NAREMA Jernkontoret

Certified Reference Materials 2024

ELEVATE YOUR **steel industry lab practices with Narema's Certified Reference Materials (CRMs)**

Contents

INTRODUCTION 3

1. LOW ALLOYED STEEL

JK 21 6
ECRM 196-2 6

CARBON STEEL

ECRM 197-1 6
JK 3B 7
JK 20A 7

2. HIGH ALLOYED STEEL

ECRM 270-1 9
ECRM 379-1 9

VANADIUM STEEL

ECRM 274-1 10

DUPLEX STAINLESS STEEL

ECRM 298-2 10

CHROMIUM - NICKEL - MOLYBDENUM ALLOYED STEEL

JK 7B 10

TOOL STEEL

JK 12A 11
ECRM 268-1 11

AUSTENITIC STAINLESS STEEL

JK 27B 11

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

SLAGS

ECRM 883-1 13
JK S10 13
JK S11 13

INDUSTRIAL FLY ASHES

ECRM 882-1 14
JK 43 14
JK 44 14
JK 45 14

IRON ORES/POWDERS

ECRM 688-1 14
ECRM 689-1 15
JK 29A 15
JK 42A 15
JK 52 16
JK 53 16
JK 47A 17
JK 55 17

4. STEEL WITH SPECIAL ELEMENT SPECIFICATION

HIGH ALLOYED STEEL

JK 25 (cerium) 19
JK 36 (carbon, sulphur, nitrogen) 19
JK 54 (carbon, sulphur, nitrogen, oxygen) 19
JK 56 (carbon, sulphur, nitrogen) 19
JK 31 (oxygen) 19
JK 32 (oxygen) 19
JK 34 (oxygen) 19

5. FERRO ALLOYS

FERROSILICON

JK 39 21

6. FLOURSPARS

JK D 21

7. SETTING UP SAMPLES

CERAMICS

CE 650A 23

STEEL PLATE WITH A LAYER OF ELECTROLESS NICKEL (NIP ALLOY)

JK SUS NiP-1 23

ZINC DISCS

JK SUS Zn-1 23
JK SUS Zn-2 23
JK SUS Zn-5 23

PARTICIPATING LABORATORIES 24

CRM ORDERING PROCEDURE 27

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:

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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, standardization, 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 analysis 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.

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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.

To request the certificates with detailed information, you have two options:

1. Download the certificates directly from Narema's database on the website, **www.narema.fi**.
2. Alternatively, you may also place an order for the certificates by contacting us at **crm@narema.fi**.

For your convenience, we recommend checking the database first. However, if you encounter any issues or have specific requirements, feel free to reach out to us via email.

1. Low alloyed steel

JK 21 - chips, NW 150 g

	C	Si	Mn	P	S	Cr	Ni	Mo	Co	V	Ti	Cu	$Al_{Acid\ Sol}$	$Al_{Non\text{-}acid\ Sol}$	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	*100*	*1*	*10*	*10*	*10*	*6*	*7*	*10*

ECRM 196-2 - chips, NW 100g, discs 38d x 25 mm

	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 100 g and disc, 38d x 25 mm 150 g

	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	$Al_{acid\ sol}$
ECRM 197-1	*50*	*0.1*	*18*	*3*	*0.027*

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JK 3B - chips, NW 150 g

	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 150 g

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

2. High alloyed steel

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

	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 100 g and disc, 38d x 25 mm

	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*

VANADIUM STEEL

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

	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 100 g and disc, 38d x 25 mm

	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*

CHROMIUM - NICKEL - MOLYBDENUM ALLOYED STEEL

JK 7B - chips, NW 150 g

	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 150 g

	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 100 g and disc, 38d x 25 mm

	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*

AUSTENITIC STAINLESS STEEL

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

	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	*20*	*1*	*2*	*2*	*27*	*63*	*30*	*3*	*14*	*3*

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3. Slags, industrial fly ashes and iron ores/powders

SLAGS

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

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	*0.0001*	*0.0064*	*0.0006*	*0.000001*	*0.135*	*0.00002*	*0.014*	*0.00006*	*0.00003*	*0.0001*	*0.04*	*0.0008*	*0.000001*	*0.006*

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

JK S 10 and JK S 11 - powder, NW 100 g

		F	CaF_2	Ca_{tot}	CaO	SiO_2	Al_2O_3	FeO	MnO	MgO	TiO_2	V_2O_5	C	P	P_2O_5	Cr_2O_3	S
JK S 10	*ESR-slag-low Al*	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	*AOD-slag*	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

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ECRM 882-1 - powder, NW 100 g

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

	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 15 g
JK 44 - powder, NW 25 g

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*

IRON ORES

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

	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	*11*	*5*	*1*	*55*	*21.7*	*36*	*3.5*	*0.4*	*0.5*	*0.7*	*26*	*0.3*	*1.6*	*26*	*7*	*9*	*468*	*0.1*	*7*	*0.7*	*4.6*	*3.3*	*19*

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	Ta	Tb	Th	Tm	U	Y	Yb	Zr
ECRM 688-1	*0.1*	*0.6*	*14*	*0.3*	*2*	*19*	*2*	*15*

