



# Alternative Design

## **Rat Ventilated Polysulfone Cage Changeout Set**



RV-COS-UD-WB



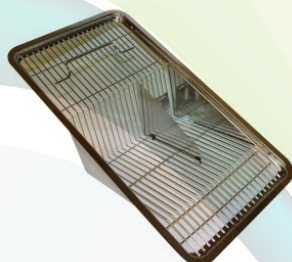
RV-COS-UD-WB-SOLID

# Solid Top

RV-COS-UD-WB-SOLID



Solid Top - VTA8X-UD-SOLID



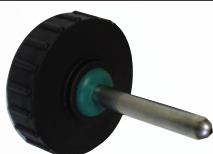
Wire Bar Lid - WL88F



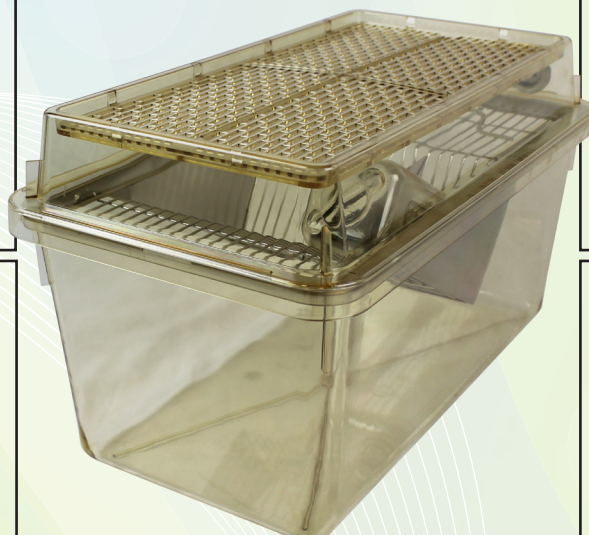
Cage - RC88D-UD



Quarter Turn Water Bottle - WB16RHE-QT



Quarter Turn Cap - TCCN8.5-QT-ST2.5-SO



RV-COS-UD-WB



RV-COS-UD-WB-SOLID

# Filter Top

RV-COS-UD-WB



Filter Top - FT8XL-UD



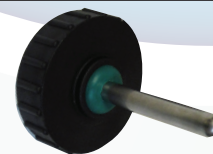
Wire Bar Lid - WL88F



Cage - RC88D-UD



Quarter Turn Water Bottle - WB16RHE-QT



Quarter Turn Cap - TCCN8.5-QT-ST2.5-SO

## Cage Dimensions:

10.25" W x 18.75" D x 6" H  
26.0 cm W x 47.6 cm D x 15.2 cm H  
900 square cm floor space

## Quarter-Turn Water Bottle with Cap - An Ergonomic Product!

This ergonomic product is a true quarter-turn twist cap that speeds up the process and helps to minimize repetitive motion injury. The bottle is 473 mL, autoclavable up to 148° C and made from clear polysulfone. It's available with either a sipper tube cap or a solid cap with a drilled bottle. Optional color tinted caps and bottle available to allow for sorting.



