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VERITAS

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

# Test Report

Report No	EQ2908-1
Client	ASSA ABLOY Inc.
Address	110 Sargent Drive New Haven, CT, 06511
Phone	203-499-6836
Items tested	H2SE Mortise and H2SE Cylindrical
FCC ID	U4A-SCSEHF
IC	6982A-SCSEHF
FRN	0016550824
Equipment Type	Part 15 Low Power Communication Device Transmitter
Equipment Code	DXX
Emission Designator	18K8F1D
FCC Rule Parts	CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 9 Annex B.6
Test Dates	Sep 23 and 26, 2016
Results	As detailed within this report
Prepared by	 Yunus Faziloglu – Sr. EMC Engineer
Authorized by	 Christopher Reynolds – EMC Supervisor
Issue Date	<u>4/5/2017</u>
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 17 of this report.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



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Form Final Report REV 7-20-07 (DW)



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## Summary

This test report supports a "Modular Approval" certification application of two transmitters operating pursuant to:

CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 9 Annex B.6

The products are H2SE Mortise and H2SE Cylindrical modules operating at 13.56MHz. The modules are electrically identical. The only difference between the modules is the casing around it. The two types of casings are specifically tuned to the antenna for an effective reading pattern.

We found that the products met the above requirements without modifications. The test samples were received in good condition.

### Release Control Record

Issue No.      Reason for change  
1              Original Release

Date Issued  
April 5, 2017



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## Test Methodology

All testing was performed according to the following rules/procedures/documents;

CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 9 Annex B.6, ISED Canada RSS-Gen Issue 4 and ANSI C63.10-2013.

Modules were tested in their only orientation of possible installation as part of a door lock assembly configuration. Emissions were maximized by rotating the turntable as well as varying the test antenna's height and polarity. The antenna of the modules cannot be maximized separately.

Operating voltage is 24VDC. AC line conducted emissions testing was performed on the AC side of a representative power supply with a 50Ω/50µH LISN.

The following bandwidths were used during radiated spurious and line conducted emissions.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz

### Release Control Record

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**Product Tested - Configuration Documentation**

EUT Configuration										
Work Order:	Q2908									
Company:	Assa Abloy									
Company Address:	110 Sargent Drive									
	New Haven CT, 06511									
Contact:	Adam Oday									
		<b>MN</b>		<b>PN</b>		<b>SN</b>				
EUT:	H2SE Mortise, H2SE Cylindrical			--		Sample 1 (Mortise), Sample 2 (Cylindrical)				
EUT Description:	Wiegand Lock									
EUT Max Frequency:	13.56 MHz									
EUT Min Frequency:	2.1 MHz									
Support Equipment		<b>MN</b>				<b>SN</b>				
Wiegand Test Box		WT2				--				
Power Supply		3520				--				
Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
E Links	Power + Data	1	1	other	No	No	10	in	yes	
Antenna	other	1	1	other	No	No	0.05	in	yes	interconnection
<b>Software Operating Mode Description:</b>										
EUT is set to transmit at 13.56 MHz. 100% on time with FSK modulation.										



## Test Results

### Fundamental Emission

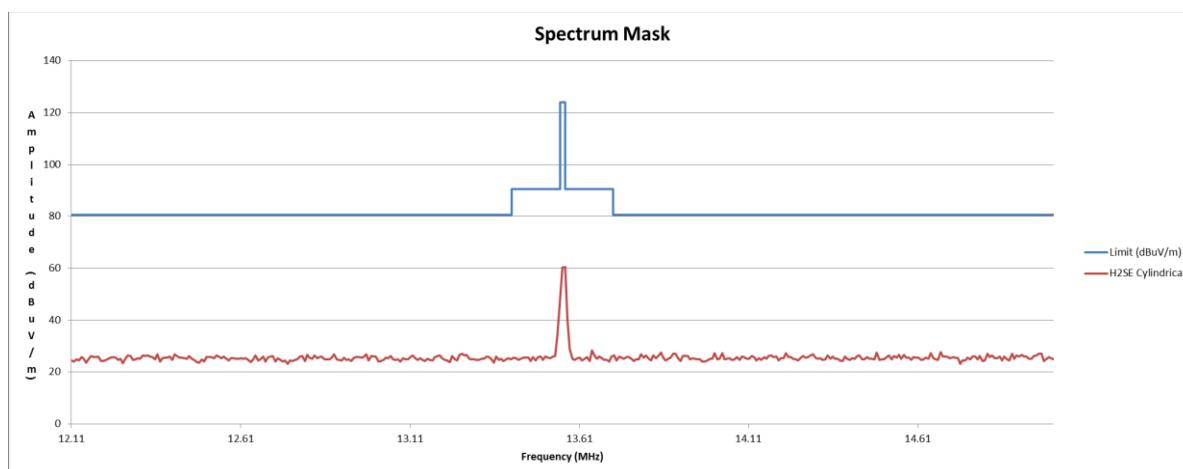
#### LIMIT

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters, (124 dB<sub>u</sub>V/m at 3m.)  
[15.225 (a)]

