

MATERIAL CHARACTERISTIC GUIDE

INTRODUCTION

This document is intended to be used as a reference guide in the selection of a point level indicator used to determine the presence or absence of material in a storage vessel at any given mounting location.

Contained within is a list of common materials along with their nominal bulk densities and dielectric constants. Use of this data is for reference only with the clear understanding that actual values may be different than listed.

CAUTION: Significant variances in material properties may occur when a material or compound is manufactured. Sometimes these variances can be a result of nature as is seen with the varying moisture content of grains or as in the case of a material or compound that tends to absorb moisture from its ambient environment. Other variances can be from a result of economic pressures of processing that can influence a manufacturer to alter their manufacturing process procedures. These variances may cause bulk density and dielectric constant values to change from those indicated in the following listing. It is impractical to account for all of these variances in such a document and is also beyond the scope of this document. Consequently, this list should be referenced only as a guide and not as a scientific document containing absolute values.

HOW TO USE THIS GUIDE

The indicated bulk density values aid in the selection of a proper sensing paddle when specifying a complete rotary paddle bin monitor. As bulk densities decrease, larger paddles (larger surface area of the blades) are required to stop rotation of the paddle and ultimately indicate material presence.

The listed dielectric constant values will assist you in determining when an RF Capacitance level monitor can be used. The lower the dielectric constant of the material the more difficult the material will be to detect. RF Capacitance probes can detect material with a minimum dielectric constant of 1.5. Some materials within this reference guide fall below this minimum dielectric constant, so RF Capacitance probes are not recommended for use with such materials. Contact the supplier when working with a low dielectric constant for application assistance.

In addition to dielectric constant, bulk density, and suggested paddle information for each listed material is a column labeled "Special Properties." The coded table is provided to assist you in your assessment of material flow characteristics and/or other material properties that will affect your decision on sensor equipment selection and mounting location.

For example, you are selecting a point level sensor for a high level alarm in a silo that is center filled. The silo contains a material with an angle of repose that exceeds 45 degrees, and your only mounting location option is near the silo wall. Depending upon the diameter of your silo, you will likely need to specify extensions for the sensor in order for material to ever reach the actual sensor switch point and physically indicate material presence when necessary. Extension information is located in the installation and operation bulletin of every applicable point level sensor.

Abrasive and corrosive characteristics will affect product selection regarding things like the type of material used in the construction of a probe's housing or

means of attachment. For example, you would not choose a point level sensor with a mounting surface made of aluminum if the material in the vessel you wish to detect would destroy or deteriorate the aluminum housing or mounting surface.

In the case of an RF capacitance probe, abrasive or corrosive material being sensed can also affect the selection of the insulator material used for construction of the actual probe. Please consult an application engineer if you need assistance with product selection.

Special Properties Column Definitions

- A: Very free flowing, <30° angle of repose
- B: Free Flowing, 30 - 40° angle of repose
- C: Sluggish, >45° angle of repose
- D: Abrasive
- E: Aerates/Deaerates/Compacts readily
- F: Fibrous or Irregular Shape
- G: Gas
- H: Hygroscopic
- L: Liquid
- M: Corrosive

