	21	0.1	0.3	8
JK SUS Zn-2	2	1394	56	75	63	19	314	0.4	...	7	43	77	34	61	5
JK SUS Zn-5	2	1992	136	63	81	15	318	19	29	9	47	108	24	99	3

Participating laboratories

Australia

CSIRO, Urrbrae

Austria

Böhler Edelstahl GmbH, Kapfenberg
Umwelt- & Betriebsanalytik, voestalpine Stahl GmbH, Linz
voestalpine Stahl GmbH, Linz

Belgium

ArcelorMittal Gent - Stainless Steel, Gent
Belgian Nuclear Research Centre, Mol
Carsid Métallurgie Qualité, Marcinelle
Fabrique de Fer de Charleroi, Marchienne-au-Pont Gent
Nyrstar, Overpelt
OCAS, Zelzate
Umicore Precious Metals Refining, Hoboken

Brazil

ArceleorMittal, Tubarão
VALE S.A. – Centro de Tecnologia de Ferrosos, Nova Lima

Canada

Corporation Scientifique Claisse, Quebec

China

Well Glow (Beijing) International Trading Ltd., Beijing

Czech Republic

TZ Chemical and Mechanical Testing Laboratories, Staré Město

Denmark

Det Danske Stålvalsevaerk A/S, Frederiksvaerk

Finland

Avesta Polarit Stainless Oy, Tornio
Oy Narema AB, Närpiö
Ovako Oy, Imatra Stålverk, Imatra
Outokumpu Oy, Tornio
Rautaruukki Oy, Raahe
SSAB Europe Oy, Raahe
Ab SpectroChem Oy, Turku

France

Aciéries Aubert et Duval, Les Ancizes
Alstom, Belfort
Arcelor Méditerranée, Fos
Arcelor Mittal, Dunkerque
Arcelor Mittal, Florange
ArcelorMittal Imphy, Imphy
ArcelorMittal Industeel Creusot
ArcelorMittal Isbergues Stainless, Isbergues
ArcelorMittal Maizières Research SA, Maizières-les-Metz
Ascométal, Fos-sur-Mer
Aubert & Duval, Les Ancizes
CNRS - Service Central d'Analyse, Vernaison
Creas, Amnéville
CRPG, Vandoeuvre-Les-Nancy
CTIF, Charleville
CTIF, Sèvres
Industeel France – Le Creusot, Le Creusot
Sylab, Metz Cedex

Germany

AG der Dillinger Hüttenwerke, Dillingen/Saar
A.M.C.O. united samplers and assayers GmbH, Duisburg
ArcelorMittal Eisenhüttenstadt Forschungs- und Qualitätszentrum GmbH,
Eisenhüttenstadt
Bruker AXS GmbH, Karlsruhe

Bundesanstalt für Materialforschung und - prüfung (BAM), Berlin
Chemad GmbH, Duisburg
Deutsche Edelstahlwerke GmbH, Witten
ELTRA GmbH, Haan
FEhS Institut für Baustoff-Forschung, Duisburg
GFE Fremat GmbH, Freiberg
H.C. Starck GmbH & Co. KG, Goslar
Heraeus Material Technology, Hanau
Industeel, Le Creusot
Institut de Sodure, Villepinte
Krupp Edelstahlprofile GmbH, Siegen
LECO, Berlin
Leibniz Institute for Solid State and Materials Research, Dresden
Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf
MRU, Muldenhütten Recycling und Umwelttechnik GmbH, Freiberg
Pont à Mousson S.A, Pont à Mousson
Recylex Harz-Metall GmbH, Goslar
Salzgitter Flachstahl GmbH, Salzgitter
SARM, Vandoeuvre-Les-Nancy
Serma Technologie CERM, Belfort
Sollac, Fos-sur-Mer
TechLab, Metz
Thyssen Krupp, Krefeld
Thyssen Krupp Stahl AG, Dortmund
Thyssen Krupp VDM, Werdohl
ThyssenKrupp Steel Europe AG, Duisburg
Ugine S.A. L'Ardoise
Ugine S.A., Isbergues
Ugine Savoie Imphy, Imphy
Ugine, Isbergues
Ugitech Laboratoire, Ugine
Weser-Metall GmbH, Nordenham

Hungary

ISD Dunaferr Zrt., Dunaújváros
Dunaferr Labor Nonprofit Ltd., Dunaújváros

Iceland
IceTec, Reykjavik

India
Inspectorate Griffith India Pvt. Ltd., Bhubaneswar Laboratory, Bhubaneswar

Italy
Centro Sviluppo Materiali, (CSM), Rome

Luxembourg
Luxcontrol, Esch-sur-Alzette

Norway
AS Norsk Jernverk, Mo i Rana
Bremanger Smelteverk, Svelgen, Saltenverk, Straummen
ELKEM-Spigerverket A/S,
Fiskaa Verk, Vaagsbygd
Molab A/S, Mo i Rana
Sintef Molab, Mo i Rana
Tinfors Jernverk A/S, Kvinesdal

