



CANNON-MUSKEGON CORPORATION
 2875 LINCOLN STREET
 P.O. BOX 506
 MUSKEGON, MICHIGAN 49443-0506 U.S.A.
 TEL 231-755-1601 FAX 231-755-4975



ISO/IEC 17025
 Materials Testing Laboratory

CERTIFICATION

CHEMICAL ANALYSIS (WT %/PPM)

Page 1 of 1

CERT. NO.: 58154 DATE PRINTED: 05/12/09

SPECIFICATION: 738 LC (04/04/09)

CUSTOMER:

HEAT: 7V2045

PURCHASE ORDER: POD 149

SHIP DATE: 5/12/09

ALLOY: IN 738 LC

SALES ORDER: 39539

SHIP QTY: 13,161#

DESCRIPTION: VACUUM INDUCTION REFINED INGOT
 5" DIA. X RANDOM LENGTH

	C++	S++	N+	O+	Si	Mn	Ag	Al	B	Bi	Cb
	PPM	PPM	PPM	PPM			PPM			PPM	
HEAT	.102	1	6	2	<.01	<.001	<.4	3.53	.011	<.2	.90
SP MAX.	.13	40	25	25	.30	.20	5	3.70	.012	.5	1.10
SP MIN.	.09							3.20	.007		.60
	Co	Cr	Cu	Fe	Ga	Hf	Mg	Mo	Ni	P	Pb
	PPM	PPM	PPM	PPM	PPM		PPM			PPM	PPM
HEAT	8.27	15.84	<.001	.067	<10	<.05	<100 <100	1.73	BALANCE	6	<.5
SP MAX.	9.0	16.30	.10	.35			100	2.00	BALANCE	150	5
SP MIN.	8.0	15.70						1.50			
	Se	Re	Ru	Ta	Te	Ti	Tl	W	Zr	Al+Ti	Sn
	PPM		PPM		PPM		PPM				PPM
HEAT	<.5	<.05	<25	1.90	<.2	3.32	<.2	2.58	.018	6.85	<10
SP MAX.	3			2.00		3.70		2.80	.06	7.20	
SP MIN.				1.50		3.20		2.40	.015	6.50	
	Sb	As	Zn	Hg	U	Th	Cd	V	Y	Pt	In
	PPM	PPM	PPM	PPM	PPM	PPM	PPM				PPM
HEAT	<1	<1	<1	<2	<.5	<1	<.2	<.005	<.001	<.010	<.2
SP MAX.											
SP MIN.											
	Ca	Pd									
	PPM										
HEAT	<25	<.001									
SP MAX.											
SP MIN.											

ADDITIONAL DATA: 100% VIRGIN PREMIUM SO[®] GRADE

+ LECO TC 436 INERT GAS FUSION ANALYSIS.
 ++ LECO CS 444 L₅ FLUXED OXYGEN FUSION ANALYSIS.
 TRACE ELEMENT ANALYSIS BY PERKIN ELMER AA/HGA/ICPMS EQUIPMENT.
 E - OE/ICPMS MAJOR ELEMENTS - XRF P, U & TH - ICPMS
 NV = 2.33 / 2.36 MAX (P3B-AG5)



Matthew Vandyke
 MATTHEW VANDYKE
 METALLURGIST

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Customer: **Cannon Muskegon Corp**
Date: **5/12/2009**