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MATERIAL	DENSITY lbs/ft³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
ABS resin, pellet	45	LVD-800-1VS	LVD-800-3V	1.5	BD
Acetic acid, liquid	66	n/a	n/a	4.1	LM
Acetone	49	n/a	n/a	21	L
Acrylic resin	33	LVD-800-3VL	LVD-800-3V	2.7	B
Adipic acid, powder	45	LVD-800-1VS	LVD-800-3V		B
Air	0	n/a	n/a	1.0	G
Alcohol, ethyl	56	n/a	n/a	24	L
Alcohol, methyl	49	n/a	n/a	33.6	L
Alfalfa, ground	16	LVD-800-3VL	LVD-800-3VL	3	CEF
Almonds, shelled	30-35	LVD-800-1VS	LVD-800-3VL	9	B
Alum powder	50	LVD-800-1V	LVD-800-3V		B
Alumina	60	LVD-800-1VS	LVD-800-3V	9-11	B
Aluminum hydrate	18	LVD-800-3VL	LVD-800-3VL		C
Aluminum oxide	60-100	LVD-800-1V	LVD-800-4V	6.5	A
Aluminum silicate	35-45	LVD-800-1VS	LVD-800-3V	3	B
Aluminum, powder	45-80	LVD-800-1V	LVD-800-3V	1.6	B
Aluminum, shavings	7-15	LVD-800-1VT	LVD-800-1VT	120	CF
Ammonia	0	n/a	n/a	25	G
Ammonium nitrate, prill	45-60	LVD-800-1VS	LVD-800-3V	14	B
Ammonium sulphate	40-58	LVD-800-1VS	LVD-800-3V		B
Apple seed	32	LVD-800-3V	LVD-800-3V	7	A
Asbestos fibers	20-25	LVD-800-1VT	LVD-800-1VT	3	CF
Ash, coal, damp	45-50	LVD-800-1VS	LVD-800-3V	25-80	CF
Ash, coal, dry	35-45	LVD-800-1VS	LVD-800-3V	1.7	CF
Asphalt, liquid	65	n/a	n/a	2.5	L
Aviation fuel (jp-4)	49	n/a	n/a	1.7	L
Bakalite, powder	30-40	LVD-800-1VS	LVD-800-3V	3.5	C
Baking powder	40-45	LVD-800-1VS	LVD-800-3V	3.6	B
Baking soda	70-80	LVD-800-1VS	LVD-800-3V	5.7	B
Ball clay	25	LVD-800-1VS	LVD-800-3V	3	BE
Bark, wood refuse	10-20	LVD-800-1VT	LVD-800-1VT	3-15	CF
Barley, flour	25-30	LVD-800-1VS	LVD-800-3V	2.9	B
Barley, ground	25-30	LVD-800-1VS	LVD-800-3V	4	B
Barley, kernal	35-40	LVD-800-1VS	LVD-800-3V	6.6	A
Barley, malted	31	LVD-800-1VS	LVD-800-3V	7	B
Bauxite, crushed	75-85	LVD-800-1V	LVD-800-4V		B
Beans, caster	36	LVD-800-1VS	LVD-800-3V	6	A
Beans, coffee	22-40	LVD-800-1VS	LVD-800-3V	1.9	A
Beans, lima	45	LVD-800-1VS	LVD-800-3V	7	A
Beans, navy	48	LVD-800-1VS	LVD-800-3V	7.7	A
Beans, soy	45-47	LVD-800-1VS	LVD-800-3V	8.1	AD
Bentonite, lump	25-40	LVD-800-4V	LVD-800-3V		C
Bentonite, powder	50-60	LVD-800-1V	LVD-800-3V	2.5	C

