

GC column installation

Turning Visions Into Reality

10 steps to properly install a Restek capillary column

1 instrument preparation

Turn off GC oven and cool all heated zones. Visually inspect the oxygen and moisture traps and review installation dates. Replace traps if necessary.

2 injection port preparation

Visually inspect injection port sleeves and replace if broken or dirty. Replace critical injection port seals (O-rings, inlet seal, column ferrule) and septum.

3 detector preparation

Inspect detector. Clean or replace detector hardware and seals if broken, dirty, or leaking. Set make-up and detector gas flows.

4 column installation: column cutting

Cut approximately 2cm from the end of each column to remove the flamed end-seals. Install a capillary column nut and appropriately-sized ferrule at one end of the column. After doing so, cut an additional 10cm off this end of the column to remove any ferrule fragments. Mount the capillary column on the GC oven hanger.

5 column installation: injection port

Connect the column to the injection port at the manufacturer's recommended insertion distance (see chart at right). Set the approximate column head pressure. Set the split vent, septum purge, and any other applicable inlet gas flows (see *quick reference* below). Confirm carrier gas flow by immersing the column outlet in a vial of solvent and checking for bubbles.

Inlet Insertion Distances

Agilent (HP):	5-7mm from tip of ferrule
Varian 1075/1077:	5.7cm from back of nut
Perkin Elmer Autosystem:	4.5 - 5.0cm from back of nut
Shimadzu 14A:	4.0cm from back of nut
Shimadzu 17A:	30mm from tip of ferrule
split:	40mm from back of nut
splitless:	64mm from back of nut

6 column installation: detector

Install a capillary column nut and appropriately-sized ferrule at the column outlet. Cut an additional 10cm from this end of column to remove any ferrule fragments. Connect the column to the detector at the instrument manufacturer's recommended insertion distance.

7 leak-check the GC

Check for leaks around the injector, column fittings, and detector base using a thermal conductivity leak detector, such as the Restek Leak Detective™. Set injector and detector temperatures and turn on the GC oven, injector, and detector.

Caution - confirm the column's maximum operating temperature before heating up the GC, injector, detector, and transfer lines.

8 setting linear velocity/column flow rate

Once all heated zones are ready, inject a non-retained substance to obtain a dead time. Then accurately set the carrier gas linear velocity and column flow rate (see *quick reference* below for determining linear velocity and flow rate). Check system integrity and column installation by ensuring that the dead time peak does not tail.

9 column conditioning

Confirm the stationary phases minimum and maximum operating temperature for thermal stability. If you are using sensitive detectors (MSD, ECDs, NPDs, PID/ELCDs), condition for 2 hours at maximum operating temperature while the column is disconnected from the detector. Then install the column into the detector, and re-condition in the detector for another hour at maximum operating temperature. For other detectors, condition the column while connected to the detector for 2 hours at maximum operating column temperature. After conditioning always check for leaks and carrier gas supply, then inject a non-retained substance to verify the proper linear velocity and column flow rate (see *quick reference* below for determining linear velocity and flow rate).

10 running samples and column storage

Run test mixtures to confirm proper column installation and performance. Calibrate instrument and inject samples.

Stand-by operation: Short-term storage (overnight or over-weekend)—Keep the column in the GC at 100°C–150°C with carrier gas flow.

Long-term storage: Remove column from GC and flame-seal or cap column ends with Restek's capillary column caps.

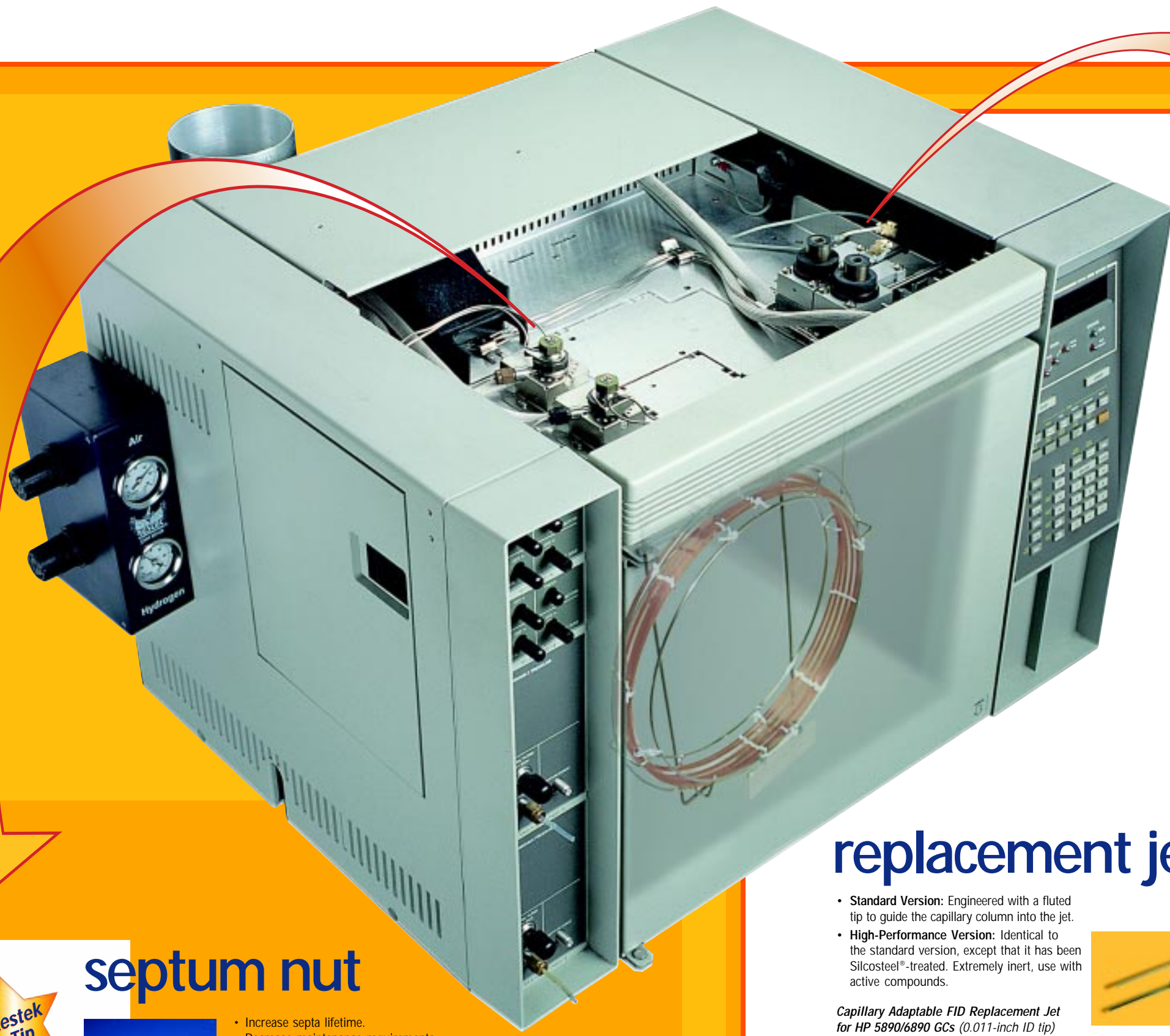
For Carbowax® 20M or bis-cyanopropylphenyl columns, store in original column box away from light to prevent stationary phase degradation.



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or call your local representative
www.restekcorp.com



detector components

FID collector assembly

Replacement FID Collector Assembly for HP 5890/6890 GCs
• Constructed of high-quality stainless steel.
• Meets original equipment specifications.
(Similar to Agilent (HP) part # 19231-60690)
Replacement FID Collector Assembly: cat. # 23010, (kit)

FID igniter

FID Igniter for HP 5890/6890 GCs
• Meets original equipment specifications.
(Similar to HP part # 19231-60680)
FID Igniter: cat. # 21001 (each)



replacement jets

Standard Version: Engineered with a fluted tip to guide the capillary column into the jet.
High-Performance Version: Identical to the standard version, except that it has been SilcoSteel™-treated. Extremely inert, use with active compounds.

Capillary Adaptable FID Replacement Jet for HP 5890/6890 GCs (0.011-inch ID tip)

Capillary Replacement FID Jets (Similar to HP part #19244-80560)	Standard	cat. # 20670, (ea.)	cat. # 20671, (3-pk.)
High-Performance	cat. # 20672, (ea.)	cat. # 20673, (3-pk.)	

inlet components

septa

Thermolite® Septa
• Lowest bleed on FIDs, ECDs, & MSDs.
• Usable to 340°C inlet temperatures.

Septum Diameter	25-pk.	50-pk.	100-pk.
9.5mm (3/8")	20359	20360	20361
10mm	20378	20379	20380
11mm (7/16")	20363	20364	20365
17mm	20384	20385	20386
Shimadzu Plug	20372	20373	20374

septum nut

• Increase septa lifetime.
• Decrease maintenance requirements.
• Ensure a leak-free injection port.
• Constructed of high-quality stainless steel.

Autosampler Septum Nut
(Similar to Agilent (HP) part #18740-60835)
cat. # 20631 (ea.)

Manual Injection Septum Nut
(Similar to Agilent (HP) part #18740-60835, except with a 26-gauge hole.)
cat. # 21309 (ea.)

O-ring

Rubber
Rubber O-rings are universal. One size fits both split (6.3mm ID) and splitless (6.5mm ID) sleeves.

	Max. temp.	Similar to HP Part #	Restek cat. #	Qty.
Silicone	350°C	5080-4982	20376	25-pk.
Viton® (fluorocarbon)	350°C	5180-4182	20377	25-pk.

Graphite
Graphite O-rings have excellent thermal stability and can be used at injection port temperatures up to 450°C!

	Similar to HP Part #	Restek cat. #
6.3mm ID for split liners	5180-4168	20296
6.5mm ID for splitless liners	5180-4173	20298

inlet liners

Request the new, updated **inlet Supplies Guide**
The guide has 40 pages of inlet liners, liner packing material, inlet seals, septa, and much more—organized by instrument manufacturer for your convenience! Call our literature request hotline at 800-356-1688 or 814-353-1300, ext. 5, or contact your local Restek representative and request kit, cat. # 59893.

liner packing material

• Ensure uniform vaporization in split or splitless sleeves.
• Prolong column lifetime by trapping non-volatile residue and septa particles.
• Inertness tested.
• Recommended for autosamplers with fast injection rates.

Packing material	cat. #	Qty.
deactivated fused silica wool	20790	10g
deactivated borosilicate glass wool	20789	10g
Siltek® deactivated borosilicate glass wool	21100	10g
base deactivated fused silica wool	20999	10g
CarboFrit™ (-4mm)	20294	10-pk.
CarboFrit™ (<4mm)	20295	10-pk.

reducing nut

• For Agilent (HP) 5890/6890 GCs.
• High-quality stainless steel.
• Meets original equipment specifications.
(Similar to Agilent (HP) part # 18740-20800)
cat. # 22078 (ea.)

ferrules

• Vespel®/graphite ferrules are a 60%/40% blend offering the best combination of sealing performance and ease of workability.
• Seals with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
• Both ferrule types stable to 400°C.
• Smoother surface and cleaner edges.
• Use Vespel®/graphite for GC/MS analyses or with O-sensitive detectors such as ECDs and NPDs.
• Use graphite for general analysis on FIDs and TCDs.

Compact Ferrules for HP GCs

Ferrule Fits Column ID (mm)	Fits Column ID (mm)	Graphite	Vespel®/Graphite
0.4	0.25	20250 (10-pk.)	20251 (50-pk.)
0.5	0.32	21007 (10-pk.)	21008 (50-pk.)
0.8	0.53	20252 (10-pk.)	20253 (50-pk.)
		20263 (10-pk.)	20264 (50-pk.)

Capillary Ferrules (for 1/16" compression-type fittings)

Ferrule ID (mm)	Fits Column ID (mm)	Graphite	Vespel®/Graphite
0.4	0.25	20200 (10-pk.)	20201 (10-pk.)
0.5	0.32	20201 (10-pk.)	20202 (50-pk.)
0.8	0.53	20202 (10-pk.)	20203 (50-pk.)

leak detective™

• Compact, lightweight, hand-held design.
• Low-cost thermal conductivity leak detector available.
• Contamination-free leak detection.
• Detects helium or hydrogen trace leaks at 23 x 10⁻⁶cc/sec. or 220ppm.

Restek's Leak Detective™ electronic leak detector is the convenient and affordable solution for GC leak detection. It responds in less than 2 seconds to trace leaks of gases with thermal conductivities different than air. Helium or hydrogen can be detected at 3 x 10⁻⁶cc/sec. or at an absolute concentration as low as 20ppm. Leaks are indicated by an audible alarm, as well as by an LED readout. Two 9-volt batteries provide 10–12 hours of continuous operation. The unit also can be used with an AC adaptor (batteries and adaptor included).

Restek Leak Detective™ Electronic Leak Detector (110 volts): cat. # 21607 (ea.)
(220 volts): cat. # 21609 (ea.)

inlet seal & washer

• Special grade of stainless steel that is softer and deforms more easily.
• Ensures complete leak-free seal.
• Reduced noise benefits high-sensitivity detectors (e.g., ECDs, MSDs).
• SilcoSteel™-treated seal offers the inertness of glass.
• Gold and SilcoSteel™ treated seals reduce breakdown and adsorption of active compounds.

Single-Column Installation, opening size 0.8mm ID

	2-pk.	10-pk.
Stainless Steel Inlet Seal	21315	21316
Gold-Plated Inlet Seal	21317	21318
SilcoSteel™-treated Inlet Seal	21319	21320

*washer included with inlet seal

capillary nut

(Similar to Agilent (HP) part # 5181-8830)
For use with "short" Agilent (HP)-type ferrules: cat. # 21884, (2-pk.)
For use with standard ferrules—designed to fit a wider variety of 1/16" ferrules: cat. # 20883 (2-pk.)

quick reference

typical column characteristics

Column Parameters	0.10mm	0.18mm	0.25mm	Column ID			
Typical Splitless Purge Times	10min.	2min.	1.5min.	1.0min.	0.75min	0.5min.	0.5min.
Column OD (Ferrule ID)	0.4mm	0.4mm	0.4mm	0.4mm	0.5mm	0.8mm	0.8mm
Column Flow Rate (He @ 20cm/sec.)	0.05cc/min.	0.3cc/min.	0.7cc/min.	0.9cc/min.	1.0cc/min.	2.1cc/min.	2.6cc/min.
Column Flow Rate (H ₂ @ 40cm/sec.)	0.09cc/min.	0.6cc/min.	1.4cc/min.	1.8cc/min.	2.0cc/min.	4.0cc/min.	5.2cc/min.
Approximate Sample Capacity	<10ng	<50ng	50-100ng	100-180ng	400-500ng	800-1200ng	1000-2000ng
Typical Effective Plates/m (80% CE)	8000	3700	2700	2500	2100	1900	1300

approximate column head pressure (He or H₂ carrier gas)

Column ID	10m	15m	20m	30m	40m	60m	75m	105m
0.10mm	20psig	—	42psig	—	—	—	—	—
0.18mm	6psig	—	13psig	—	27psig	—	—	—
0.25mm	—	6psig	—	11psig	—	23psig	—	40psig
0.32mm	—	—	—	9psig	—	15psig	—	—
0.45mm	—	4psig	—	7psig	—	14psig	—	28psig
0.53mm	—	—	—	3.0psig	4.5psig	5.6psig	8psig	—
		1psig	—	2.5psig	—	6psig	7psig	9psig

Always optimize the column flow rate by using linear velocity.

split vent flow rates (50:1 split ratio)

Carrier Gas	0.10mm ID	0.18mm ID	0.25mm ID	0.28mm ID	0.32mm ID	0.45mm ID	0.53mm ID
Helium	8cc/min.	15cc/min.	35cc/min.	44cc/min.	50cc/min.	100cc/min.	130cc/min.
Hydrogen	16cc/min.	30cc/min.	70cc/min.	89cc/min.	100cc/min.	201cc/min.	260cc/min.

other flow rates

Septum Purge: between 3 to 5cc/min.
Splitless Vent Flow: 50cc/min.
Direct Injection Flow Rate: 5–10cc/min.
Purge & Trap Flow Rate: 8–10cc/min.

setting dead times for optimum linear velocity

To set a dead time, inject 2.0µL of a non-retained gaseous substance (compatible with the detector) via a standard 10µL syringe with a Teflon®-tipped plunger (cat. # 24557 or 24725) or draw 2µL from the headspace over neat compounds. Accurately mark the injection starting time and peak elution time with an electronic integrator.

Detector Type	Recommended Dead Volume Compounds	Detector Type	Recommended Dead Volume Compounds
FID	methane, propane, butane	ECD	air*, methylene chloride headspace vapors
TCD	air*, methane, butane	ELCD	dichlorodifluoromethane or methylene chloride headspace vapors
NPD	acetonitrile headspace vapors, air*	MS	air*, propane, butane, argon
		PID	acetylene ethylene

Some compounds may be slightly retained on thick-film phases (1.0 to 7.0µm) giving slightly erroneous dead volume times, however, they will be reproducible for similar column types.

retention time (dead volume) for methane

Column Length	10m	15m	20m	30m	45m	60m	75m	105m
Hydrogen @ 40cm/sec.	0.42 min.	0.63 min.	0.83 min.	1.25 min.	1.88 min.	2.50 min.	3.13 min.	4.38 min.
Helium @ 20cm/sec.	0.83 min.	1.25 min.	1.67 min.	2.50 min.	3.75 min.	5.00 min.	6.25 min.	8.75 min.

pressure conversion factors

Pressure	PSI	atm	kg/cm ²	Torr (mm Hg)	Inches Hg	kPa	Barr
PSI	1	0.0680	0.0703	51.813	2.0359	6.8948	0.06895
atm (std.)	14.696	1	1.0332	760	29.921	101.32	1.0133
kg/cm ²	14.223	0.9678	1	735.56	28.958	98.06	0.9806
Torr mm Hg (32°F)	0.0193	0.00132	0.00136	1	0.0394	0.1330	0.00133
Inches Hg (32°F)	0.4912	0.0334	0.0345	25.400	1	3.386	0.03386
kPa	0.1450	0.00987	0.0102	7.52	0.2953	1	0.0100
Barr	14.5033	0.9869	1.0197	751.88	29.5300	100	1

measures of composition

Name	Abbr.	Weight/weight	Weight/volume	Volume/volume
parts/thousand	ppt	mg/g	µg/µL	mL/L
parts/million	ppm	µg/kg	µg/mL	nL/mL
parts/billion	ppb	ng/g	pg/µL	nL/L