P.O.#
Job # **M18908**
S09X3610

Customer ID: **IN738**
7V2045

Shiva ID: **S090512009**

Element	[ppm wt]	Element	[ppm wt]
Li	< 0.005	Pd	< 0.1
Be	< 0.005	Ag	< 0.1
B	-	Cd	< 0.1
C	-	In	< 0.05
N	-	Sn	5.5
O	-	Sb	0.08
F	< 0.1	Te	< 0.01
Na	< 0.01	I	< 0.01
Mg	110	Cs	< 0.01
Al	Matrix	Ba	0.02
Si	21	La	0.13
P	2.9	Ce	0.15
S	2.5	Pr	0.01
Cl	< 0.01	Nd	0.03
K	< 0.05	Sm	< 0.01
Ca	0.37	Eu	< 0.01
Sc	< 0.05	Gd	< 0.01
Ti	Matrix	Tb	< 0.01
V	4.1	Dy	0.01
Cr	Matrix	Ho	< 0.01
Mn	4.2	Er	< 0.01
Fe	890	Tm	< 0.01
Co	Matrix	Yb	< 0.01
Ni	Matrix	Lu	< 0.01
Cu	1.6	Hf	138
Zn	0.1	Ta	Matrix
Ga	4.1	W	Matrix
Ge	< 0.1	Re	4.5
As	0.98	Os	< 0.01
Se	< 2	Ir	< 0.01
Br	< 0.05	Pt	< 0.1
Rb	< 1	Au	< 0.1
Sr	< 5	Hg	< 0.1
Y	< 5	Tl	< 0.01
Zr	230	Pb	< 0.05
Nb	Matrix	Bi	< 0.05
Mo	Matrix	Th	0.1
Ru	< 0.05	U	0.03
Rh	< 0.1		

David C. Van Arman



CANNON-MUSKEGON CORPORATION
 2876 LINCOLN STREET
 P.O. BOX 508
 MUSKEGON, MICHIGAN 49443-0508 U.S.A.
 TEL 231-755-1881 FAX 231-755-4875



CERTIFICATION
CHEMICAL ANALYSIS (WT %/PPM)

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1 of 1

ISO/IEC 17025
 Materials Testing Laboratory

CERT. NO.: 58141 DATE PRINTED: 05/11/09

SPECIFICATION: **738 LC (04/04/09)**

CUSTOMER: **[REDACTED]**

HEAT: 4V3075 PURCHASE ORDER: POD 149 SHIP DATE: 5/12/09
 ALLOY: IN 738 LC SALES ORDER: 39539 SHIP QTY: 12,912#

DESCRIPTION: **VACUUM INDUCTION REFINED INGOT**
5" DIA. X RANDOM LENGTH

	C++	S++	N+	O+	Si	Mn	Ag	Al	B	Bi	Cb
	PPM	PPM	PPM	PPM			PPM			PPM	
HEAT	.101	1	6	2	<.01	<.001	<.4	3.56	.011	<.2	.90
SP MAX.	.13	40	25	25	.30	.20	5	3.70	.012	.5	1.10
SP MIN.	.09							3.20	.007		.60
	Co	Cr	Cu	Fe	Ga	Hf	Mg	Mo	Ni	P	Pb
	PPM	PPM	PPM	PPM	PPM		PPM			PPM	PPM
HEAT	8.31	15.88	<.001	.049	<10	<.05	<100	1.74	BALANCE	4	<.5
SP MAX.	9.0	16.30	.10	.35			100	2.00	BALANCE	150	5
SP MIN.	8.0	15.70						1.50			
	Se	Re	Ru	Ta	Te	Ti	Tl	W	Zr	Al+Ti	Sn
	PPM		PPM		PPM		PPM				PPM
HEAT	<.5	<.05	<25	1.89	<.2	3.31	<.2	2.61	.018	6.87	<10
SP MAX.	3			2.00		3.70		2.80	.06	7.20	
SP MIN.				1.50		3.20		2.40	.015	6.50	
	Sb	As	Zn	Hg	U	Th	Cd	V	Y	Pt	In
	PPM	PPM	PPM	PPM	PPM	PPM	PPM				PPM
HEAT	<1	<1	<1	<2	<.5	<1	<.2	<.005	<.001	<.010	<.2
SP MAX.											
SP MIN.											
	Ce	Rd									
	PPM										
HEAT	<25	<.001									
SP MAX.											
SP MIN.											