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Bicarbonate of soda	41	LVD-800-1VS	LVD-800-3V	5.7	A
Biphenyl		n/a	n/a	20	L
Blood, dry	35-45	LVD-800-1VS	LVD-800-3V		C
Bone meal	55-60	LVD-800-1VS	LVD-800-3V		B
Borate of lime	50-70	LVD-800-1VS	LVD-800-3V		B
Borax	50-70	LVD-800-1VS	LVD-800-3V		B
Boric acid powder	55	LVD-800-1VS	LVD-800-3V		B
Bran, oat	25	LVD-800-3V	LVD-800-3VL	3.1	BF
Bran, wheat	15-20	LVD-800-3V	LVD-800-3VL	8	B
Brewers grain	27	LVD-800-3V	LVD-800-3VL	6	B
Brewers grits	33	LVD-800-3V	LVD-800-3V	6.4	B
Bromine		n/a	n/a	3.1	G
Bronze chips	30-50	LVD-800-1VS	LVD-800-3V		C
Buckwheat	34-42	LVD-800-3V	LVD-800-3V		A
Buckwheat flour	40	LVD-800-1VS	LVD-800-3V	3.7	C
Butane		n/a	n/a	1.4	G
Butter	54	n/a	n/a		
Buttermilk powder	25-30	LVD-800-3V	LVD-800-3VL	1.7	BE
Butyl chloride		n/a	n/a	10	L
Cake mix	30-40	LVD-800-1VS	LVD-800-3V	3.2	B
Calcium carbide	75	LVD-800-1V	LVD-800-4V		B
Calcium carbonate	75	LVD-800-1V	LVD-800-4V	9.1	C
Calcium fluoride		n/a	n/a	7.4	G
Calcium oxide	27	LVD-800-3V	LVD-800-3VL	11.8	C
Carbide powder	100	LVD-800-1V	LVD-800-4V	6	B
Carbon black powder	4-25	LVD-800-3V	LVD-800-3VL	1.4-6	CE
Carbon black, pellet	20-45	LVD-800-1VS	LVD-800-3V	15-25	B
Carbon dioxide	0	n/a	n/a	1.6	G
Carbon disulfide	0	n/a	n/a	2.6	G
Carbon tetrachloride		n/a	n/a	2.2	L
Carbon, granulated, activated	50-60	LVD-800-1VS	LVD-800-3V	15	AE
Carbon, graphite	40	LVD-800-1VS	LVD-800-3V	12	BE
Casein powder	35-40	LVD-800-1VS	LVD-800-3V	6	BH
Cashew nuts	32-37	LVD-800-1VS	LVD-800-3V	2.2	B
Caster beans	36	LVD-800-1VS	LVD-800-3V		A
Cat food	20-25	LVD-800-3V	LVD-800-3V	4	BF
Cellophane, flocking	5	LVD-800-3VL	LVD-800-3VL	1.4	CF
Cellulose acetate	10	LVD-800-3VL	LVD-800-3VL	3.3	CF
Cellulose, flocking	1.5-3	n/a	n/a	1.4	CF
Cement powder, portland	85-95	LVD-800-1VS	LVD-800-3V	1.5	BE
Cement, clinker	75-90	LVD-800-1V	LVD-800-2V*		CF
Cereal flake	12	LVD-800-3VL	LVD-800-3VL	3	BF
Chalk, fine	70-75	LVD-800-1V	LVD-800-3V		C

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Chalk, lump	85-90	LVD-800-1V	LVD-800-4V		C
Charcoal	15-30	LVD-800-1VT	LVD-800-3V	1.5	C
Chlorine	0	n/a	n/a	2	G
Chloroform	0	n/a	n/a	5.5	G
Chromium ore	135	LVD-800-1V	LVD-800-2V*	7.7	B
Cinders, coal	40-50	LVD-800-1V	LVD-800-3V		C
Citric acid	55	LVD-800-1V	LVD-800-3V		B
Clay, attapulugus	55	LVD-800-1V	LVD-800-3V	2.5	B
Clay, ball	25	LVD-800-3VL		3	B
Clay, bentonite	51	LVD-800-1V	LVD-800-3V	2.3	BE
Clay, calcined	80	LVD-800-1V	LVD-800-4V	2.2	BE
Clay, dicalite	20-50	LVD-800-3V	LVD-800-3VL	2.5	BE
Clay, kaoline	20-60	LVD-800-3V	LVD-800-3VL	3	BE
Clay, sno-brite	15-50	LVD-800-3V	LVD-800-3VL	3	BE
Clay, whitex	15-50	LVD-800-3V	LVD-800-3VL	3	BE
Clinker, cement	80	LVD-800-1V	LVD-800-2V*		BD
Clinker, coal	80-90	LVD-800-1V	LVD-800-4V		BD
Coal, ground	40	LVD-800-1VS	LVD-800-3V	4	B
Coal, lump	45-55	LVD-800-4V	LVD-800-4V		CF
Coconut, shredded	20-22	LVD-800-1VS	LVD-800-3V	2	CF
Coffee bean, green	32-45	LVD-800-1VS	LVD-800-3VL	3.5	B
Coffee bean, roasted	22-30	LVD-800-1VS	LVD-800-3VL	1.9	A
Coffee, ground	20	LVD-800-1VS	LVD-800-3VL	1.9	B
Coke, calcined, petrol	35-45	LVD-800-1VS	LVD-800-3VL	1.5	B
Copper ore	135	LVD-800-1VS	LVD-800-3VL		BD
Copper oxide	190	LVD-800-1V	LVD-800-2V*	18.1	C
Cork, ground	5-15	LVD-800-3VL	LVD-800-3VL	1.5	CF
Corn bran	13	LVD-800-3V	LVD-800-3VL	6	BF
Corn cob, ground	35	LVD-800-1VS	LVD-800-3V	2.3	BF
Corn, cracked	35-40	LVD-800-1VS	LVD-800-3V	7.7	B
Corn, flaked	6	LVD-800-3V	LVD-800-3VL	1.8	BF
Corn, gern	21	LVD-800-3V	LVD-800-3VL	5	B
Corn, gluten	26-33	LVD-800-1VS	LVD-800-3V	2.5	B
Corn, grits	40-45	LVD-800-1VS	LVD-800-3V	6.4	A
Corn, ground	30-35	LVD-800-1VS	LVD-800-3V	6	B
Corn, meal	32-40	LVD-800-1VS	LVD-800-3V	7	B
Corn, starch	25-35	LVD-800-1VS	LVD-800-3V	3.4	B
Corn, sugar, liquid	88	n/a	n/a	115	L
Corn, sugar, powder	31	LVD-800-1VS	LVD-800-3V	2.1	BH
Corn, whole kernel	45	LVD-800-1VS	LVD-800-3V	5	A
Cotton blossoms	15-25	n/a	n/a	1.4	CF
Cottonseed	22-40	LVD-800-1VS	LVD-800-3VL	1.4	B
Cottonseed hulls	12	LVD-800-3V	LVD-800-3VL		CF