### MEASUREMENTS / RESULTS

#### Radiated Emissions Table

Date: 23-Sep-16	Company: Assa Abloy	Work Order: Q2908										
Engineer: Tuyen Truong	EUT Desc: H2SE Cylindrical	EUT Operating Voltage/Frequency: 24Vdc										
Temp: 22°C	Humidity: 42%	Pressure: 1006mBar										
Frequency Range: 13.56 MHz		Measurement Distance: 3 m										
Notes: Fundamental		EUT Max Freq: 13.56 MHz										
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB <sub>u</sub> V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB <sub>u</sub> V/m)	---			FCC Class B		
							Limit (dB <sub>u</sub> V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB <sub>u</sub> V/m)	Margin (dB)	Result (Pass/Fail)
90	13.56	43.8	22.5	39.0	0.3	60.6	---	---	---	124.0	-63.4	Pass
0	13.56	41.2	22.5	39.0	0.3	58.0	---	---	---	124.0	-66.0	Pass
<b>Table Result:</b> Pass by -63.4 dB							<b>Worst Freq:</b> 13.56 MHz					
Test Site: EMI Chamber 2 Analyzer: Asset #1328 CSsoft Radiated Emissions Calculator	Cable 1: Asset #1784 Preamp: Blue v 1.017.173	Cable 2: Asset #2052 Antenna: Sm Loop (high)	Cable 3: --- Preselector: ---	Copyright Curtis-Straus LLC 2000								
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor												

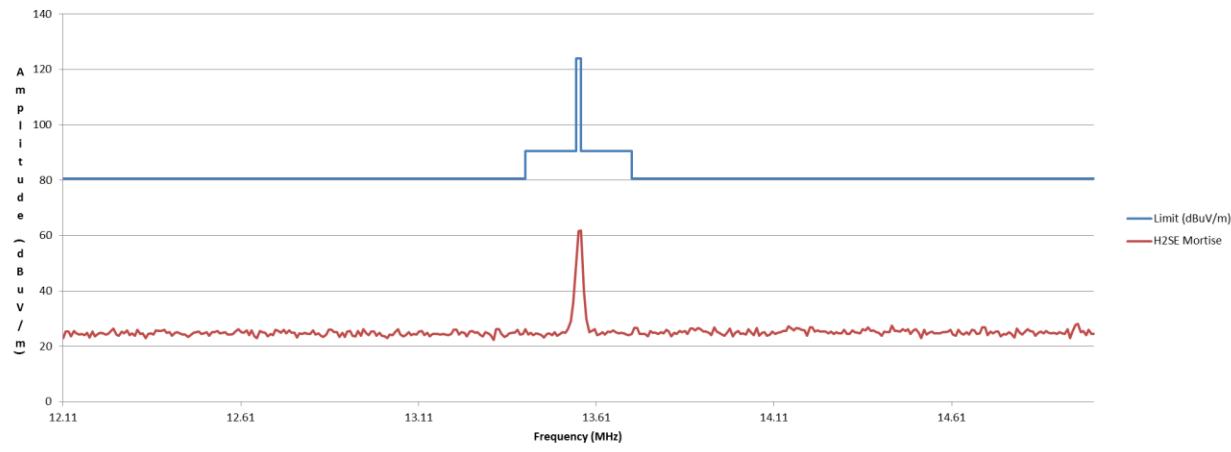


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**Radiated Emissions Table**

