

Appendix C

Calibration Certificates of Monitoring

Equipment



REPORT OF EQUIPMENT CALIBRATION

INSTRUMENT DESCRIPTION

It is certified that the item under calibration has been calibrated by corresponding calibrated High Volume Sampler and the filter paper is weighted by HOKLAS laboratory.

Instrument: Handheld TSP meter
Brand Name: TSI
Model No.: AM510
Serial No.: 11008019
Date Received: 16/10/2013
Date of Issue: 27/10/2013
Date of Calibration: 22/10/2013
Date of Next Calibration : 22/10/2014

ISSUING ORGANISATION

Address

Enovative Environmental Service Limited
Flat 6, 3/F, Block E, Wah Lok Industrial Centre
31-35 Shan Mei Street
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Thomas

Mr Wong Siu Ho, Thomas
Manager

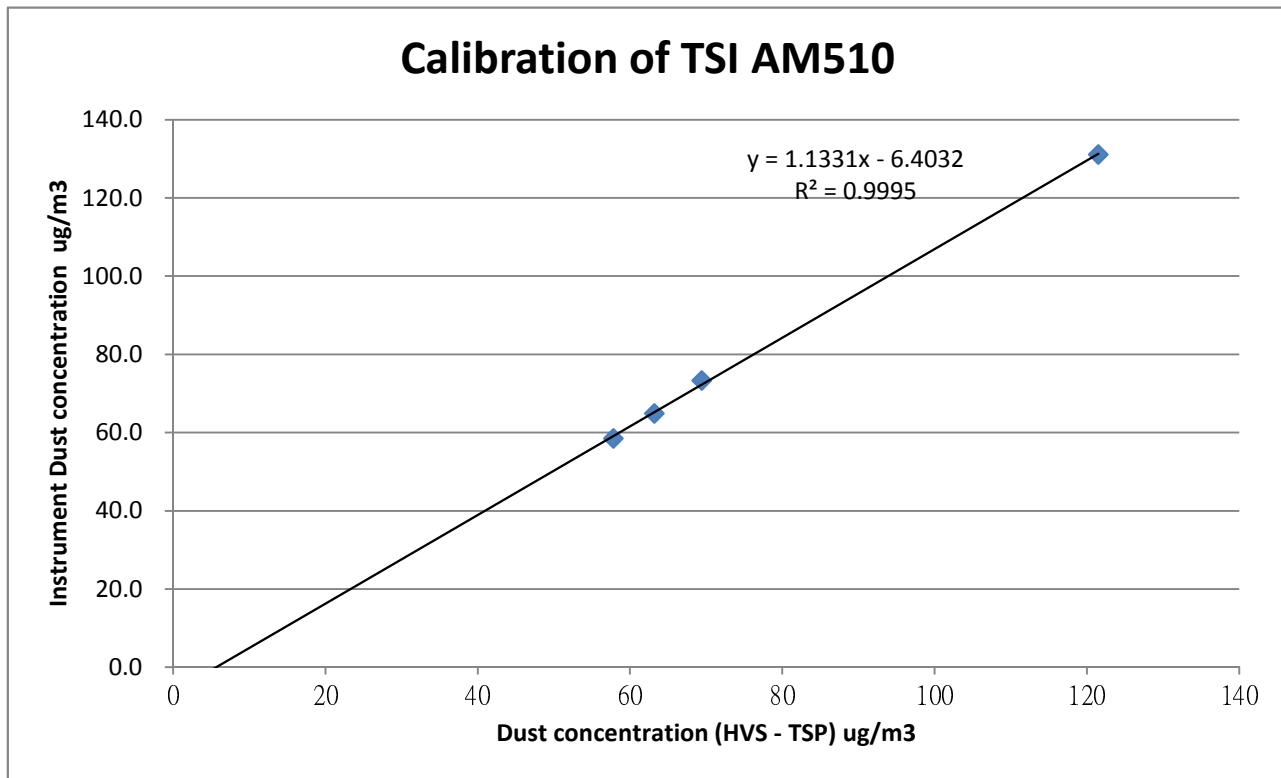


Enovative Environmental Service Limited

Brand Name: TSI
Model No.: AM510
Serial No.: 11008019
HVS No.: A12-TSP-102
HVS Calibration Kit No.: Tisch 1941
Date of Calibration: 22/10/2013
Date of next Calibration: 22/10/2014

Calibration Record

HVS - TSP ug/m3	121.5	57.8	63.2	69.4
TSI AM510	131.1	58.5	64.9	73.3



*** Filter paper being used in the calibrator 205472, 205476, 205480, 205483
Those filter papers are weighted by HOKLAS laboratory (ALS Technichem (HK) Pty Ltd.)