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Cottonseed meats	40	LVD-800-1VS	LVD-800-3V		B
Cottonseed oil	58	n/a	n/a	3.1	L
Cottonseed, meal	35-40	LVD-800-1VS	LVD-800-3V		B
Cream powder	38	LVD-800-1VS	LVD-800-3V	2	BE
Creosote		n/a	n/a	2	L
Cresol		n/a	n/a	5	L
Cullett, glass	120	LVD-800-1V	LVD-800-2V*	3.7	BF
Dextrin	50-55	LVD-800-1VS	LVD-800-3V	2.2	CF
Dextrose	31	LVD-800-1VS	LVD-800-3V	3.1	CH
Diatomaceous earth	11-14	LVD-800-3VL	LVD-800-3VL	2.5	BE
Dicalcium phosphate	43	LVD-800-1VS	LVD-800-3V		C
Diesel fuel	52	n/a	n/a	1.8	L
Dirt, dry	65-80	LVD-800-1VS	LVD-800-4V	25-85	B
Distillers grain	30	LVD-800-1VS	LVD-800-3V	6	B
Dog food, IAMS minichunk	26	LVD-800-1VS	LVD-800-3V	4.5	A
Dolomite, lump	88-99	LVD-800-1V	LVD-800-4V		BF
Dolomite, powdered	45	LVD-800-1VS	LVD-800-3V	8	B
Down, goose	1	n/a	n/a	1.2	CF
Ebonite, crushed	65-70	LVD-800-1V	LVD-800-4V	2.5	B
Emery, crushed	95	LVD-800-1V	LVD-800-4V	16.5	B
Epsom salt	40-50	LVD-800-1VS	LVD-800-3V		B
Ethanol	56	n/a	n/a	24.3	L
Ethyl ether	44	n/a	n/a	4.7	L
Ethyl iodine		n/a	n/a	7.8	L
Ethylene glycol	70	n/a	n/a	37	L
Expancel microsphere	0.8	n/a	n/a	1.1	AE
Farina	44	LVD-800-1VS	LVD-800-3V	6.7	A
Feathers, goose	1	n/a	n/a	1.2	CF
Feed pellets, animal	32-38	LVD-800-1VS	LVD-800-3V	4-7	B
Feldspar, ground	65-70	LVD-800-1V	LVD-800-4V		B
Ferrous sulphate	50-75	LVD-800-1V	LVD-800-3V	14.2	B
Fertilizer, phosphate	60	LVD-800-2V	LVD-800-3V	14	B
Fish meal	25-40	LVD-800-1VS	LVD-800-3V	8	B
Flax seed	40-45	LVD-800-1VS	LVD-800-3V	18	A
Flour, barley	25-30	LVD-800-3V	LVD-800-3V	15	B
Flour, corn	30-34	LVD-800-3V	LVD-800-3V	2.5	B
Flour, patent	20	LVD-800-3V	LVD-800-3VL	2.5	B
Flour, wheat	30-35	LVD-800-3V	LVD-800-3V	5.0	B
Flourospar	90	LVD-800-1V	LVD-800-4V	6.8	B
Fluff, poly-fim floc	1.5-2	n/a	n/a	1.4	CF
Fly ash	35-45	LVD-800-1VS	LVD-800-3V	1.5	B
Freon		n/a	n/a	2.4-3.1	L
Froot loops, kellogs	8	LVD-800-3VL	LVD-800-3VL	1.6	A