Date: 23-Sep-16	Company: Assa Abloy	Work Order: Q2908										
Engineer: Tuyen Truong	EUT Desc: H2SE Mortise	EUT Operating Voltage/Frequency: 24Vdc										
Temp: 22°C	Humidity: 42%	Pressure: 1006mBar										
<b>Frequency Range:</b> 13.56 MHz		<b>Measurement Distance:</b> 3 m										
<b>Notes:</b> Fundamental		<b>EUT Max Freq:</b> 13.56 MHz										
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	---			FCC Class B		
							Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)
90	13.56	45.1	22.5	39.0	0.3	61.9	---	---	---	124.0	-62.1	Pass
0	13.56	44.2	22.5	39.0	0.3	61.0	---	---	---	124.0	-63.0	Pass
<b>Table Result:</b> Pass		by	-62.1 dB				<b>Worst Freq:</b> 13.56 MHz					
Test Site: EMI Chamber 2		Cable 1: Asset #1784		Cable 2: Asset #2052		Cable 3: ---						
Analyzer: Asset #1328		Preamp: Blue		Antenna: Sm Loop (high)		Preselector: ---						
CSsoft Radiated Emissions Calculator		v 1.017.173				Copyright Curtis-Straus LLC 2000						
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor												

**Spectrum Mask**

Rev. 9/18/2016									
Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
SA EMI Chamber (1328)	9KHz-13.2 GHz	E4405B	Agilent	MY44210241	1328	I	2/26/2017	2/26/2016	
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range		Cat	Calibration Due	Calibrated on	
EMI Chamber 2	719150	2762A-T	A-0015	30-1000MHz		II	3/22/2017	3/22/2015	
Preamps / Couplers / Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Blue	0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	III	5/13/2017	5/13/2016	
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Small Loop	10KHz-30MHz	PLA-130/A	ARA	1024	755	I	6/14/2018	6/14/2016	
Metereological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016	
TH A#2081	HTC-1	HDE		2081		II	4/5/2017	4/5/2016	
Cables	Range	Mfr				Cat	Calibration Due	Calibrated on	
Asset #1784	9KHz - 18GHz	Florida RF				III	3/7/2017	3/7/2016	
Asset #2052	9KHz - 18GHz	Florida RF				III	3/2/2017	3/2/2016	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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## Radiated Spurious Emissions

### LIMITS

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

[15.225(d)]

### MEASUREMENTS / RESULTS

Radiated Emissions Table															
Date: 23-Sep-16	Company: Assa Abloy				Work Order: Q2908										
Engineer: Tuyen Truong	EUT Desc: H2SE Cylindrical				EUT Operating Voltage/Frequency: 24Vdc										
Temp: 22°C	Humidity: 42%				Pressure: 1006mBar										
Frequency Range: 9 KHz to 30 MHz				Measurement Distance: 3 m											
Notes: EUT Max Freq: 13.56 MHz															
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	---			FCC Class B					
							Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)			
No emissions found in this range within 10dB of limit															
<b>Table Result:</b> --- by --- dB				<b>Worst Freq:</b> --- MHz											
Test Site: EMI Chamber 2	Cable 1: Asset #1784			Cable 2: Asset #2052			Cable 3: ---								
Analyzer: Asset #1328	Preamp: Blue			Antenna: Sm Loop			Preselector: ---								
CSsoft Radiated Emissions Calculator	v 1.017.173						Copyright Curtis-Straus LLC 2000								
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															

Radiated Emissions Table															
Date: 23-Sep-16	Company: Assa Abloy				Work Order: Q2908										
Engineer: Tuyen Truong	EUT Desc: H2SE Mortise				EUT Operating Voltage/Frequency: 24Vdc										
Temp: 22°C	Humidity: 42%				Pressure: 1006mBar										
Frequency Range: 9 KHz to 30 MHz				Measurement Distance: 3 m											
Notes: EUT Max Freq: 13.56 MHz															
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	---			FCC Class B					
							Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)			
No emissions found in this range within 10dB of limit															
<b>Table Result:</b> --- by --- dB				<b>Worst Freq:</b> --- MHz											
Test Site: EMI Chamber 2	Cable 1: Asset #1784			Cable 2: Asset #2052			Cable 3: ---								
Analyzer: Asset #1328	Preamp: Blue			Antenna: Sm Loop			Preselector: ---								
CSsoft Radiated Emissions Calculator	v 1.017.173						Copyright Curtis-Straus LLC 2000								
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															