ECRM 689-1 - powder, NW 100 g

	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

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

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

	Fe	SiO_2	CaO	MgO	Al_2O_3	TiO_2	MnO	P	S	Na_2O	K_2O	V_2O_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	GoI	Zr	Ag	Au	B	Be	Bi	Cd	Ce	Cs	Ga	Ge	Hf	Hg	I
JK 29A	*40*	*< 10*	*< 3*	*2*	*30*	*3*	*3.2%*	*2*	*< 0.1*	*< 0.1*	*0.4*	*0.1*	*< 0.1*	*< 0.1*	*0.7*	*< 0.1*	*41*	*0.7*	*0.1*	*< 0.1*	*< 0.1*
JK 42A	*117*	*< 10*	*< 3*	*3*	*100*	*4*	*3.3%*	*4*	*< 0.1*	*< 0.1*	*1*	*0.2*	*< 0.1*	*< 0.1*	*9*	*< 0.1*	*37*	*0.8*	*0.1*	*< 0.1*	*< 0.1*

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

JK 52 and JK 53 (Blast Furnace Pellets and Direct Reduction Pellets, respectively) - powder, NW 100 g

	Fe	Fe(II)	SiO_2	CaO	MgO	Al_2O_3	TiO_2	MnO	Na_2O	K_2O	V_2O_5	Cr	Ni	Zn	Co	Cu
JK 52	**66.76**	**0.83**	**2.58**	**0.464**	**0.510**	**0.399**	**0.284**	**0.0485**	**0.0406**	**0.0321**	**0.252**	**0.0137**	**0.0172**	**0.0021**	**0.0095**	**0.0009**
JK 53	**67.82**	*<0.3%*	**0.795**	**0.932**	**0.691**	**0.165**	**0.164**	**0.0609**	**0.0406**	**0.0315**	**0.188**	**0.0039**	**0.0178**	**0.0021**	**0.0074**	*<0.04%*

	P	S	Cl	Ag	As	B	Ba	Be	Bi	Cd	Ce	Cs	Dy	Er	Eu	F	Ga	Hf	Hg	Ho	La
JK 52	*<0.01%*	*27*	*24*	*<0.01*	*0.05*	*<0.5*	*12*	*0.2*	*0.01*	*<0.02*	*7*	*0.08*	*0.3*	*0.2*	*0.1*	*1*	*33*	*0.7*	*<0.02*	*0.1*	*4*
JK 53	**0.0245**	*28*	*23*	*<0.01*	*0.06*	*<0.5*	*11*	*0.4*	*0.05*	*<0.02*	*13*	*0.03*	*0.8*	*0.6*	*0.2*	*3*	*20*	*0.8*	*<0.02*	*0.2*	*7*

	Li	Lu	Nb	Nd	Pb	Pd	Pr	Pt	Rb	Re	Ru	Sb	Sc	Se	Sm	Sn	Sr	Ta	Tb	Te	Th
JK 52	*2*	*0.05*	*0.8*	*3*	*0.9*	*<0.02*	*0.8*	*<0.01*	*1*	*<0.01*	*<0.01*	*0.1*	*1*	*<0.5*	*0.6*	*2*	*5*	*0.3*	*0.05*	*<0.02*	*6*
JK 53	*2*	*0.07*	*1*	*6*	*0.7*	*<0.02*	*1*	*<0.01*	*1*	*<0.01*	*<0.01*	*0.1*	*2*	*<0.5*	*0.7*	*1*	*9*	*0.4*	*0.1*	*<0.01*	*7*

	Tl	Tm	U	W	Y	Yb	Zr	LOI
JK 52	*<0.01*	*0.03*	*0.9*	*2*	*3*	*0.3*	*43*	*220*
JK 53	*<0.01*	*0.05*	*0.9*	*2*	*6*	*0.3*	*37*	*220*

IRON POWDER

JK 47A - powder, NW 35 g

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 (Direct Reduced Iron) - powder, NW 100 g

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

	Fe_{tot}	Fe_M	*SiO_2*	*CaO*	*MgO*	*Al_2O_3*	*TiO_2*	*MnO*	*P*	*K_2O*	*V_2O_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*

4. Steel with special element specification

HIGH ALLOYED STEEL

JK 25 (cerium) - chips, NW 150 g

	Ce	Cr	La	Mn	Mo	Nd	Ni	Pr
JK 25	**0.096**	*22.3*	*0.015*	*1.7*	*0.1*	*0.015*	*11.3*	*0.006*

JK 36, JK 54, JK 56 (carbon, sulphur, nitrogen and oxygen) - JK 36-chips, NW 150g, JK 54-punched discs 100 pieces á 1.1 g and JK 56-pins 100 pieces á 0.5g

	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 56	**0.0835**	**0.00030**	**0.0108**	…	…

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

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

	O	C	Si	Mn	Cr	Ni	Al_{sol}	Al_{tot}
JK 31	**0.0015**	*1.03*	*0.32*	*0.36*	…	…	*0.020*	*0.021*
JK 32	**0.0028**	*1.02*	*0.32*	*0.30*	*1.38*	…	*0.008*	*0.011*
JK 34	**0.0068**	*0.13*	*0.31*	*1.40*	…	…	*0.047*	*0.051*

5. Ferro alloys
6. Flourspars

5. Ferro alloys

FERROSILICON

JK 39 - powder, NW 50 g

	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_2O_3	Fe_2O_3	Pb
JK D	47.24	97.07	*1.5*	0.035	0.004	0.04	0.20	*<0.001*

NAREMA Jernkontoret

7. Setting up standards

CERAMICS

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

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*

In the following table 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 10 mm

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

	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*

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Nyrstar, Overpelt
OCAS, Zelzate
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