# The Benefits of Low Velocity Air

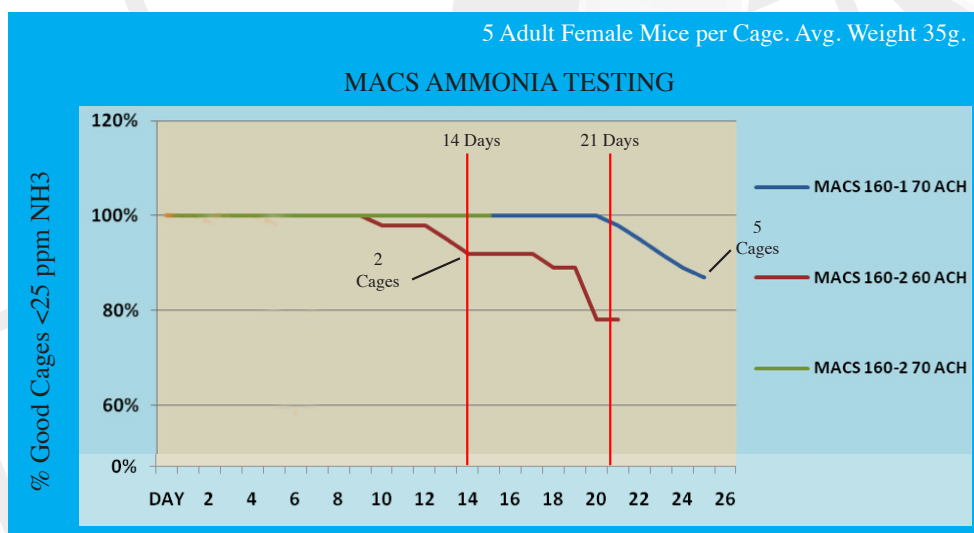
## Stable, Balanced Air Flow

Because the Alternative Design system has much lower air velocities than traditional systems, the balance of airflow between cages is very stable and uniform. As well, changes to the number of AC/H have a smaller affect on the performance of the system. Testing of the uniformity of AC/H was performed at the cage level with the following results:

| Maximum   | Minimum   | Average   | Standard Deviation |
|-----------|-----------|-----------|--------------------|
| 74.2 AC/H | 64.2 AC/H | 70.0 AC/H | ±3.2 AC/H          |

The above results demonstrate a maximum of  $\pm 5.0$  AC/H with 95% of the cages within  $\pm 3.2$  AC/H of average.

## M.A.C.S. Meets All In-cage Guidelines for NH<sub>3</sub>, CO<sub>2</sub> and Air Velocity



### AMMONIA:

The best results for the MACS double-sided 160 cage are at 70 ACH with five adult mice per cage. All of the test cages went 14 days with Ammonia at 0 ppm and went 21 days with all cages less than 25 ppm NH<sub>3</sub>. At day 26 (test arbitrarily stopped) only 5 cages of 36 total exceeded 25 ppm.

A second confirming test was performed at 70 ACH and all 35 test cages went 16 days at 0 ppm Ammonia.

The MACS 160 at 60 ACH went 10 days before one cage exceeded 25 ppm NH<sub>3</sub>. It was not until day 14 that a second cage exceeded 25 ppm NH<sub>3</sub>. The overall performance was good, only slightly less than at 70 ACH.

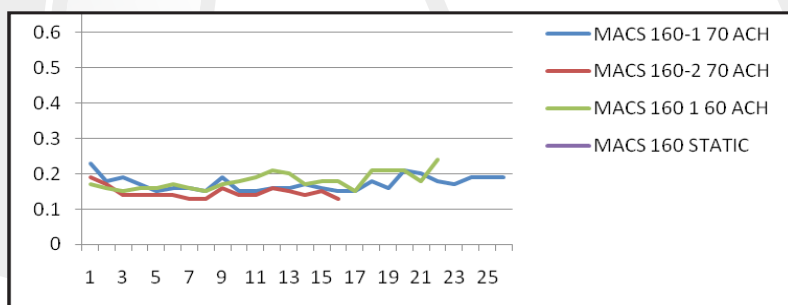
### CARBON DIOXIDE:

Carbon Dioxide was a non-issue. For reference the TLV is .5% (5000 ppm) and normal atmospheric is .04% (400 ppm).

Our highest overall average in the IVC was .18% (1800 ppm).

CO<sub>2</sub> in the static cages was much different. The average was .8% (8000 ppm).

In all cases there was very little daily fluctuation. The MACS double-sided 160 showed some higher levels towards the end of the test period. These were during the last days approaching 3 weeks but all were well below the TLV.



## Air Velocity within the Cage

| Parameter    | Device                               |
|--------------|--------------------------------------|
| Air Velocity | Hot-Wire Anemometer \ DAQ Board \ PC |

### In-cage Air Velocity:

Based on Euro TIZ-BIFO Guidelines

#### Purpose:

The purpose of this test was to accurately measure air velocity and airflow patterns within an animal cage to confirm that all velocities obtained within the cage at the animal level were in fact under the Euro guideline of <0.2 m/sec limiting value. The current U. S. guideline for air velocity is <0.25 m/s.