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Rev. 9/18/2016	Spectrum Analyzers / Receivers / Preselectors							Calibration Due	Calibrated on
SA EMI Chamber (1328)	Range 9kHz-13.2 GHz	MN E4405B	Mfr Agilent	SN MY44210241	Asset 1328	Cat I	2/26/2017	2/26/2016	
Radiated Emissions Sites EMI Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCI Code A-0015	Range 30-1000MHz		Cat II	Calibration Due 3/22/2017	Calibrated on 3/22/2015	
Preamps / Couplers / Attenuators / Filters Blue	Range 0.009-2000MHz	MN ZFL-1000-LN	Mfr CS	SN N/A	Asset 759	Cat II	Calibration Due 5/13/2017	Calibrated on 5/13/2016	
Antennas Small Loop	Range 10kHz-30MHz	MN PLA-130/A	Mfr ARA	SN 1024	Asset 755	Cat I	Calibration Due 6/14/2016	Calibrated on 6/14/2016	
Metereological Meters Weather Clock (Pressure Only) TH A#2061	MN BA928	Mfr Oregon Scientific HDE	SN C3166-1	Asset 831	Cat I	Calibration Due 4/28/2016	Calibrated on 4/28/2016		
Cables Asset #1784	Range 9kHz - 18GHz	Mfr Florida RF	SN 2081	Asset 831	Cat II	Calibration Due 4/5/2017	Calibrated on 4/5/2016		
Asset #2052	9kHz - 18GHz	Florida RF			Cat II	3/2/2017	3/2/2016		

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

### Radiated Emissions Table

Date: 23-Sep-16	Company: Assa Abloy	Work Order: Q2908									
Engineer: Tuyen Truong	EUT Desc: H2SE Cylindrical	EUT Operating Voltage/Frequency: 24Vdc									
Temp: 22°C	Humidity: 42%	Pressure: 1006mBar									
Frequency Range: 30 to 1000 MHz		Measurement Distance: 3 m									
Notes:		EUT Max Freq: 13.56 MHz									
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dB <sub>UV</sub> )	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB <sub>UV</sub> /m)	---		FCC Class B		
							Limit (dB <sub>UV</sub> /m)	Margin (dB)	Result (Pass/Fail)	Limit (dB <sub>UV</sub> /m)	Margin (dB)
v	40.67	34.2	22.4	13.3	0.4	25.5	---	---	40.0	-14.5	Pass
v	67.8	38.8	22.5	8.3	0.6	25.2	---	---	40.0	-14.8	Pass
h	94.89	47.9	22.5	9.0	0.7	35.1	---	---	43.5	-8.4	Pass
v	94.91	46.7	22.5	9.0	0.7	33.9	---	---	43.5	-9.6	Pass
v	108.5	45.5	22.4	12.6	0.7	36.4	---	---	43.5	-7.1	Pass
v	122.0	41.3	22.5	14.3	0.9	34.0	---	---	43.5	-9.5	Pass
h	122.055	46.8	22.5	14.3	0.9	39.5	---	---	43.5	-4.0	Pass
v	135.6	30.5	22.5	13.7	0.9	22.6	---	---	43.5	-20.9	Pass
<b>Table Result:</b> Pass		-4.0 dB	<b>Worst Freq:</b> 122.055 MHz								
Test Site: EMI Chamber 2	Cable 1: Asset #1784	Cable 2: Asset #2052	Cable 3: ---								
Analyzer: Asset #1328	Preamp: Blue	Antenna: Red-White	Preselector: ---								
CSsoft Radiated Emissions Calculator	v 1.017.173		Copyright Curtis-Straus LLC 2000								
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor											



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**Radiated Emissions Table**

Date: 23-Sep-16	Company: Assa Abloy	Work Order: Q2908										
Engineer: Tuyen Truong	EUT Desc: H2SE Mortise	EUT Operating Voltage/Frequency: 24Vdc										
Temp: 22°C	Humidity: 42%	Pressure: 1006mBar										
<b>Frequency Range:</b> 30 to 1000 MHz		<b>Measurement Distance:</b> 3 m										
<b>Notes:</b>		<b>EUT Max Freq:</b> 13.56 MHz										
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	--			FCC Class B		
							Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)
v	40.68	42.9	22.4	13.3	0.4	34.2	---	---	---	40.0	-5.8	Pass
v	67.8	47.6	22.5	8.3	0.6	34.0	---	---	---	40.0	-6.0	Pass
h	87.375	44.6	22.5	7.7	0.6	30.4	---	---	---	40.0	-9.6	Pass
v	88.75	44.0	22.5	7.8	0.6	29.9	---	---	---	43.5	-13.6	Pass
v	94.91	50.5	22.5	9.0	0.7	37.7	---	---	---	43.5	-5.8	Pass
h	95.025	47.1	22.5	9.0	0.7	34.3	---	---	---	43.5	-9.2	Pass
h	108.47	49.0	22.4	12.6	0.7	39.9	---	---	---	43.5	-3.6	Pass
v	108.5	47.5	22.4	12.6	0.7	38.4	---	---	---	43.5	-5.1	Pass
v	122.0	39.3	22.5	14.3	0.9	32.0	---	---	---	43.5	-11.5	Pass
v	135.6	30.9	22.5	13.7	0.9	23.0	---	---	---	43.5	-20.5	Pass
v	149.14	30.5	22.4	12.7	0.9	21.7	---	---	---	43.5	-21.8	Pass
v	162.7	27.9	22.6	12.3	1.0	18.6	---	---	---	43.5	-24.9	Pass
<b>Table Result:</b> Pass		by	-3.6 dB				<b>Worst Freq:</b> 108.47 MHz					
Test Site: EMI Chamber 2	Cable 1: Asset #1784			Cable 2: Asset #2052			Cable 3: ---			Preselector: ---		
Analyzer: Asset #1328	Preamp: Blue			Antenna: Red-White			Copyright Curtis-Straus LLC 2000					
CSsoft Radiated Emissions Calculator	v 1.017.173											
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor												

Rev. 9/18/2016

<b>Spectrum Analyzers / Receivers/Preselectors</b> SA EMI Chamber (1328)	Range 9kHz-13.2 GHz	MN E4405B	Mfr Agilent	SN MY44210241	Asset 1328	Cat I	Calibration Due 2/26/2017	Calibrated on 2/26/2016
<b>Radiated Emissions Sites</b> EMI Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCI Code A-0015	Range 30-1000MHz	Cat II	Calibration Due 3/22/2017	Calibrated on 3/22/2015	
<b>Preamps /Couplers Attenuators / Filters</b> Blue	Range 0.009-2000MHz	MN ZFL-1000-LN	Mfr CS	SN N/A	Asset 759	Cat II	Calibration Due 5/13/2017	Calibrated on 5/13/2016
<b>Antennas</b> Red-White BiLog	Range 30-2000MHz	MN JB1	Mfr Sunol	SN A091604-1	Asset 1105	Cat I	Calibration Due 8/12/2017	Calibrated on 8/12/2015
<b>Meteorological Meters</b> Weather Clock (Pressure Only) TH A#2081	MN BA928 HTC-1	Mfr Oregon Scientific HDE	SN C3166-1	Asset 831 2081	Cat I II	Calibration Due 4/28/2018 4/5/2017	Calibrated on 4/28/2016 4/5/2016	
<b>Cables</b> Asset #1784 Asset #2052	Range 9kHz - 18GHz 9kHz - 18GHz	Mfr Florida RF Florida RF	Cat II II	Calibration Due 3/7/2017 3/2/2017	Calibrated on 3/7/2016 3/2/2016			

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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## Frequency Tolerance

### LIMITS

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

[15.225(e)]

### MEASUREMENTS / RESULTS

Frequency Stability					
Test Date:	9/26/2016	Company:	Assa Abloy	WO:	Q2908
Test Engineer:	Tuyen Truong	EUT:	H2SE Cyclindrical	Operating Voltage:	24Vdc
SA:	1860	Cable:	1522		
Antenna:	Small Loop	Test Site:	Safety / ENV #17		
Voltage (Vdc)	Temp (°C)	Freq (MHz)	Δ Freq (MHz)	Limit (MHz)	Result (Pass/Fail)
<b>Voltage Variation:</b>					
24	20	13.55970	n/a	n/a	n/a
20.4	20	13.55970	0.000000	+0.001356	Pass
27.6	20	13.55970	0.000000	+0.001356	Pass
<b>Temperature Variation:</b>					
24	20	13.55970	n/a	n/a	n/a
24	30	13.55950	-0.000200	+0.001356	Pass
24	40	13.55965	-0.000050	+0.001356	Pass
24	50	13.55930	-0.000400	+0.001356	Pass
24	10	13.55975	0.000050	+0.001356	Pass
24	0	13.55990	0.000200	+0.001356	Pass
24	-10	13.55955	-0.000150	+0.001356	Pass
24	-20	13.56000	0.000300	+0.001356	Pass



## Frequency Stability

<b>Test Date:</b>	9/26/2016	<b>Company:</b>	Assa Abloy	<b>WO:</b>	Q2908
<b>Test Engineer:</b>	Tuyen Truong	<b>EUT:</b>	H2SE Mortise	<b>Operating Voltage:</b>	24Vdc
<b>SA:</b>	1860	<b>Cable:</b>	1522		
<b>Antenna:</b>	Small Loop	<b>Test Site:</b>	Safety / ENV #17		
<b>Voltage (Vdc)</b>	<b>Temp (°C)</b>	<b>Freq (MHz)</b>	<b>Δ Freq (MHz)</b>	<b>Limit (MHz)</b>	<b>Result (Pass/Fail)</b>