Mr Wong Siu Ho, Thomas
Manager



TISCH ENVIRONMENTAL, INC.
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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Apr 07, 2014 Rootmeter S/N 0438320 Ta (K) - 294
 Operator Tisch Orifice I.D. - 1612 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3940	3.2	2.00
2	NA	NA	1.00	0.9790	6.4	4.00
3	NA	NA	1.00	0.8800	7.8	5.00
4	NA	NA	1.00	0.8350	8.8	5.50
5	NA	NA	1.00	0.6910	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9866	0.7077	1.4077	0.9957	0.7142	0.8896
0.9823	1.0034	1.9908	0.9914	1.0127	1.2581
0.9804	1.1140	2.2258	0.9894	1.1243	1.4066
0.9791	1.1726	2.3345	0.9881	1.1834	1.4753
0.9739	1.4094	2.8155	0.9829	1.4224	1.7793
Qstd slope (m) = 2.00757			Qa slope (m) = 1.25710		
intercept (b) = -0.01628			intercept (b) = -0.01029		
coefficient (r) = 0.99989			coefficient (r) = 0.99989		
y axis = $\text{SQRT}[\text{H2O}(\text{Pa}/760)(298/\text{Ta})]$			y axis = $\text{SQRT}[\text{H2O}(\text{Ta}/\text{Pa})]$		

CALCULATIONS

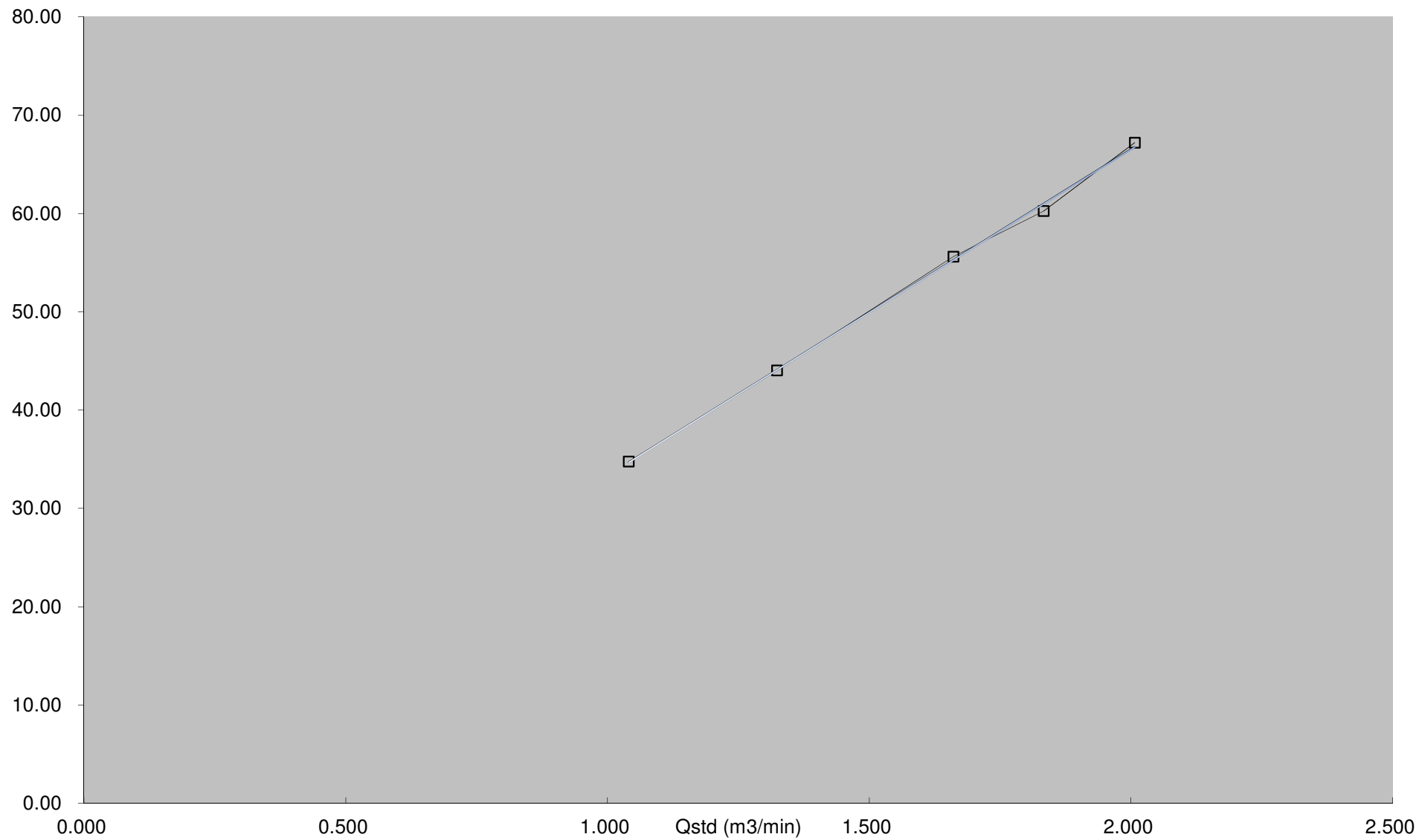
$V_{std} = \text{Diff. Vol} [(\text{Pa} - \text{Diff. Hg}) / 760] (298 / \text{Ta})$
 $Q_{std} = V_{std} / \text{Time}$

$V_a = \text{Diff Vol} [(\text{Pa} - \text{Diff Hg}) / \text{Pa}]$
 $Q_a = V_a / \text{Time}$

For subsequent flow rate calculations:

$Q_{std} = 1/m \{ [\text{SQRT}(\text{H2O}(\text{Pa}/760)(298/\text{Ta}))] - b \}$
 $Q_a = 1/m \{ [\text{SQRT}(\text{H2O}(\text{Ta}/\text{Pa}))] - b \}$

IC (Corrected)(ft3/min)





Calibration Certificate

Certificate No. 37521

Page 1 of 2 Pages

Customer : Enovative Environmental Service Limited

Address : Room 3, 12/F., New City Centre, 2 Lei Yue Mun Road, Kwun Tong, Kowloon, H.K.

Order No. : Q32432

Date of receipt : 16-Oct-13

Item Tested

Description : Sound Level Calibrator

Manufacturer : B&K

Model : Type 4231

Serial No. : 2685684

Test Conditions

Date of Test : 31-Oct-13

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure : F21, Z02.

Test Results

All results were within the IEC 942 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

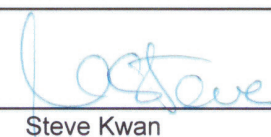
<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	35730	NIM-PRC & SCL-HKSAR
S205	Ref. Sound Level Calibrator	PHCO40002	SCL-HKSAR
S041	Universal Counter	34621	SCL-HKSAR
S206	Sound Level Meter	36203	SCL-HKSAR
S031	6½ dgt. Multimeter	30128	NIM-PRC

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
Dorothy Cheuk

Approved by : 
Steve Kwan

Date: 31-Oct-13

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646



Calibration Certificate

Certificate No. 37521

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Results :

1. Level Accuracy

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.08	± 0.3 dB
114	114.07	

Uncertainty : ± 0.1 dB

2. Frequency

UUT Nominal Value	Measured Value	IEC 942 Class 1 Spec.
1 kHz	1.002 kHz	± 2 %

Uncertainty : ± 3.6 x 10⁻⁶

3. **Level Stability** : 0.0 dB
IEC 942 Class 1 Spec. : ± 0.1 dB
Uncertainty : ± 0.01 dB

4. **Total Harmonic Distortion** : < 0.7 %
IEC 942 Class 1 Spec. : < 3 %
Uncertainty : ± 2.3 % of reading

- Remark : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Atmospheric Pressure : 1014 hPa.

----- END -----



Calibration Certificate

Certificate No. **36604**

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Customer : Enovative Environmental Service Limited

Address : Room 3, 12/F., New City Centre, 2 Lei Yue Mun Road, Kwun Tong, Kowloon, H.K.

Order No. : Q32395

Date of receipt : 4-Sep-13

Item Tested

Description : Sound Level Meter (N12-RION-004)

Manufacturer : Rion

Model : NL-52

Serial No. : 00220553

Test Conditions

Date of Test : 10-Sep-13

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 61672 Type1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017	Multi-Function Generator	C127181	SCL-HKSAR
S205	Ref. Sound Level Calibrator	PHCO40002	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
Dorothy Cheuk

Approved by : 
Steve Kwan

Date: 16-Sep-13

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.
Tel: 2425 8801 Fax: 2425 8646



Calibration Certificate

Certificate No. 36604

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Results :

1. Self-generated noise: 16.4 dBA (Mfr's Spec ≤ 17 dBA)
2. Acoustical signal test

UUT Setting			Applied Value (dB)	UUT Reading (dB)
Level Range (dB)	Weight	Response		
30 – 130	L _A	Fast	94.0	94.0
		Slow		94.0
	L _C	Fast		94.0
	L _Z	Fast		94.0
	L _A	Fast	114.0	114.0
		Slow		114.0
	L _C	Fast		114.0
	L _Z	Fast		114.0

IEC 61672 Type 1 Spec. : ± 1.1 dB

Uncertainty : ± 0.1 dB

3 Electrical signal tests of frequency weightings (A weighting)

Frequency	Attenuation (dB)	IEC 61672 Type 1 Spec.
31.5 Hz	-39.8	- 39.4 dB, ± 2 dB
63 Hz	-26.4	- 26.2 dB, ± 1.5 dB
125 Hz	-16.3	- 16.1 dB, ± 1.5 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.3	- 3.2 dB, ± 1.4 dB
1 kHz	0.0 (Ref)	0 dB, ± 1.1 dB
2 kHz	+1.2	+ 1.2 dB, ± 1.6 dB
4 kHz	+0.9	+ 1.0 dB, ± 1.6 dB
8 kHz	-1.1	- 1.1 dB, + 2.1 dB \sim -3.1 dB
16 kHz	-8.0	- 6.6 dB, + 3.5 dB \sim - 17.0 dB

Uncertainty : ± 0.1 dB



Calibration Certificate

Certificate No. 36604

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4. Frequency & Time weightings at 1 kHz

4.1 Frequency Weighting (Fast)

UUT Setting	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
A	94.0	94.0 (Ref.)	--	± 0.4 dB
C	94.0	94.0	0.0	
Z	94.0	94.0	0.0	

4.2 Time Weighting (A-weighted)

UUT Setting	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
Fast	94.0	94.0 (Ref.)	--	± 0.3 dB
Slow	94.0	94.0	0.0	
Time-averaging	94.0	94.0	0.0	

Uncertainty : ± 0.1 dB

5. Level linearity on the reference level range

UUT Range	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
130 dB (Ref Level)	129.0	129.0	0.0	± 1.1 dB
	124.0	124.0	0.0	
	119.0	119.0	0.0	
	114.0	114.0	0.0	
	109.0	109.0	0.0	
	104.0	104.0	0.0	
	99.0	99.0	0.0	
	94.0	94.0 (Ref)	--	
	89.0	89.0	0.0	
	84.0	84.0	0.0	
	79.0	79.0	0.0	
	74.0	74.0	0.0	
	69.0	69.0	0.0	
	64.0	64.0	0.0	
	59.0	59.0	0.0	
	54.0	54.0	0.0	
	49.0	49.0	0.0	
44.0	44.0	0.0		

Uncertainty : ± 0.1 dB



Calibration Certificate

Certificate No. **36604**

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6. Toneburst response (4kHz)

UUT Setting	Tone Burst Duration(ms)	UUT Reading(dB)	Difference (dB)	IEC 61672 Type 1 Spec.
Fast	Steady	127.0(Ref)	--	--
	200	126.0	-1.0	-1.0 ± 0.8dB
	2	108.9	-18.1	-18.0, +1.3 dB ~ -1.8 dB
	0.25	99.9	-27.1	-27.0, +1.3 dB ~ -3.3 dB
Slow	Steady	127.0(Ref)	--	--
	200	120.2	-6.8	-7.4 ± 0.8dB
	2	100.6	-26.4	-27.0, +1.3 dB ~ -3.3 dB
Time averaging	Steady	127.0(Ref)	--	--
	200	120.1	-6.9	-7.0±0.8dB
	2	99.5	-27.5	-27.0, +1.3 dB ~ -1.8 dB
	0.25	91.7	-35.3	-36.0, +1.3 dB ~ -3.3 dB

Uncertainty : ± 0.1 dB

7. Overload indication (130 dB range, A-weighted, Time-average, 4kHz)

UUT Reading at overload (dB)		Difference (dB)	IEC 61672 Type 1 Spec.
+ ve one half cycle	- ve one half cycle		
138.4	138.2	0.2	< 1.8 dB

The overload indicator latched on until reset

Uncertainty : ± 0.1 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure : 996 hPa.

4. Preamplifier model : NH-25 , S/N : 10553

5. Firmware Version: 1.2

6. Power Supply Check: OK

7. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.

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