### Results:

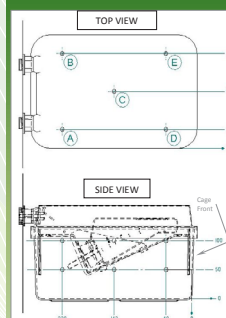
The following table shows the mean recorded air velocities (in meters per second, m/s) at the various cage locations shown to the right.

At all the animal level points, A1-E1, the air velocity was well below 0.2 m/s. At 60 ACH and 90 ACH, the velocity exceeded 0.2 m/s is at point A2, the upper corner of the cage. It is at this point on the GA cage that the air supply is delivered into the cage. Still, even at its highest velocity, the airflow is less than 1 mile per hour.

**SUMMARY:** The testing results show that the MACS IVC system meets both the guidelines for keeping air velocity low at the animal level as well as maintaining low ammonia and carbon dioxide within the cages for 14 days.



## Air Velocity within the Cage



| MAX 75% In-Cage Location | Minimum ACH (45) |       | Middle ACH (60) |       | Maximum ACH (90) |       |
|--------------------------|------------------|-------|-----------------|-------|------------------|-------|
|                          | + P              | - N   | + P             | - N   | + P              | - N   |
| A1                       | 0.021            | 0.020 | 0.155           | 0.016 | 0.061            | 0.054 |
| B1                       | 0.027            | 0.017 | 0.041           | 0.026 | 0.029            | 0.022 |
| C1                       | 0.002            | 0.000 | 0.019           | 0.009 | 0.043            | 0.033 |
| D1                       | 0.028            | 0.012 | 0.134           | 0.070 | 0.190            | 0.153 |
| E1                       | 0.007            | 0.003 | 0.018           | 0.011 | 0.051            | 0.050 |
| A2                       | 0.183            | 0.072 | 0.326           | 0.254 | 0.404            | 0.362 |
| B2                       | 0.011            | 0.010 | 0.012           | 0.015 | 0.008            | 0.012 |
| C2*                      | N/A              | N/A   | N/A             | N/A   | N/A              | N/A   |
| D2                       | 0.025            | 0.017 | 0.036           | 0.025 | 0.075            | 0.064 |
| E2                       | 0.001            | 0.000 | 0.037           | 0.019 | 0.088            | 0.062 |

Animal Level

Human Perceived Draft  
V = 0.200 m/s

Units: m/s (meters per second)

## Reduced Ammonia Levels

Improving the microenvironment of the animal is a key objective of the Gentle-Air System. In dozens of tests conducted in facilities around North America, the Gentle-Air was demonstrated to be a reliable way to maintain a good microenvironment while extending the time between cage changes anywhere from 7 to 21 days. The table below is representative of the types of results achieved after 14 days.

Concerns had been expressed that with a solid cage top the rodent might be at risk should ventilation stop due to power or fan failure. To determine the risk, we turned the fan off on the unit, which was fully housed with rodent. Smoke tests confirmed that passive ventilation continued at a reduced rate due to natural convection. After observing the animals for several hours without any obvious signs of distress, the power was left off over night. The next morning all animals appeared in good condition. Actual field experience has confirmed that the natural convective flow sufficiently ventilated the rodent for extended periods of time. It is recommended that should the cages be removed from the rack for extended periods of time, that a standard filter top be placed on the cage.

| Cage Position           | Number of Mice | Ammonia Results |
|-------------------------|----------------|-----------------|
| 1                       | 5              | 5               |
| 4                       | 5              | 1               |
| 5                       | 5              | 2               |
| 7                       | 5              | 2               |
| 8                       | 5              | 7               |
| 9                       | 5              | 1               |
| 11                      | 4              | 2               |
| 12                      | 4              | 2               |
| 14                      | 4              | 1               |
| 15                      | 4              | 0               |
| 16                      | 4              | 1               |
| 17                      | 4              | 3               |
| 18                      | 4              | 6               |
| 21                      | 5              | 2               |
| 24                      | 5              | 1               |
| 26                      | 5              | 1               |
| 27                      | 5              | 1               |
| 28                      | 4              | 1               |
| 31                      | 4              | 0               |
| 33                      | 4              | 1               |
| 36                      | 4              | 1               |
| 52                      | 5              | 1               |
| Average Ammonia Reading |                | 1.83            |



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