**Voltage Variation:**

24	20	13.55970	none	n/a	n/a
20.4	20	13.56015	-0.000450	+0.001356	Pass
27.6	20	13.56000	-0.000300	+0.001356	Pass

**Temperature Variation:**

24	20	13.55970	none	n/a	n/a
24	30	13.55965	-0.000050	+0.001356	Pass
24	40	13.55955	-0.000150	+0.001356	Pass
24	50	13.55955	-0.000150	+0.001356	Pass
24	10	13.55955	-0.000150	+0.001356	Pass
24	0	13.55975	0.000050	+0.001356	Pass
24	-10	13.55955	-0.000150	+0.001356	Pass
24	-20	13.55940	-0.000300	+0.001356	Pass

Rev. 9/25/2016

Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
SA #2 (1860)	9kHz-26.5 GHz	E7405A	Agilent	MY45104916	1860	I	12/23/2016	12/23/2015
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Small Loop	10kHz-30MHz	PLA-130/A	ARA	1024	755	I	6/14/2018	6/14/2016
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016	
TH A#2085	HTC-1	HDE		2085	II	4/5/2017	4/5/2016	
Cables	Range	Mfr			Cat	Calibration Due	Calibrated on	
Asset #1522	9kHz - 18GHz	Florida RF			II	2/14/2017	2/14/2016	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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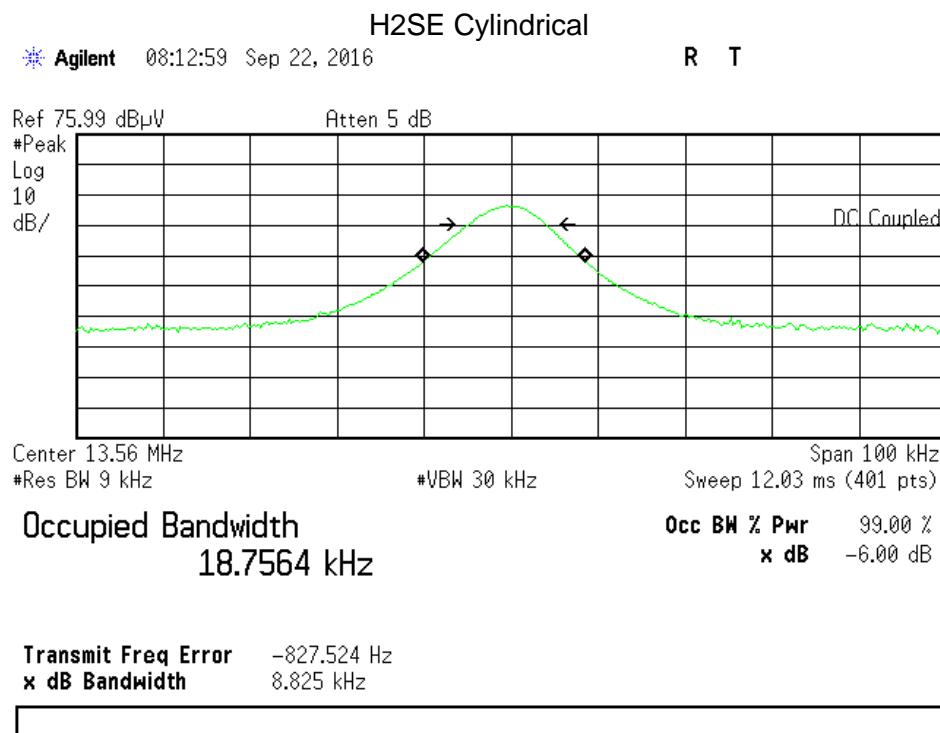
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## 99% Occupied Bandwidth

### REQUIREMENT

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. [RSS-GEN 6.6]

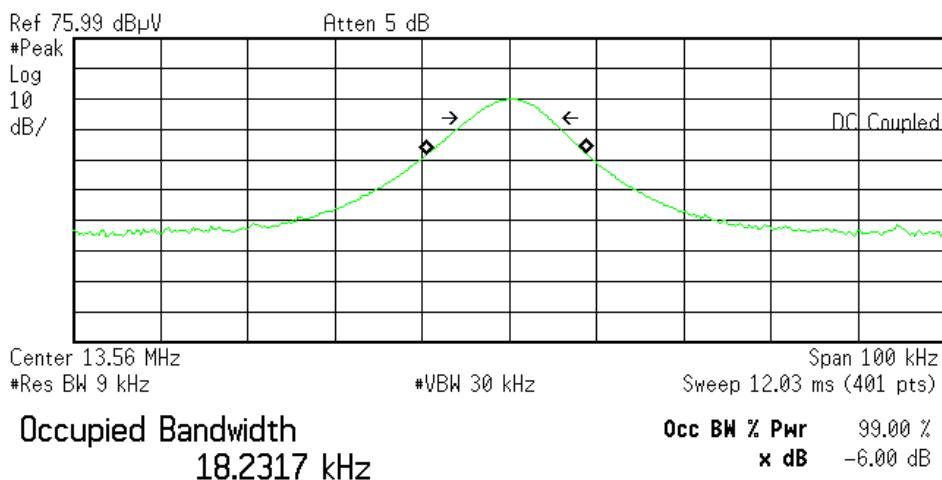
Note: Since the signal is narrowband, reduction in RBW causes the 99% occupied bandwidth to get smaller and smaller at each iteration. Therefore to have a meaningful reading, an RBW value that is higher than 5% of the emission bandwidth is selected.



## H2SE Mortise

\* Agilent 07:32:53 Sep 22, 2016

R T



Transmit Freq Error -300.465 Hz  
 x dB Bandwidth 8.826 kHz

C:\temp.gif file saved

Rev. 9/18/2016	Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
	SA EMI Chamber (1328)	9kHz-13.2 GHz	E4405B	Agilent	MY44210241	1328	I	2/26/2017	2/26/2016
	Radiated Emissions Site EM Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCL Code A-0015	Range 30-1000MHz		II	Calibration Due 3/22/2017	Calibrated on 3/22/2015
	Preamps / Couplers Attenuators / Filters Blue	0.009-2000MHz	ZFL-1000-L-N	CS	SN N/A	759	II	Calibration Due 5/13/2017	Calibrated on 5/13/2016
	Antennas Small Loop	10kHz-30MHz	MN PLA-130/A	Mfr ARA	SN 1024	Asset 755	I	Calibration Due 6/14/2016	Calibrated on 6/14/2016
	Meteorological Meters Weather Clock (Pressure Only) TH A#2081	MN BA928 HTO-1	Oregon Scientific HDE	SN C3166-1	Asset 831	I	4/28/2016	4/28/2016	
	Cables Asset #1784 Asset #2052	Range 9kHz - 18GHz	Mfr Florida RF	SN 2081	Asset 755	II	4/5/2017	4/5/2016	
		9kHz - 18GHz	Florida RF				Calibration Due 3/7/2017	Calibrated on 3/7/2016	
							3/2/2017	3/2/2016	

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## AC Line Conducted Emissions

### LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dB $\mu$ V)	Average limit (dB $\mu$ V)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency. 47 CFR 15.207(a)

### MEASUREMENTS / RESULTS

AC Conducted Emissions Data Table										Work Order: Q2908				
Notes:		Frequency Range: 0.15 to 30 MHz				EUT Input Voltage/Frequency: 120Vac/60Hz				Work Order: Q2908				
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC/CISPR Class B					
	QP1 (dB $\mu$ V)	QP2 (dB $\mu$ V)	AVG1 (dB $\mu$ V)	AVG2 (dB $\mu$ V)	L1 (dB)	L2 (dB)			QP Limit (dB $\mu$ V)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dB $\mu$ V)	Margin (dB)	Result (Pass/Fail)
11.44	17.8	14.6	15.0	16.4	-0.2	-0.1	-0.1	-20.8	60.0	-21.1	Pass	50.0	-12.5	Pass
13.54	24.6	22.2	23.6	24.2	-0.2	-0.2	-0.1	-20.9	60.0	-14.3	Pass	50.0	-4.7	Pass
18.84	25.0	25.6	15.5	15.3	-0.2	-0.2	-0.3	-20.9	60.0	-13.0	Pass	50.0	-13.1	Pass
19.10	24.4	25.5	24.6	26.0	-0.2	-0.2	-0.3	-20.9	60.0	-13.1	Pass	50.0	-2.6	Pass
19.38	26.3	26.6	22.5	26.6	-0.2	-0.2	-0.3	-20.9	60.0	-12.0	Pass	50.0	-2.0	Pass
29.73	21.7	20.0	21.5	19.3	-0.1	-0.2	-0.3	-20.8	60.0	-17.0	Pass	50.0	-7.2	Pass

**Result:** Pass      **Worst Margin:** -2.0 dB      **Frequency:** 19.375 MHz

**Measurement Device:** LISN Asset 2092      **Cable:** CEMI-10      **Spectrum Analyzer:** SA EMI Chamber (1328)  
**Attenuator:** 20dB Attenuator-07      **Site:** CEMI 6  
**Equipment Factor Sheet rev:** 9/19/2016

C-S CEMI Calculator Version 3.0.14  
Adjusted Reading = Raw Reading + LISN Insertion Loss + Cable Loss + Attenuation

AC Conducted Emissions Data Table										Work Order: Q2908				
Notes:		Frequency Range: 0.15 to 30 MHz				EUT Input Voltage/Frequency: 120Vac/60Hz				Work Order: Q2908				
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC/CISPR Class B			FCC/CISPR Class B		
	QP1 (dB $\mu$ V)	QP2 (dB $\mu$ V)	AVG1 (dB $\mu$ V)	AVG2 (dB $\mu$ V)	L1 (dB)	L2 (dB)			QP Limit (dB $\mu$ V)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dB $\mu$ V)	Margin (dB)	Result (Pass/Fail)
0.21	9.1	9.4	3.8	4.5	0.0	0.0	-0.1	-20.8	63.3	-33.0	Pass	53.3	-27.9	Pass
12.82	20.7	21.6	20.7	21.7	-0.2	-0.2	-0.1	-20.9	60.0	-17.3	Pass	50.0	-7.2	Pass
15.01	22.4	22.1	21.9	21.1	-0.2	-0.2	-0.2	-20.9	60.0	-16.3	Pass	50.0	-6.9	Pass
15.27	25.4	25.0	24.6	23.7	-0.2	-0.2	-0.2	-20.9	60.0	-13.4	Pass	50.0	-4.2	Pass
15.56	20.3	20.9	21.0	15.0	-0.2	-0.2	-0.2	-20.9	60.0	-17.9	Pass	50.0	-7.8	Pass
15.82	17.8	17.7	17.8	17.0	-0.2	-0.2	-0.2	-20.9	60.0	-21.0	Pass	50.0	-11.0	Pass
22.10	16.5	23.2	16.0	20.9	-0.2	-0.2	-0.4	-20.8	60.0	-15.5	Pass	50.0	-7.8	Pass
29.74	22.2	20.9	17.9	18.4	-0.1	-0.2	-0.3	-20.8	60.0	-16.5	Pass	50.0	-10.3	Pass

**Result:** Pass      **Worst Margin:** -4.2 dB      **Frequency:** 15.270 MHz

**Measurement Device:** LISN Asset 2092      **Cable:** CEMI-10      **Spectrum Analyzer:** SA EMI Chamber (1328)  
**Attenuator:** 20dB Attenuator-07      **Site:** CEMI 6  
**Equipment Factor Sheet rev:** 9/19/2016

C-S CEMI Calculator Version 3.0.14  
Adjusted Reading = Raw Reading + LISN Insertion Loss + Cable Loss + Attenuation

Rev. 9/26/2016	Spectrum Analyzers / Receivers/Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
	SA EMI Chamber (1328)	9KHz-13.2 GHz	E4405B	Agilent	MY44210241	1328	I	2/26/2017	2/26/2016
	LISNs/Measurement Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
	LISN Asset 2092	9KHz-30MHz	NNLK 8121	Schwarzebeck	NNLK 8121-662	2092	I	7/14/2017	7/14/2016
	Conducted Test Sites (Mains / Telco)	FCC Code		VCCI Code			Cat	Calibration Due	Calibrated on
	CEMI 6	719150		A-0015			III	NA	N/A
	Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
	Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016	
	TH A#2078	HTC-1	HDE	2078	II		4/5/2017	4/5/2016	
	Cables	Range	Mfr			Cat	Calibration Due	Calibrated on	
	CEMI-10	9KHz - 2GHz	C-S			II	5/10/2017	5/10/2016	
	Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
	20dB Attenuator-07	9KHz-2GHz	BW-N20W+	MCL	N/A		II	4/10/2017	4/10/2016

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## Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucispqr)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucispqr)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	$3.23 \times 10^{-8}$	$1 \times 10^{-7}$
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		



## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS," "MTL," "ACTS," "MTL-ACTS" and CURTIS-STRAUS (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.



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13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

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16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

Rev.160009121(2)\_#684340 v13CS



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