3. CHEMICAL AND PHYSICAL INFORMATION

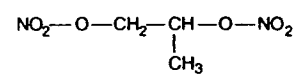
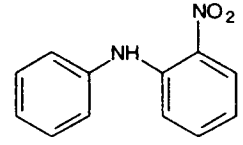
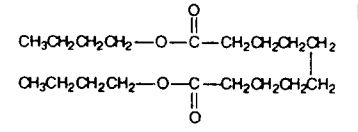
3.1 CHEMICAL IDENTITY

Information regarding the chemical identity of Otto Fuel II and its components is located in Table 3-1.

3.2 PHYSICAL AND CHEMICAL PROPERTIES

Information regarding the physical and chemical properties of Otto Fuel II and its components is located in Table 3-2.

TABLE 3-1. Chemical Identity of Otto Fuel II and Its Components[a]

Characteristic	Otto fuel II	Propylene glycol dinitrate[b]	2-Nitrodiphenylamine[c]	Dibutyl sebacate
Synonym(s)	No data	PGDN; 1,2-propylene glycol dinitrate; 1,2-propanediol, dinitrate; propylene dinitrate; isopropylene nitrate; methylnitroglycol; propylene	2-nitrobenzenamine, 2-nitro-N-phenyl; o-nitro-N-phenylaniline; o-nitro-diphenylamine[b]	Bis (n-butyl) sebacate; butyl sebacate; decanedioic acid, dibutyl ester; sebacic acid, dibutyl ester; dibutyl decanedioate; di-n-butylsebacate[a]; dibutylester kyseliny
Registered trade name(s)	No data	No data	Sudan yellow 1339; C.I. 10335[b]	Kodaflex DBS; Staflex DBS; PX 404; Monoplex DBS; Polycizer DBS[f]
Chemical formula	Not applicable	$C_3H_6N_2O_6$[g]	$C_{12}H_{10}N_2O_2$[b]	$C_{18}H_{34}O_4$[f]
Chemical structure	Not applicable	 c	 b	 h
Identification numbers:				
CAS registry	106602-80-6	6423-43-4[i]	119-75-5[b]	109-43-3
NIOSH RTECS	No data	TY 6300000[h]	No data	VS 1150000
EPA hazardous waste	No data	No data	No data	878212204; 878221572; 878221503[j]
OHM/TADS	No data	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data	No data
HSDB	No data	No data	No data	309
NCI	No data	No data	No data	No data

[a]All information obtained from HSDB 1994 except where noted
[b]Forman 1988
[c]Army 1979
[d]NRC 1982
[e]RTECS 1994
[f]Sax and Lewis 1989a
[g]ACGIH 1986
[h]SANSS 1994
[i]Sax and Lewis 1989b
[j]Chemlist 1991

CAS = Chemical Abstracts Services; DOT/UN/NA/IMCO = Department of Transportation/United Nations/North America/International Maritime Dangerous Goods Code; EPA = Environmental Protection Agency; HSDB = Hazardous Substances Data Bank; NCI = National Cancer Institute; NIOSH = National Institute for Occupational Safety and Health; OHM/TADS = Oil and Hazardous Materials/Technical Assistance Data System; RTECS = Registry of Toxic Effects of Chemical Substances

TABLE 3-2. Physical and Chemical Properties of Otto Fuel II and Its Components[a]

Property	Otto fuel II	Propylene glycol dinitrate	2-Nitrodiphenylamine	Dibutyl sebacate
Molecular weight	No data	166.1[b]	214.23[c]	314.52[d]
Color	Reddish-orange[e]	Colorless[f]	Orange[g]	Clear[d]
Physical state	Oily liquid[e]	Liquid[f]	Solid (orthorhombic crystals)[c]	Liquid[d]
Melting point	–27.7 °C[h]	-27.7° C[f]	75–76 °C[c]	-10 °C
Boiling point	Decomposes at 121 °C[h]	Decomposes at 121 °C[f]; 92 °C (10 mmHg)[f]	223 °C (20 mmHg)[c]	180 °C (3 mmHg)[d]; 344–345 °C (pressure unspecified)
Density	1.232 g/mL (25 °C)[h]	1.232 g/mL (25 °C)[f]	1.366 g/mL[c]	0.936 g/mL (20 °C)[d]
Odor	Distinctive[h]	Disagreeable[f]	No data	No data
Odor threshold:				
Water	No data	No data	No data	No data
Air	No data	No data	No data	No data
Solubility:				
Water	Insoluble[h]	0.13 g/100 mL[f]	Insoluble[i]	Insoluble
Organic solvent(s)	Alcohols; benzene carbon tetrachloride; hexane; chloroform; toluene; dibutyl phthalate; acetone; trichloroethylene[h]	No data	Ethanol, 2 g/100 mL (25 °C)[c]; Methanol, 2.4 g/100 mL (20 °C)[c]; Acetone, 43.6 g/100 mL (20 °C)[c]; Benzene, 51.7 g/100 mL (20 °C)[c]	Ether
Partition coefficients:				
Log K_{ow}	No data	No data	0.49[c]	No data
Log K_{oc}	No data	No data	No data	No data
Vapor pressure	0.0877 mm Hg (25 °C)[h]	0.09844 mm Hg (25 °C)[j]	0.00001 mm Hg (25 °C)[k]	3 mm Hg (180 °C)
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	121 °C[l]	No data	No data	No data
Flashpoint	130 °C[hg]	No data	No data	178 °C
Flammability limits	Monopropellant[l]	No data	No data	Slight potential when exposed to heat or flame
Conversion factors	No data	1 ppm = 7.14 mg/m^3 [m]	No data	No data
Explosive limits	No data	No data	No data	No data

[a]All information obtained from HSDB 1994 unless otherwise noted
[b]Sax and Lewis 1989b
[c]Army 1979
[d]Sax and Lewis 1989a
[e]Forman 1988
[f]ACGIH 1986
[g]Dean 1974
[h]Air Force 1985a
[i]American Cyanamid 1982
[j]Crater 1929
[k]Baughman and Perenich 1988
[l]Rivera 1974