MATERIAL	DENSITY lbs/ft³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Fullers earth	35-45	LVD-800-1VS	LVD-800-3V	3	B
Gasoline	45	n/a	n/a	2	L
Gelatine, granulated	32	LVD-800-1VS	LVD-800-3V		B
Gilsonite	37	LVD-800-1VS	LVD-800-3V		B
Glass bead	120	LVD-800-1V	LVD-800-4V	3.1	A
Glass cullett crushed	120	LVD-800-1V	LVD-800-2V*	3.7	B
Gluten, wheat	30-35	LVD-800-1VS	LVD-800-3V	2.7	B
Glycerine	78	n/a	n/a	47	L
Golf tees	15	LVD-800-3V	LVD-800-3V	1.8	BF
Graphite, ground	25-30	LVD-800-1VS	LVD-800-3VL	12	B
Grass seed	10-35	LVD-800-3V	LVD-800-3VL	3	=
Gravel	75-85	LVD-800-1V	LVD-800-2V*	18	B
Grits, corn	40-45	LVD-800-1VS	LVD-800-3V	6.4	B
Grits, rice	42-45	LVD-800-1VS	LVD-800-3V	5	B
Gun powder	50	LVD-800-1VS	LVD-800-3V	88	A
Gypsum, lump	90-100	LVD-800-1V	LVD-800-2V*	1.8	B
Gypsum, powder	60-80	LVD-800-1V	LVD-800-4V	2.5	C
Hay	5-24	LVD-800-3V	LVD-800-3V	2	CF
HDPE, poethylene	35-40	LVD-800-1VS	LVD-800-3V	1.6	B
Helium	0	n/a	n/a	1	L
Heptane	0	n/a	n/a	1.9	L
Hexane	0	n/a	n/a	1.9	L
Hominey	37-50	LVD-800-1VS	LVD-800-3V	6.4	B
Hops	35	LVD-800-1VS	LVD-800-3V	7	BF
Hops, spent dry	35	LVD-800-1VS	LVD-800-3V	5	BF
Hydrochloric acid	75	n/a	n/a	4	LM
Hydrogen bromide	0	n/a	n/a	3.8	L
Hydrogen cyanide	0	n/a	n/a	95	L
Hydrogen flouride	0	n/a	n/a	84	G
Hydrogen iodide	0	n/a	n/a	2.9	L
Hydrogen peroxide	0	n/a	n/a	84	L
Hydrogen sulfide	0	n/a	n/a	5.8	L
Ice, crushed	55	LVD-800-4V	LVD-800-4V	16	B
Illmenite, ground	120	LVD-800-1V	LVD-800-4V	6	C
Iodine		n/a	n/a	11	L
Iron chips	165	LVD-800-1V	LVD-800-2V*		C
Iron ore	150	LVD-800-1V	LVD-800-2V*		B
Iron oxide	180	LVD-800-1V	LVD-800-4V	14.2	C
Isobutyl alcohol		n/a	n/a	19	L
Isopropyl alcohol		n/a	n/a	18.3	L
Jet fuel, jp4	51	n/a	n/a	1.7	L
Kafir	40-45	LVD-800-1VS	LVD-800-3V	6.2	B
Kalsomine, powder	32	LVD-800-3V	LVD-800-3VL		B

