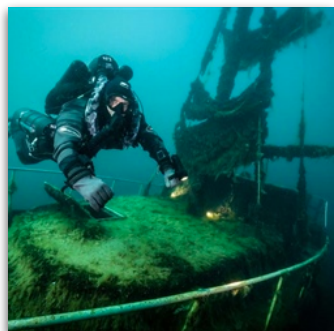


### About rebreathers

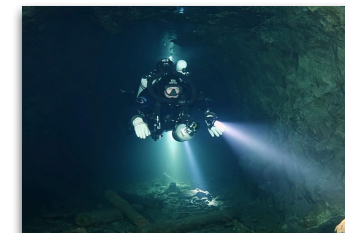
- What is the reason for the use of a rebreather
- Basic components a closed circuit rebreather
- Other types of rebreathers
- Advantages and Disadvantages



### What is the reason for the use of a rebreather ?



- New form of diving
- Photography
- Remote location, and logistics
- Technical diving
- **Safe gas and less bubbles**
- **Right tool for the job**



### Basic components of a closed circuit rebreather

Breathing hoses and mouthpiece

Counter lungs

Oxygen source

3 Oxygen cells

Primary controller and secondary monitoring system

CO2 absorbent and Scrubber canister

Diluent source

### Breathing hoses and mounthpiece

Good gas with the controlled PPo2 and scrubbed of Co2

Used exhaled gas with lower PPo2 and high Co2

On way valves to ensure a uni-directional gas flow

LEFT

RIGHT

Lever to close and open the loop

# About Rebreathers

Counter lungs

Back mounted counter lung inside the body of the SF2 CCR

Front / Chest mounted counter lung

Backmounted counter lung as found on the JJ CCR

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# About Rebreathers

Electronics and monitoring

Main handset or controller

Secondary PPo2 monitor or HUD, Heads Up Display

Head of the CCR with 3 oxygen cells

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# About Rebreathers

Oxygen cells

Cal. mV/Volts

10 11 12

.21 .21 .21

Cal. @ FO2=1.00

Cancel Calibrate

PSR 11-39-XD

Current related to Mv readout

Teflon / Hydrophobic membrane

Cathode

Electrolyte

Anode

Cell housing

Measured CURRENT mA

Current related to Mv readout

mV reading @1 ata in air / 0.20945 =

Expected mV reading @1 ata in 100% O2

$12mV / 0.20945 = 57.3mV$

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# About Rebreathers

Oxygen cells rotation

	Months	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42
sp	1		3		12		12		12		12		12			
	2			6		12		12		12		12				
	3				9		3		12		12		12		12	




lifetime of sensors: 1000 sensors from a any batch

Test performed by Paul Raymaekers

**O2 cells need to be changed at least every 12 calendar months**


**Not Diving months, so regardless of their exposure**

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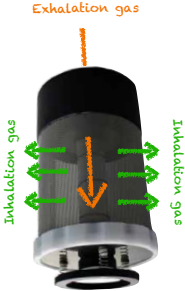




# About Rebreathers

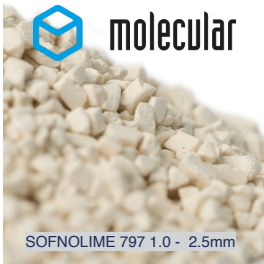
## Scrubber canisters and Co2 absorbent



**Axial CO2 Scrubber**






**Radial CO2 Scrubber**



**molecular**  
SOFNOLIME 797 1.0 - 2.5mm

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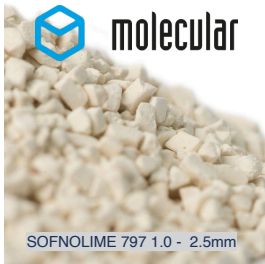




# About Rebreathers

## Co2 absorbent duration

Type:	Axial
Soda lime:	Average 2.5kg (Sofnolime 797)
Running time:	180 min with dive profile (40 m) 180 min with dive profile (100 m)
Dive profile:	40 min at 40 m, 5 min at 15 m, 9 m for the remaining time
Dive profile:	10 min at 100 m, 1 min at 39 m, 1 min at 36 m, 2 min at 33 m, 2 min at 30 m, 2 min at 27 m, 3 min at 24 m, 4 min at 21 m, 4 min at 18 m, 6 min at 15m, 7 min at 12 m, 10 min at 9 m, 6 m for the remaining time
Test parameter:	40l/min air, 1.6l/min CO2, 4°C water temperature
Used diluent:	40 m - Air 100 m - Trimix 11/65

The only supported soda lime is: Sofnolime® 797 manufactured by Molecular Products.



**molecular**  
SOFNOLIME 797 1.0 - 2.5mm

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# About Rebreathers

## Oxygen supply

- SPG
- LP hose to SOLOINOID
- LP hose to MAV

- M26 DIN
- I.P. 7.0 bar
- OPV to 10bar






## Diluent supply

- SPG
- LP hose to ADV
- LP hose to MAV
- LP hose to LPI wing

- g5/8 DIN
- I.P. 9.0 bar
- OPV to 15bar

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# About Rebreathers

## Other types of rebreathers


### Oxygen Rebreather

- Recreational
- Military




### Semi closed rebreather

- SCR
- pSCR



### Distinctions of CCR

- eCCR
- mCCR
- dcCCR



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### Advantages and disadvantages

Efficiency of gas usage  
No bubbles  
Constant PPO<sub>2</sub>  
Oxygen consumption is not related to  
depth  
Safety  
Logistics  
Warm and moist breathing gas



Cost  
Re-training  
Traveling  
More complex  
More subtle failures  
More discipline in care and maintenance