Russia
Institute of Certified Reference Materials, Yekaterinburg

South Africa
Cawood Laboratory, Saldanha Bay

Spain
Acerinox S.A, Palmones
ArcelorMittal-Asturias, Bilbao
Centre Nacional de Investigaciones Metalurgicas (CENIM), Madrid

Sweden
AB Bofors, Bofors
AB Ferrolegeringar, Trollhättan

AB Sandvik Coromant, Stockholm
AB Sandvik Materials Technology, Sandviken
Alleima Tube AB, Sandviken
ALS Scandinavia AB, Luleå
ASEA, Västerås
Avesta Jernverks AB, Avesta
Avesta Polarit AB, Avesta
Avesta Polarit, Degerfors Stainless, Degerfors
Avesta Sheffield AB, Avesta
Bodycote Powdermet AB, Surahammar
Chemal, Hofors
Degerfors Järnverk, Degerfors
Degerfors Laboratorium AB, Degerfors
Domnarvets Järnverk, Borlänge
Erasteel Kloster AB, Söderfors
ESAB AB, Göteborg
Fagersta AB, Fagersta
Fagersta BruksAB, Fagersta
Fundia Special Bar AB, Smedjebacken
Gränges Gruvor, Stråssa
Gränges Stål, Oxelösunds Järnverk, Oxelösund
Höganäs Sweden AB, Höganäs
Höganäs Halmstadsverken, Halmstad
Höganäs Sweden AB, Höganäs
IVL, Stockholm
Kanthal AB, Hallstahammar
Kloster Speedsteel AB, Söderfors
KM Lab, Linköping
Leco Corporation Svenska AB, Upplands Väsby
LKAB, Kiruna
LKAB, Malmberget
NASAB, Hälfors
Norrbottnens Järnverk, Luleå
Outokumpu Stainless AB, Avesta Works, Avesta
Ovako Steel AB, Hofors
Ovako Sweden AB, Hofors
Oxelösunds Järnverk, Oxelösund

Sandvik Heating Technology AB, Hallstahammar
Sandvik Materials Technology, Sandviken
Sandvikens Jernverk, Sandviken
ScanDust, Landskrona
Seco Tools AB, Fagersta
SGAB, Luleå
SKF Steel, Hellefors AB, Hällefors
SSAB EMEA AB, Borlänge
SSAB EMEA AB, Oxelösund
SSAB Europe, Borlänge
SSAB Special Steels, Oxelösund
SSAB Tunnplåt, Luleå
Stora Kopparberg, Specialstålverken, Söderfors
Surahammars Bruks AB, Surahammar
Sweco Ecoanalys AB, Stockholm
Swerim, Stockholm
Söderfors Bruk, Söderfors
Uddeholm Tooling AB, Hagfors
Uddeholms AB, Hagfors Jernverk, Hagfors
University of Uppsala, Uppsala
Volvo Aero Corporation, Trollhättan

The Netherlands

Corus Strip Products, Ijmuiden
Tata Steel, Ijmuiden

UK

Alfred H Knight International Ltd, St Helens, Merseyside
AMG Superalloys UK Limited, Rotherham
ATI Allvac Ltd, Sheffield
Bodycote Materials Testing, Teesside
Castings Development Centre, Birmingham
CERAM Research Ltd, Stoke-on-Trent
Corus Engineering Steels, Stocksbridge
Corus Strip Products, Lianwern
Corus Strip Products, Scunthorpe

Corus Testing Solutions, Scunthorpe
Corus, Llanwern Works, Newport, Gwent
Exova Teesside, Middlesbrough
Harwell Scientifics Ltd, Didcot
IncoTest, Hereford
Lucideon, Stoke-on-Trent
Pattinson & Stead (2005), Ltd., Middlesbrough
Ridsdale & Co. Ltd, Middlesbrough
Sheffield Testing Laboratories, Sheffield
Tata Steel, Port Talbot
Tata Steel, Scunthorpe
UES Steels-Stockbridge, Sheffield

USA

Brammer Standards Co., Houston, Texas
LECO Corporation, Saint Joseph
LECO Technical Services Lab, Saint Joseph
North American Hoganas, Inc., Hollsopple PA

CRM Ordering procedure

Order

Homepage www.narema.fi

E-mail crm@narema.fi

Please give reference number, number of units and description of each reference material requested.

Payment

Payment information will be found in the footer of the invoice.

VAT-number FI 30996857

Address

Oy Narema Ab, Närpiöntie 2, FIN-64200 Närpiö, Finland,

Oy Narema Ab is a company performing chemical analyses for companies covering iron, steel and metal industries as well as mechanical industries and who is in charge of the CRM production. Certification analyses are carried out by Nordic and international laboratories, and the results are statistically evaluated according to the Cochran's test and the Grubb's test, following the ISO document 5725.

Jernkontoret represents Sweden's steel industry on issues that relate to education, trade policy, research and development, standardisation, energy and environment as well as taxes and levies. Jernkontoret also manages the joint Nordic research in the steel industry. In addition, Jernkontoret draws up statistical information relating to the industry and carries on research into the history of mining and metallurgy.

All ECRM and CRM in the JK-series are produced and issued by
Oy Narema Ab.



Närpiöntie 2
FIN-64200 Närpiö, Finland
crm@narema.fi
www.narema.fi