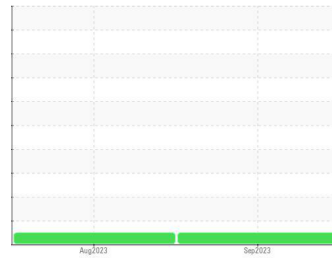




OIL ANALYSIS REPORT

Sample Rating Trend

NORMAL



Area
OCEAN NAVIGATOR
Machine Id
[OCEAN NAVIGATOR] OCEAN NAVIGATOR - D6
Component
Starboard Diesel Engine
Fluid
FUCHS 15W40 (60 LTR)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor. Please specify the component make and model with your next sample.

Wear

All component wear rates are normal.

Contamination

There is no indication of any contamination in the oil.

Fluid Condition

The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

SAMPLE INFORMATION

method	limit/base	current	history1	history2
Sample Number	Client Info	WC0824574	WC0824507	---
Sample Date	Client Info	24 Sep 2023	09 Aug 2023	---
Machine Age	hrs	Client Info	0	---
Oil Age	hrs	Client Info	0	---
Oil Changed	Client Info	N/A	N/A	---
Sample Status		NORMAL	NORMAL	---

CONTAMINATION

method	limit/base	current	history1	history2
Fuel	WC Method >5	<1.0	<1.0	---
Glycol	WC Method	NEG	NEG	---

WEAR METALS

method	limit/base	current	history1	history2
Iron	ppm ASTM D5185m >100	23	26	---
Chromium	ppm ASTM D5185m >20	<1	<1	---
Nickel	ppm ASTM D5185m >4	0	<1	---
Titanium	ppm ASTM D5185m	0	<1	---
Silver	ppm ASTM D5185m >3	0	0	---
Aluminum	ppm ASTM D5185m >20	2	2	---
Lead	ppm ASTM D5185m >40	8	10	---
Copper	ppm ASTM D5185m >330	17	29	---
Tin	ppm ASTM D5185m >15	<1	<1	---
Vanadium	ppm ASTM D5185m	0	0	---
Cadmium	ppm ASTM D5185m	0	0	---

ADDITIVES

method	limit/base	current	history1	history2
Boron	ppm ASTM D5185m	14	24	---
Barium	ppm ASTM D5185m	0	0	---
Molybdenum	ppm ASTM D5185m	4	9	---
Manganese	ppm ASTM D5185m	<1	<1	---
Magnesium	ppm ASTM D5185m	18	19	---
Calcium	ppm ASTM D5185m	2899	2972	---
Phosphorus	ppm ASTM D5185m	951	926	---
Zinc	ppm ASTM D5185m	1222	1127	---
Sulfur	ppm ASTM D5185m	3773	3635	---

CONTAMINANTS

method	limit/base	current	history1	history2
Silicon	ppm ASTM D5185m >25	5	6	---
Sodium	ppm ASTM D5185m	23	47	---
Potassium	ppm ASTM D5185m >20	<1	3	---

INFRA-RED

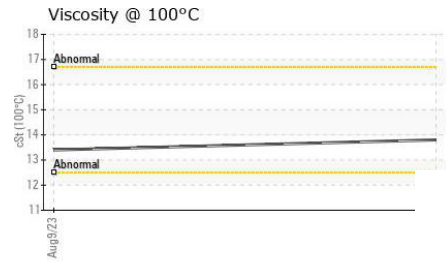
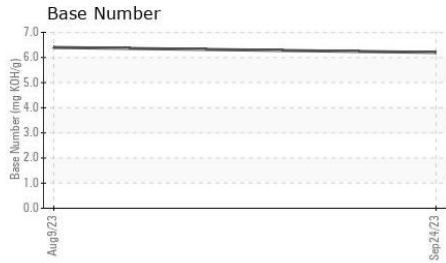
method	limit/base	current	history1	history2
Soot %	% *ASTM D7844 >3	0.2	0.2	---
Nitration	Abs/cm *ASTM D7624 >20	9.8	10.0	---
Sulfation	Abs/.1mm *ASTM D7415 >30	23.1	23.4	---

FLUID DEGRADATION

method	limit/base	current	history1	history2
Oxidation	Abs/.1mm *ASTM D7414 >25	18.3	18.3	---
Base Number (BN)	mg KOH/g ASTM D2896	6.2	6.4	---