ADDITIONAL DATA: **100% VIRGIN PREMIUM SQ[®] GRADE**

+ LECO **TC 436** INERT GAS FUSION ANALYSIS.
 ++ LECO **CS 444 LS** FLUXED OXYGEN FUSION ANALYSIS.
 TRACE ELEMENT ANALYSIS BY PERKIN ELMER AA/HGA/ICPMS EQUIPMENT.
B - O6/ICPMS MAJOR ELEMENTS - XRF P, U & TH - ICPMS
 NV = 2.34 / 2.36 MAX (P3B-AGS)



Matthew Vandyke
MATTHEW VANDYKE
 METALLURGIST

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Customer: **Cannon Muskegon Corp**
Date: **5/12/2009**

P.O.# **M16908**
Job # **S09X3610**

Customer ID: **IN738**
4V3075

Shiva ID: **S090512010**

Element	[ppm wt]	Element	[ppm wt]
Li	< 0.005	Pd	< 0.1
Be	< 0.005	Ag	< 0.1
B	-	Cd	< 0.1
C	-	In	< 0.05
N	-	Sn	6.4
O	-	Sb	0.42
F	< 0.1	Te	< 0.01
Na	< 0.01	I	< 0.01
Mg	64	Cs	< 0.01
Al	Matrix	Ba	< 0.01
Si	28	La	0.08
P	3.1	Ce	0.13
S	1.7	Pr	0.01
Cl	< 0.01	Nd	0.03
K	< 0.05	Sm	< 0.01
Ca	0.22	Eu	< 0.01
Sc	< 0.05	Gd	< 0.01
Ti	Matrix	Tb	< 0.01
V	5.4	Dy	< 0.01
Cr	Matrix	Ho	< 0.01
Mn	5.6	Er	< 0.01
Fe	470	Tm	< 0.01
Co	Matrix	Yb	0.02
Ni	Matrix	Lu	< 0.01
Cu	2.1	Hf	19
Zn	< 0.1	Ta	Matrix
Ga	3.9	W	Matrix
Ge	< 0.1	Re	0.63
As	1.2	Os	0.06
Se	< 2	Ir	0.15
Br	< 0.05	Pt	< 0.1
Rb	< 1	Au	< 0.1
Sr	< 5	Hg	< 0.1
Y	< 5	Tl	< 0.01
Zr	240	Pb	0.08
Nb	Matrix	Bi	< 0.05
Mo	Matrix	Th	0.03
Ru	< 0.05	U	0.03
Rh	< 0.1		

Daniel C. Van Arman



CANNON-MUSKEGON CORPORATION
 2875 LINCOLN STREET
 P.O. BOX 506
 MUSKEGON, MICHIGAN 49443-0506 U.S.A.
 TEL 231-755-1661 FAX 231-755-4975



ISO/IEC 17025
 Materials Testing Laboratory

CERTIFICATION

CHEMICAL ANALYSIS (WT %/PPM)

Page 1 of 1

CERT. NO.: 58184

DATE PRINTED: 05/15/09

SPECIFICATION: **IN 738 LC (04/04/09)**

CUSTOMER: **[REDACTED]**

HEAT: **4V3080** PURCHASE ORDER: **POD 149** SHIP DATE: **5/19/09**
 ALLOY: **IN 738 LC** SALES ORDER: **39539** SHIP QTY: **12,985#**

DESCRIPTION: **VACUUM INDUCTION REFINED INGOT
 5" DIA. X RANDOM LENGTH**

	C++	S++	N+	O+	Si	Mn	Ag	Al	B	Bi	Cb
	PPM	PPM	PPM	PPM			PPM			PPM	
HEAT	.100	3	6	4	<.02	<.001	<.4	3.52	.011	<.2	.91
SP MAX.	.13	40	25	25	.30	.20	5	3.70	.012	.5	1.10
SP MIN.	.09							3.20	.007		.60
	Co	Cr	Cu	Fe	Ga	Hf	Mg	Mo	Ni	P	Pb
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
HEAT	8.32	15.87	<.001	.01	<10	<.05	<100 <100	1.76	BALANCE	7	<.5
SP MAX.	9.0	16.30	.10	.35			100	2.00	BALANCE	150	5
SP MIN.	8.0	15.70						1.50			
	Se	Re	Ru	Ta	Te	Tl	Tl	W	Zr	Al+Ti	Sn
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
HEAT	<.5	<.05	<25	1.91	<.2	3.32	<.2	2.60	.018	6.84	<10
SP MAX.	3			2.00		3.70		2.80	.06	7.20	
SP MIN.				1.50		3.20		2.40	.015	6.50	
	Sb	As	Zn	Hg	U	Th	Cd	V	Y	Pt	In
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
HEAT	<1	<1	<1	<2	<.5	<1	<.2	<.005	<.001	<.010	<.2
SP MAX.											
SP MIN.											
	Ca	Pd									
	PPM	PPM									
HEAT	<25	<.001									
SP MAX.											
SP MIN.											

ADDITIONAL DATA: **100% VIRGIN PREMIUM SO⁹⁹ GRADE**

+ LECO **TC 436** INERT GAS FUSION ANALYSIS.
 ++ LECO **CS 444** LS FLUXED OXYGEN FUSION ANALYSIS.
 TRACE ELEMENT ANALYSIS BY PERKIN ELMER AA/HGA/ICPMS EQUIPMENT.
B - O6/ICPMS MAJOR ELEMENTS - XRF P, U & TH - ICMS
 NV = 2.32 / 2.36 MAX (P3B-AG5)

Jacqueline Wahl

 JACQUELINE WAHL
 SENIOR METALLURGIST

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Customer: Cannon Muskegon Corp
Date: 5/19/2009

P.O.# M16908
Job # S09X3676

Customer ID: IN738LC
4V3080

Shiva ID: S090518024

Element	[ppm wt]	Element	[ppm wt]
Li	< 0.005	Pd	< 0.1
Be	< 0.005	Ag	< 0.1
B	-	Cd	< 0.1
C	-	In	< 0.05
N	-	Sn	1.6
O	-	Sb	0.18
F	< 0.1	Te	< 0.01
Na	< 0.01	I	< 0.01
Mg	110	Cs	< 0.01
Al	Matrix	Ba	< 0.01
Si	21	La	0.06
P	2.9	Ce	0.14
S	4.7	Pr	0.02
Cl	< 0.01	Nd	0.03
K	< 0.05	Sm	< 0.01
Ca	0.31	Eu	< 0.01
Sc	< 0.05	Gd	< 0.01
Ti	Matrix	Tb	< 0.01
V	2.4	Dy	0.01
Cr	Matrix	Ho	< 0.01
Mn	2.4	Er	< 0.01
Fe	110	Tm	< 0.01
Co	Matrix	Yb	< 0.01
Ni	Matrix	Lu	< 0.01
Cu	1.4	Hf	2.1
Zn	0.13	Ta	Matrix
Ga	0.35	W	Matrix
Ge	< 0.1	Re	0.19
As	1.1	Os	< 0.01
Se	< 2	Ir	< 0.01
Br	< 0.05	Pt	0.57
Rb	< 1	Au	< 0.1
Sr	< 5	Hg	< 0.1
Y	< 5	Tl	< 0.01
Zr	200	Pb	< 0.05
Nb	Matrix	Bi	< 0.05
Mo	Matrix	Th	0.04
Ru	< 0.05	U	0.03
Rh	< 0.1		

David C. Van Arman



CANNON-MUSKEGON CORPORATION
 2876 LINCOLN STREET
 P.O. BOX 506
 MUSKEGON, MICHIGAN 49443-0506 U.S.A.
 TEL 231-755-1681 FAX 231-755-4975



CERTIFICATION
CHEMICAL ANALYSIS (WT %/PPM)

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ISO/IEC 17025
 Materials Testing Laboratory