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Kaoline, crushed	20-22	LVD-800-3V	LVD-800-3VL	3	B
Kerosene	51	n/a	n/a	2.8	L
Lactose	32	LVD-800-3V	LVD-800-3VL	2.9	B
LDPE, polyethylene	35	LVD-800-1VS	LVD-800-3V	1.8	B
Lead oxide	30-150	LVD-800-1V	LVD-800-4V	25.9	B
Lignite	40-55	LVD-800-1VS	LVD-800-3V		B
Lima beans dry	45	LVD-800-1VS	LVD-800-3V	7	A
Lime, hydrated	25-30	LVD-800-1VS	LVD-800-3V	4.8	C
Lime, pebble	55-65	LVD-800-1VS	LVD-800-3V	12	B
Lime, quicklime	25-30	LVD-800-1VS	LVD-800-3V	4.8	C
Lime, slaked	32	LVD-800-1VS	LVD-800-3V	2.0	C
Limestone, crushed	85-95	LVD-800-1V	LVD-800-2V*	20	B
Limestone, dust	68	LVD-800-1V	LVD-800-4V	20	C
Linseed oil	58	n/a	n/a	3.2	L
Linseed, kernel	25	LVD-800-1VS	LVD-800-3V	14	A
Maize, kernel	45	LVD-800-1VS	LVD-800-3V	6.2	A
Malt sugar	30-35	LVD-800-1VS	LVD-800-3V	3.6	B
Malt, dry, whole	30-35	LVD-800-1VS	LVD-800-3V	6	B
Malt, ground, dry	20	LVD-800-3V	LVD-800-3VL	7	CF
Malt, spent, damp	55-65	LVD-800-1VS	LVD-800-3V	25-50	BF
Malt, spent, dry	10	LVD-800-3VL	LVD-800-3VL	4	BF
Maltodextrin powder	35	LVD-800-1VS	LVD-800-3V	3.4	AEH
Maple syrup	85	n/a	n/a	90	L
Marble, crushed	85-95	LVD-800-1V	LVD-800-2V*	5.8	B
Margarine		n/a	n/a	2.8	L
Menthol	49	n/a	n/a	3.9	L
Metal dust	50-120	LVD-800-1VS	LVD-800-3V	5-18	B
Methanol	49	n/a	n/a	33.6	L
Methyl alcohol	49	n/a	n/a	33	L
Mica	13-30	LVD-800-3V	LVD-800-3VL	2.6	B
Milk powder	15-20	LVD-800-3V	LVD-800-3VL	1.7	CH
Milk sugar	32	LVD-800-1VS	LVD-800-3V	2.9	BH
Miller, ground	35	LVD-800-1VS	LVD-800-3V	4.9	B
Millet seed	48	LVD-800-1VS	LVD-800-3V	6.2	A
Mineral oil	57	n/a	n/a	2.1	L
Mineral spirits	49	n/a	n/a	3.7	L
Molybdenum, floc	10-12	LVD-800-3VL	LVD-800-3VL	1.8	CF
Monosodium phosphate	50	LVD-800-1VS	LVD-800-3V		C
Muriate of potash	77	LVD-800-1V	LVD-800-4V		C
Mustard seed	45	LVD-800-1VS	LVD-800-3V	7	A
Naphthalene	56	n/a	n/a	2.5	L
Naphthalene flakes	45	LVD-800-1VS	LVD-800-3V	2.5	CF
Navy beans, dry	48	LVD-800-1VS	LVD-800-3V	7.7	A