OIL ANALYSIS REPORT

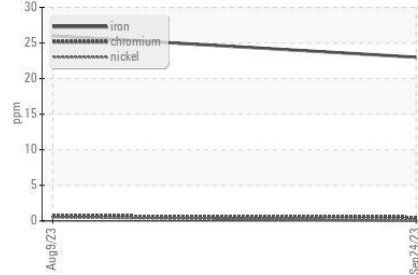


VISUAL	method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	---
Yellow Metal	scalar	*Visual	NONE	NONE	---
Precipitate	scalar	*Visual	NONE	NONE	---
Silt	scalar	*Visual	NONE	NONE	---
Debris	scalar	*Visual	NONE	NONE	---
Sand/Dirt	scalar	*Visual	NONE	NONE	---
Appearance	scalar	*Visual	NORML	NORML	---
Odor	scalar	*Visual	NORML	NORML	---
Emulsified Water	scalar	*Visual	>0.2	NEG	---
Free Water	scalar	*Visual	NEG	NEG	---

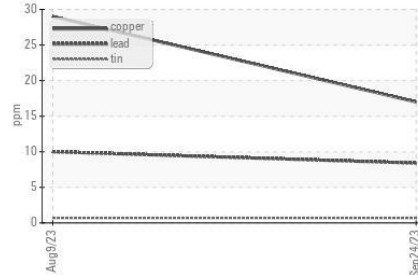
FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	13.8	13.4	---

GRAPHS

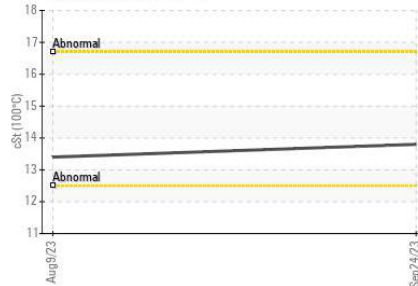
Ferrous Alloys



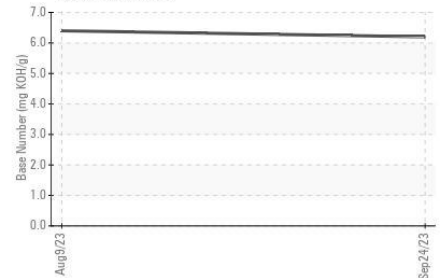
Non-ferrous Metals



Viscosity @ 100°C



Base Number



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0824574
Lab Number : 05967399
Unique Number : 10673950
Test Package : MAR 2

Received : 03 Oct 2023
Diagnosed : 04 Oct 2023
Diagnostician : Wes Davis

American Queen Voyages - Oceans
1201 Bridgeport Drive
Jeffersonville, IN
US 47130
Contact: Dietrich Giles

To discuss this sample report, contact Customer Service at 1-800-237-1369.

* - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

F:



OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area

OCEAN NAVIGATOR

Machine Id

[OCEAN NAVIGATOR] OCEAN NAVIGATOR AUXENG SB

Component

Starboard Auxiliary Engine

Fluid

CASTROL TECTION EXTRA SAE 15W-40 (--- LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		WC0824529	WC0633850	WC0667206
Sample Date		Client Info		24 Jul 2023	14 Apr 2023	01 Sep 2022
Machine Age	hrs	Client Info		0	2314	7841
Oil Age	hrs	Client Info		0	0	2732
Filter Age	hrs	Client Info		0	0	0
Oil Changed		Client Info		N/A	N/A	Changed
Filter Changed		Client Info		N/A	N/A	N/A
Sample Status				NORMAL	NORMAL	ATTENTION

WEAR

All component wear rates are normal.

Iron	ppm	ASTM D5185m	>100	26	16	6
Chromium	ppm	ASTM D5185m	>20	<1	<1	<1
Nickel	ppm	ASTM D5185m	>2	0	0	<1
Titanium	ppm	ASTM D5185m	>2	<1	<1	<1
Silver	ppm	ASTM D5185m	>2	0	0	<1
Aluminum	ppm	ASTM D5185m	>20	2	<1	2
Lead	ppm	ASTM D5185m	>40	13	5	3
Copper	ppm	ASTM D5185m	>330	35	18	92
Tin	ppm	ASTM D5185m	>15	<1	<1	2
Vanadium	ppm	ASTM D5185m		<1	0	<1
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE

CONTAMINATION

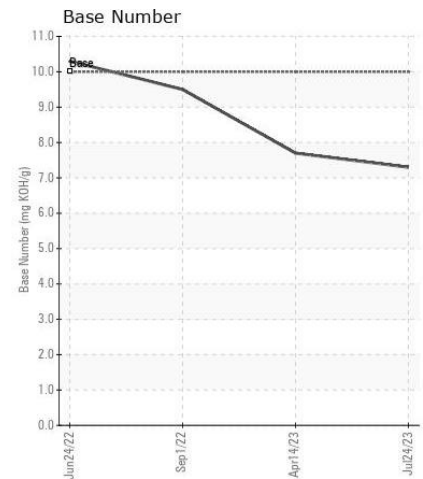
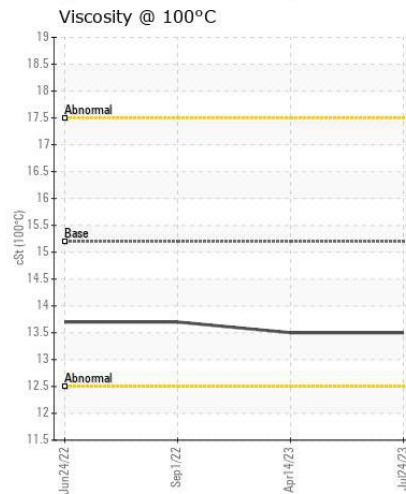
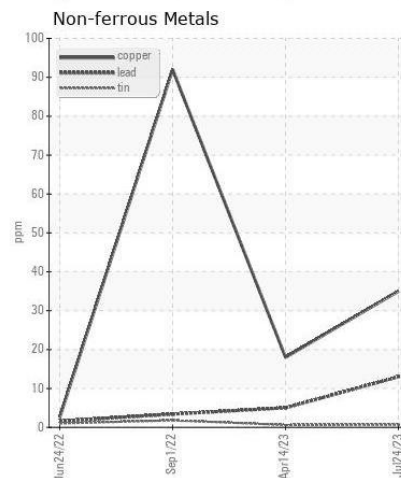
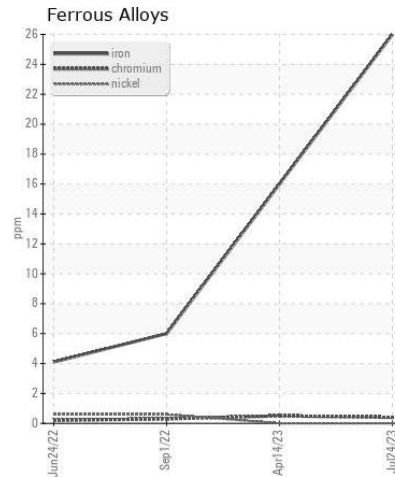
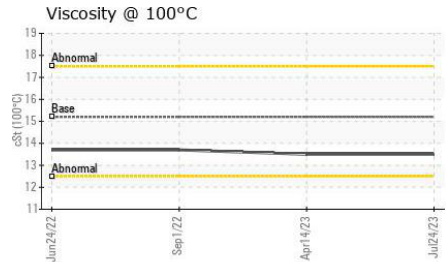
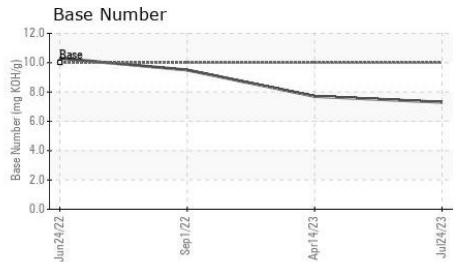
There is no indication of any contamination in the oil.

Silicon	ppm	ASTM D5185m	>25	6	5	4
Potassium	ppm	ASTM D5185m	>20	2	3	3
Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Glycol		WC Method		NEG	NEG	NEG
Soot %	%	*ASTM D7844		0.2	0.1	0.1
Nitration	Abs/cm	*ASTM D7624	>20	10.2	8.7	9.9
Sulfation	Abs/.1mm	*ASTM D7415	>30	23.4	21.5	24.9
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	LIGHT	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG

FLUID CONDITION

The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Sodium	ppm	ASTM D5185m		68	2	<1
Boron	ppm	ASTM D5185m	30	24	39	88
Barium	ppm	ASTM D5185m		0	0	0
Molybdenum	ppm	ASTM D5185m		12	4	8
Manganese	ppm	ASTM D5185m		<1	<1	<1
Magnesium	ppm	ASTM D5185m	110	15	18	16
Calcium	ppm	ASTM D5185m	2740	3271	3576	3287
Phosphorus	ppm	ASTM D5185m	1240	963	967	885
Zinc	ppm	ASTM D5185m	1350	1202	1179	1121
Sulfur	ppm	ASTM D5185m	3520	4408	3706	3644
Oxidation	Abs/.1mm	*ASTM D7414	>25	17.6	16.7	18.6
Base Number (BN)	mg KOH/g	ASTM D2896	10.0	7.3	7.7	9.5
Visc @ 100°C	cSt	ASTM D445	15.2	13.5	13.5	13.7



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0824529
Lab Number : 05907050
Unique Number : 10573702
Test Package : MAR 2

Received : 25 Jul 2023
Diagnosed : 27 Jul 2023
Diagnostician : Sean Felton

American Queen Voyages - Oceans
 1201 Bridgeport Drive
 Jeffersonville, IN
 US 47130
 Contact: Dietrich Giles

To discuss this sample report, contact Customer Service at 1-800-237-1369.

* - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

F:



FLUID ANALYSIS REPORTS

USA NO.10

To: Dietrich Giles

American Queen Voyages - Oceans
1201 Bridgeport Drive
Jeffersonville, IN, US 47130

Laboratory

WearCheck USA
501 Madison Ave.
Cary, NC, USA 27513

American Queen Voyages - Oceans - 1201 Bridgeport Drive, Jeffersonville, IN 47130

Sample No. : WC0824581
Lab Number : 05990112
Test Package : MAR 2
Sampled : 20 Oct 2023

Area

Machine Id

Component

Fluid

OCEAN NAVIGATOR

[OCEAN NAVIGATOR] OCEAN NAVIGATOR - D6

Starboard Genset

FUCHS 15W40 (60 LTR)

WEAR

ABNORMAL

CONTAMINATION

NORMAL

FLUID CONDITION

NORMAL

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OIL ANALYSIS REPORT

WEAR	ABNORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area

OCEAN NAVIGATOR

Machine Id

[OCEAN NAVIGATOR] OCEAN NAVIGATOR - D6

Component

Starboard Genset

Fluid

FUCHS 15W40 (60 LTR)

RECOMMENDATION

No corrective action is recommended at this time. Resample at the next service interval to monitor.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		WC0824581	WC0824574	WC0824507
Sample Date		Client Info		20 Oct 2023	24 Sep 2023	09 Aug 2023
Machine Age	hrs	Client Info		0	0	0
Oil Age	hrs	Client Info		0	0	0
Filter Age	hrs	Client Info		0	0	0
Oil Changed		Client Info		N/A	N/A	N/A
Filter Changed		Client Info		N/A	N/A	N/A
Sample Status				ABNORMAL	NORMAL	NORMAL

WEAR

The aluminum level is abnormal. All other component wear rates are normal.

Iron	ppm	ASTM D5185m	>50	37	23	26
Chromium	ppm	ASTM D5185m	>4	<1	<1	<1
Nickel	ppm	ASTM D5185m	>2	0	0	<1
Titanium	ppm	ASTM D5185m		0	0	<1
Silver	ppm	ASTM D5185m	>5	0	0	0
Aluminum	ppm	ASTM D5185m	>12	▲ 17	2	2
Lead	ppm	ASTM D5185m	>17	10	8	10
Copper	ppm	ASTM D5185m	>70	15	17	29
Tin	ppm	ASTM D5185m	>15	2	<1	<1
Vanadium	ppm	ASTM D5185m		0	0	0
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE

CONTAMINATION

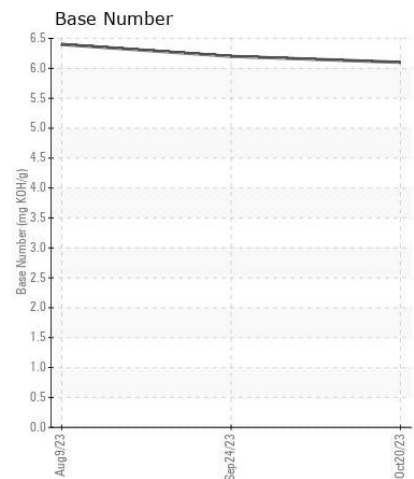
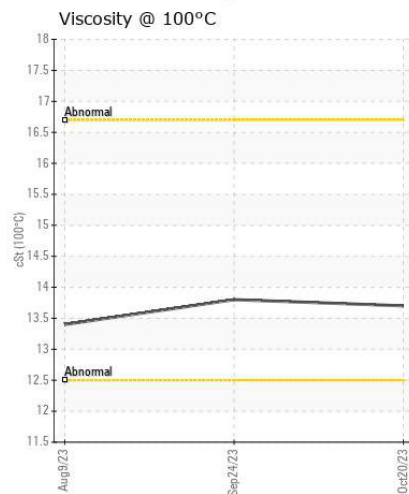
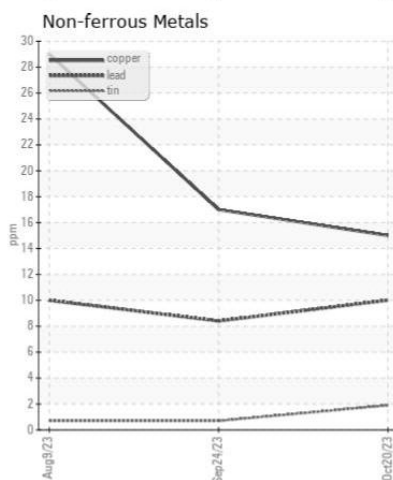
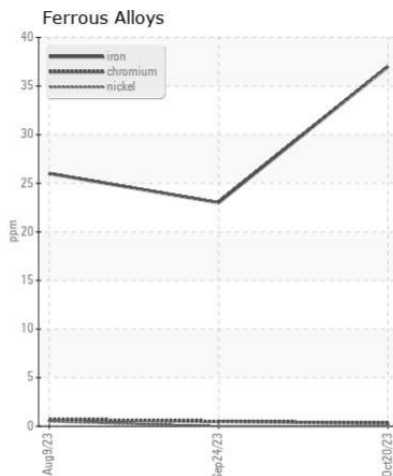
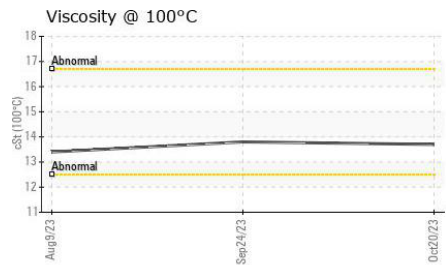
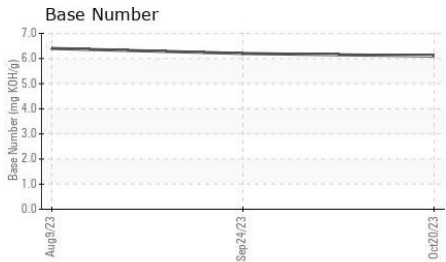
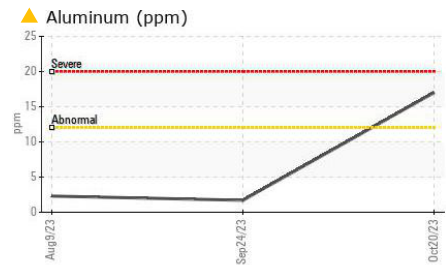
There is no indication of any contamination in the oil.

Silicon	ppm	ASTM D5185m	>25	7	5	6
Potassium	ppm	ASTM D5185m	>20	2	<1	3
Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Glycol		WC Method		NEG	NEG	NEG
Soot %	%	*ASTM D7844		0.2	0.2	0.2
Nitration	Abs/cm	*ASTM D7624	>20	9.7	9.8	10.0
Sulfation	Abs/.1mm	*ASTM D7415	>30	23.3	23.1	23.4
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	LIGHT	LIGHT
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG

FLUID CONDITION

The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Sodium	ppm	ASTM D5185m		19	23	47
Boron	ppm	ASTM D5185m		10	14	24
Barium	ppm	ASTM D5185m		0	0	0
Molybdenum	ppm	ASTM D5185m		5	4	9
Manganese	ppm	ASTM D5185m		<1	<1	<1
Magnesium	ppm	ASTM D5185m		7	18	19
Calcium	ppm	ASTM D5185m		2683	2899	2972
Phosphorus	ppm	ASTM D5185m		963	951	926
Zinc	ppm	ASTM D5185m		1241	1222	1127
Sulfur	ppm	ASTM D5185m		3712	3773	3635
Oxidation	Abs/.1mm	*ASTM D7414	>25	18.3	18.3	18.3
Base Number (BN)	mg KOH/g	ASTM D2896		6.1	6.2	6.4
Visc @ 100°C	cSt	ASTM D445		13.7	13.8	13.4



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
 Sample No. : WC0824581
 Lab Number : 05990112
 Unique Number : 10712774
 Test Package : MAR 2

Received : 26 Oct 2023
 Diagnosed : 30 Oct 2023
 Diagnostician : Sean Felton

American Queen Voyages - Oceans
 1201 Bridgeport Drive
 Jeffersonville, IN
 US 47130
 Contact: Dietrich Giles

To discuss this sample report, contact Customer Service at 1-800-237-1369.

* - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

F: