SHEARING ACTION
OF THE
TRIFLEX BLADES

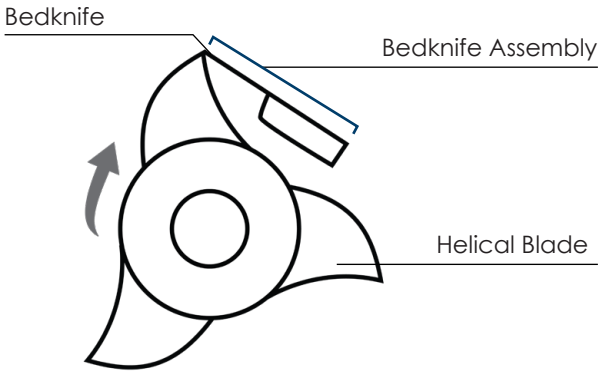
MOBIUS TRIMMER

MOBIUSTRIMMER.COM

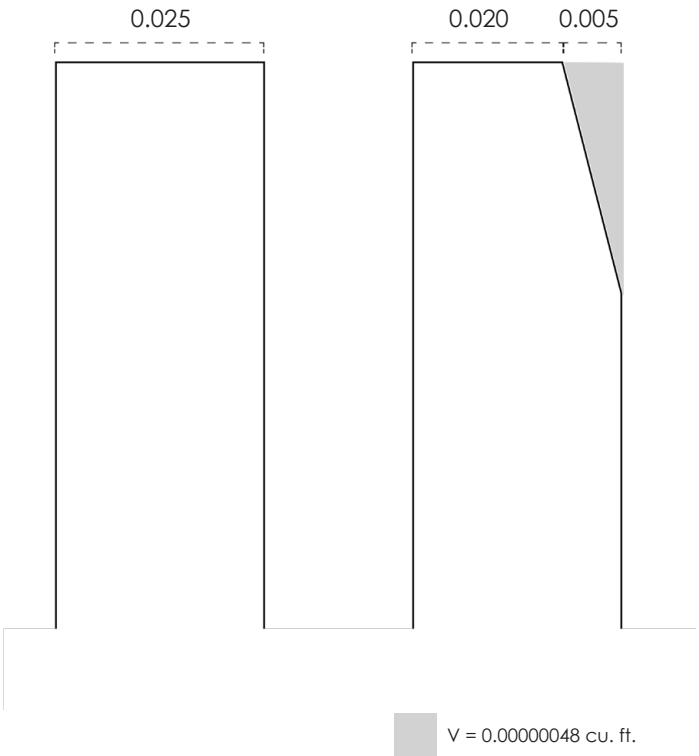
DESIGNED AND BUILT for COMMERCIAL SCALE CULTIVATORS

Wondering about metal-on-metal contact when using the Mobius Trimmer M108? Below is an overview of how the Mobius TriFlex Blade System works and a breakdown of the numbers.

The Mobius TriFlex Blade System was designed to work just like scissors. Scissors are used when a job requires small, precise cuts, particularly in situations where the cut is being done unsupported (i.e. trimming with scissors in mid-air vs. cutting against a hard surface using a knife). Scissors have asymmetric overlapping blades that work through shearing action when the two blades flex against one another. At the point where the blades meet, the shearing contact between the two metal surfaces is what cuts the material.



On the M108, the two shearing surfaces are the helical blade and the bedknife (held in place by the bedknife assembly). The helical blade rotates against the stationary bedknife and cuts are made at the contact point between these two shearing surfaces. The bedknife flexes against the helical blade as it rotates, maintaining a constant tension and cut, just like using scissors.



Now that you know how the blades function on the M108, let's have a closer look at the impact of the shearing action of the two metal surfaces against one another. When you first receive your M108, the machine and the blades in the machine have been run-in for a minimum of one hour. Any spare blades will not have been run-in. As you operate the M108 for the first few hours, you will notice signs of shearing on the edge of the bedknife. This is normal and expected.

The TriFlex Blade System was designed with 5 thousandths of pre-load on the bedknife and it takes approximately six hours to reach full break-in to the pre-load. Throughout this six-hour period, the Mobius is moving 2,400 cubic feet per minute (cfm) of air for a total of 864,000 cubic feet. The total volume of bedknife loss (across all three blades) over the six-hour period is 0.0000087 cubic feet, which is the equivalent of 0.0000018 parts per million (ppm) or 1.8 parts per trillion (ppt)!!

	IMPERIAL	METRIC
Mobius air flow	2,400 cfm	4,078 m^3/hr
Pre-load on bedknife	0.005 inch	0.127 mm
Volume of bedknife loss through break-in period	2.9 x 10-6 cu. ft.	8.26 x 10^{-8} m^3
Estimated break-in period	6 hours	
Volume of bedknife loss per hour during break-in period	4.8 x 10-7 cu. ft.	1.4 x 10-8 m^3
Total air flow through Mobius over break-in period	864,000 cu. ft.	24,468 m^3
Bedknife material present during break-in period (per blade)	0.0000006 ppm 0.0006 ppb 0.6 ppt	

To put 0.0000018 ppm in perspective, let's look at some relevant comparisons. The tables below outline regulated limits for various contaminants in drinking water (Canada), food (Canada) and pharmaceutical/drug products (European Union).