CERT. NO.: 58187

DATE PRINTED: 05/15/09

SPECIFICATION: **IN 738 LC (04/04/09)**

CUSTOMER: **[REDACTED]**

HEAT: 4V3081

PURCHASE ORDER: POD 119

SHIP DATE: 5/19/09

ALLOY: IN 738 LC

SALES ORDER: 39539

SHIP QTY: 12,788#

DESCRIPTION: VACUUM INDUCTION REFINED INGOT
 5" DIA. X RANDOM LENGTH

	C++ PPM	S++ PPM	N+ PPM	O+ PPM	Si PPM	Mn PPM	Ag PPM	Al PPM	B PPM	Bi PPM	Cb PPM
HEAT	.099	1	7	4	<.02	<.001	<.4	3.56	.012	<.2	.90
SP MAX.	.13	40	25	25	.30	.20	5	3.70	.012	.5	1.10
SP MIN.	.09							3.20	.007		.60
	Co PPM	Cr PPM	Cu PPM	Fe PPM	Ga PPM	Hf PPM	Mg PPM	Mo PPM	Ni PPM	P PPM	Pb PPM
HEAT	8.30	15.90	.001	.04	<10	<.05	<100 <100	1.74	BALANCE	6	<.5
SP MAX.	9.0	16.30	.10	.35			100	2.00	BALANCE	150	5
SP MIN.	8.0	15.70						1.50			
	Se PPM	Re PPM	Ru PPM	Ta PPM	Te PPM	Ti PPM	Tl PPM	W PPM	Zr PPM	Al+Ti PPM	Sn PPM
HEAT	<.5	<.05	<25	1.90	<.2	3.34	<.2	2.60	.018	6.90	<10
SP MAX.	3			2.00		3.70		2.80	.06	7.20	
SP MIN.				1.50		3.20		2.40	.015	6.50	
	Sb PPM	As PPM	Zn PPM	Hg PPM	U PPM	Th PPM	Cd PPM	V PPM	Y PPM	Pt PPM	In PPM
HEAT	<1	<1	<1	<2	<.5	<1	<.2	<.005	<.001	<.010	<.2
SP MAX.											
SP MIN.											
	Ca PPM	Pd PPM									
HEAT	<25	<.001									
SP MAX.											
SP MIN.											

ADDITIONAL DATA: **100% VIRGIN PREMIUM SQ[®] GRADE**

- + LECO **TC 436** INERT GAS FUSION ANALYSIS.
- ++ LECO **CS 444 LS** FLUXED OXYGEN FUSION ANALYSIS.
- TRACE ELEMENT ANALYSIS BY PERKIN ELMER AA/HGA/ICPMS EQUIPMENT.
- B - OR/ICPMS MAJOR ELEMENTS - XRF P, U & TH - ICPMS**
- NV = 2.34 / 2.36 MAX (P3B-AG5)

Jacqueline Wahl

 JACQUELINE WAHL
 SENIOR METALLURGIST

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GOMS
ANALYTICAL REPORT

SHIVA Technologies
An Operating Unit of Evans Analytical Group LLC
6707 Brooktown Parkway
Syracuse, New York 13211

Telephone (315) 431-8900
Fax (315) 431-8800
Email info.ny@eaglabs.com
www.eaglabs.com

Customer: **Cannon Muskegon Corp**
Date: **5/19/2009**

P.O.# **M16908**
Job # **S09X3676**

Customer ID: **IN736LC**
4V3081

Shiva ID: **S090518025**

Element	[ppm wt]	Element	[ppm wt]
Li	< 0.005	Pd	< 0.1
Be	< 0.005	Ag	< 0.1
B	-	Cd	< 0.1
C	-	In	< 0.05
N	-	Sn	7.5
O	-	Sb	0.31
F	< 0.1	Te	< 0.01
Na	< 0.01	I	< 0.01
Mg	47	Cs	< 0.01
Al	Matrix	Ba	< 0.01
Si	66	La	0.05
P	4.4	Ce	0.17
S	2.6	Pr	0.02
Cl	< 0.01	Nd	0.05
K	< 0.05	Sm	< 0.01
Ca	0.27	Eu	< 0.01
Sc	< 0.05	Gd	< 0.01
Ti	Matrix	Tb	< 0.01
V	3.9	Dy	0.01
Cr	Matrix	Ho	< 0.01
Mn	6.3	Er	< 0.01
Fe	430	Tm	< 0.01
Co	Matrix	Yb	< 0.01
Ni	Matrix	Lu	< 0.01
Cu	2.4	Hf	12
Zn	< 0.1	Ta	Matrix
Ga	4.1	W	Matrix
Ge	< 0.1	Re	1.6
As	1.1	Os	0.05
Se	< 2	Ir	0.14
Br	< 0.05	Pt	0.17
Rb	< 1	Au	< 0.1
Sr	< 5	Hg	< 0.1
Y	< 5	Tl	< 0.01
Zr	200	Pb	< 0.05
Nb	Matrix	Bi	< 0.05
Mo	Matrix	Th	0.06
Ru	< 0.05	U	0.05
Rh	< 0.1		

Daniel Chua-Avery