

## CARGILLE LABORATORIES

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TCWMO23

WATER MATCHING OIL 23°C CODE 3421

30-NOV-17

n (589.3nm) 23°C = 1.3327

### TYPICAL CHARACTERISTICS

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<u>COMPOSITION</u> .....	Perfluorocarbon and Chlorofluorocarbon (does not contain types of CFC thought to affect the ozone)
<u>APPEARANCE</u> .....	Colorless liquid
<u>COLOR STABILITY IN DIRECT SUN</u> .....	No visible change after 10 years
<u>INDEX CHANGE RATE BY EVAPORATION</u> .....	Moderate: -0.00030 to +0.00009 expected Exposed surface area to volume ratio of 0.2 cm <sup>2</sup> /cc @ 25°C for 32 days
<u>ODOR</u> .....	None
<u>POUR POINT</u> °C .....	< -20
<u>BOILING POINT</u> °C @ 760mm Hg .....	>215
<u>FLASH POINT</u> °C C.O.C. ....	None
<u>DENSITY</u> g/cc @ 25°C .....	1.927
<u>DENSITY TEMP. COEFFICIENT</u> g/cc/°C .....	-0.0020
<u>COEF. OF THERM. EXP.</u> cc/cc/°C .....	0.0010
<u>THERMAL CONDUCTIVITY</u> @ 25°C cal/sec/cm <sup>2</sup> /°C – 1 cm thickness .....	0.00024 (1.02 watts/meter/°K)
<u>VISCOSITY</u> @ 25°C .....	15cSt                      29cP
<u>SURFACE TENSION</u> dynes/cm @ 25°C .....	18
<u>DIELECTRIC CONSTANT</u> @ 1000cps 25°C .....	2.19
<u>SOLUBLE:</u> Golden PFS2, Fluoroclean HE, Chlorofluorocarbons	
<u>PARTLY SOLUBLE:</u> Most Organic Solvents (to remove from glass use tissue & Acetone)	
<u>INSOLUBLE:</u> Ethanol, Water	
<u>COMPATIBLE</u> 10-month immersion at 25°C: Acrylic, Cellulose Acetate, Epoxy, Mylar, Nylon, Polycarbonate, Polyester, Polyethylene, Polypropylene, Polystyrene, Polyurethane, Polyvinyl Chloride, Phenolic, Teflon; Latex, Neoprene, Fluorosilicone (Silastic 730 RTV), Silicone (Sylgard 184, 3140 RTV) Rubbers; Tygon F-4040-A, Tygothane, Copper, Brass, Steel; (tests done on one example of each).	
<u>INCOMPATIBLE:</u> Burna-S, Natural, and some Silicone Rubbers; Tygon types: S-50-HL, R-3603, B-44-3; Chlorotrifluoro Ethylene Polymers, Aluminum	

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The above values are typical for this liquid and are calculated from values typical of its components

CAUCHY EQUATION: refractive index as a function of wavelength at 23.0°C

W = wavelength (nm)

$$n(W) = 1.3267543 + (2.0442519E+03) / W^2 + (5.8428992E+06) / W^4$$

SOURCE OR SPECTRAL LINE	WAVELENGTH (nm)	REFRACTIVE INDEX 23°C	% TRANSMITTANCE 25°C		
			0.1 mm	1 mm	1 cm
Near UV cut off	240	1.36	99	92	42
excimer	248	1.36	99	95	60
excimer	308	1.349	100	99	94
N laser	337	1.345	100	100	97
l (Hg)	365	1.3424	100	100	98
F (H)	486.1	1.3355	100	100	100
e (Hg)	546.1	1.3337	100	100	100
D (Na D1, D2 mean)	589.3	1.3327	100	100	100
HeNe laser	632.8	1.3319	100	100	100
C (H)	656.3	1.3315	100	100	100
GaAs laser	840	1.3297	100	100	100
Nd: YAG laser	1064.8	1.3286	99	100	100
Diode	1300	1.328	100	100	100
Diode	1550	1.328	100	100	99
near end max %T	2500	1.33	100	99	90
$n_F - n_C$			=	0.0040	
Abbe $v_D: (n_D - 1)/(n_F - n_C)$			=	83.6	
Temp. coef: $dn_D/dt$ 15 - 35°C			=	-0.000337	

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