DRINKING WATER

SOURCE: GUIDELINES FOR CANADIAN DRINKING WATER QUALITY [I]

SUBSTANCE	ALLOWABLE LIMIT
Arsenic in drinking water	0.01 ppm
Cyanide in drinking water	0.02 ppm
Lead in drinking water	0.01 ppm
Mercury in drinking water	0.001 ppm

FOOD

SOURCE: HEALTH CANADA'S MAXIMUM LEVELS FOR VARIOUS CHEMICAL CONTAMINANTS IN FOOD [II]

SUBSTANCE	ALLOWABLE LIMIT
Mercury in fish	0.5 ppm
Melamine in infant formula	0.5 ppm

PHARMACEUTICALS AND DRUG PRODUCTS

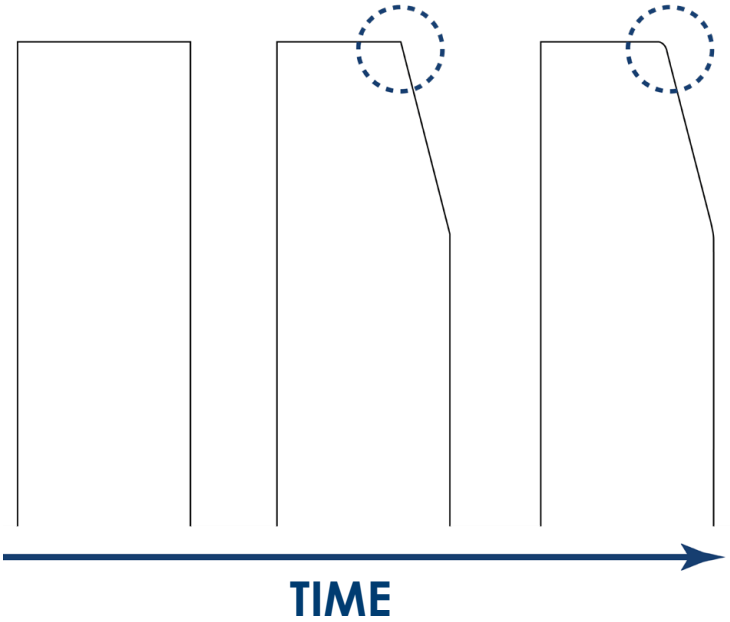
SOURCE: EUROPEAN MEDICINES AGENCY GUIDELINE ON THE SPECIFICATION LIMITS FOR RESIDUES OF METAL CATALYSTS OR METAL REAGENTS IN PHARMACEUTICAL SUBSTANCES OR DRUG PRODUCTS [1][2][3]

(note: the elements listed below are those that are present in SS 316, the material of the bedknife)

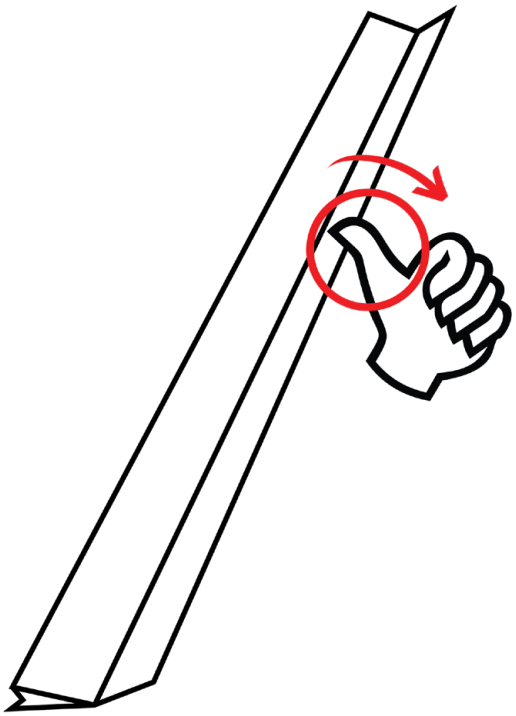
SUBSTANCE	ALLOWABLE LIMIT
Manganese	250 ppm
Chromium	25 ppm
Molybdenum	25 ppm

Conclusion: The shearing action of the helical blade against the bedknife during the break-in period generates a concentration of metal that is several orders of magnitude less than allowable limits of contaminants in substances for human consumption and, in fact, is so low as to be undetectable in practice.

What happens after the break-in period?



After the initial break-in period, there is no further visible wear on the bedknife. Over time, though, the edge on the bedknife will begin to dull or 'roll', which happens to all knife and scissor edges.



The bedknives on the Mobius are designed as semi-consumables - once the edge begins to 'roll', it's time to swap out that bedknife for a new one. To determine if your bedknife edge has rolled, run the surface of your fingernail at a 45° angle across the blade edge. if the blade edge scrapes the fingernail surface, the edge is still good. if there is no scraping of the fingernail surface, the edge has rolled and the bedknife should be replaced*.

* Note: there is a 1/8" section at each end of the bedknife that will break-in and wear more quickly than the rest of the blade. This is caused by contact between the anti-dive disc on the helical blade and the bedknife. Rolling of this small segment does not indicate rolling on the rest of the bedknife edge and should not be used to determine if replacement is required.

---

i https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html

ii https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

iii http://academy.gmp-compliance.org/guidemgr/files/444600ENFIN.PDF