MATERIAL	DENSITY lbs/ft³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Neoprene		LVD-800-3V	LVD-800-3V	6	B
Nitrate of soda	68	LVD-800-1VS	LVD-800-3V		A
Nitric acid	94	n/a	n/a		LM
Nitrobenzene		n/a	n/a	26	L
Nitrocellulose	25	LVD-800-3VL	LVD-800-3VL	6.2	CF
Nitroethane		n/a	n/a	19.7	L
Nitroglycerin		n/a	n/a	19	L
Nitromethane		n/a	n/a	22.7	L
Nitrotoluene		n/a	n/a	25	L
Nitrox oxide	0	n/a	n/a	1.6	G
Nylon	35-45	LVD-800-1VS	LVD-800-3V	4	B
Oat flour	30-35	LVD-800-1VS	LVD-800-3V	2.9	B
Oat hulls	8-12	LVD-800-3VL	LVD-800-3VL	1.5	BF
Oat meal	35-40	LVD-800-1VS	LVD-800-3V	4.3	B
Oat middlings	35-45	LVD-800-1VS	LVD-800-3V	4	B
Oats	25-35	LVD-800-3V	LVD-800-3V	5.8	A
Oats, bran	25	LVD-800-3V	LVD-800-3VL	3	BF
Oats, ground	25-30	LVD-800-3V	LVD-800-3V	3.6	B
Oats, rolled	24	LVD-800-3V	LVD-800-3VL	7	BF
Octane	45	n/a	n/a	2	L
Octyl alcohol		n/a	n/a	3.4	L
Oil, almond		n/a	n/a	2.8	L
Oil, cottonseed		n/a	n/a	3.1	L
Oil, grapeseed		n/a	n/a	2.9	L
Oil, lemon		n/a	n/a	2.3	L
Oil, linseed	58	n/a	n/a	3.4	L
Oil, olive	57	n/a	n/a	3.1	L
Oil, parafin		n/a	n/a	2.2	L
Oil, peanut		n/a	n/a	3	L
Oil, petroleum, crude	53	n/a	n/a	2.1	L
Oil, pyranol		n/a	n/a	5.3	L
Oil, sesame		n/a	n/a	3	L
Oil, sperm whale	57	n/a	n/a	3.2	L
Oil, transformer	55	n/a	n/a	2.2	L
Oil, turpentine	54	n/a	n/a	2.2	L
Oxalic acid, crystals	60	LVD-800-1V	LVD-800-4V		C
Oyster shells, ground	53	LVD-800-1VS	LVD-800-4V		B
Paint, oil base		n/a	n/a	5-8	L
Paper, shreaded	5-12	LVD-800-1VT	LVD-800-1VT	2	CF
Paraffin wax	45	LVD-800-1VS	LVD-800-3V	2.1	CF
Parafin oil		n/a	n/a	2.2	L
PC, polycarbonate	34-36	LVD-800-1VS	LVD-800-3V	2.9	B
Peanut shell refuse	4	LVD-800-3V	LVD-800-3VL	1.2	CF

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Peanuts, shelled	35-45	LVD-800-1VS	LVD-800-3V	2	B
Peanuts, unshelled	15-24	LVD-800-1VS	LVD-800-3V	1.5	B
Peas, dry	45-50	LVD-800-1VS	LVD-800-3V	9.8	A
Peat	25-50	LVD-800-1VS	LVD-800-4V	80	CF
Pentane	0	n/a	n/a	1.8	G
Perlite, expanded	3	LVD-800-3VL	LVD-800-3VL	1.3	C
Petroleum oil	51	n/a	n/a	2.1	L
Phosphate rock, crushed	60-80	LVD-800-1V	LVD-800-4V		C
Phosphate sand	90-100	LVD-800-1V	LVD-800-4V		B
Plaster of Paris	50-55	LVD-800-1VS	LVD-800-3V	2.5	C
Plastic pellet	34-48	LVD-800-1VS	LVD-800-3V	1-3	B
Ployethylene, pellet	34-36	LVD-800-1VS	LVD-800-3V	1.5	A
Ployvinyl chloride, powder	30	LVD-800-1VS	LVD-800-3V	1.4	B
Polycarbonate		LVD-800-1VS	LVD-800-3V	2.9	B
Polyester resin		LVD-800-1VS	LVD-800-3V	2.8	B
Polyethylene pellet	35-37	LVD-800-1VS	LVD-800-3V	1.6	A
Polypropylene powder	25	LVD-800-3V	LVD-800-3VL	2.2	B
Polypropylene, pellet	34-36	LVD-800-1VS	LVD-800-3V	1.5-1.8	A
Polystyrene, expanded beads	1.5	n/a	n/a	2.2	BF
Polystyrene, pellet	40	LVD-800-1VS	LVD-800-3V	2.2	A
Polyvinyl alcohol		n/a	n/a	1.5	L
Polyvinyl chloride, pellet	48-52	LVD-800-1VS	LVD-800-3V	1.8	A
Popcorn, popped	2-3	LVD-800-3VL	LVD-800-3VL	1.2	BF
Popcorn, shelled	45-50	LVD-800-1VS	LVD-800-3V	10.4	A
Potash	50-60	LVD-800-1VS	LVD-800-3V	5.6	B
Potassium chloride	2-3	LVD-800-3VL	LVD-800-3VL	1.2	B
Potassium carbonate	45-50	LVD-800-1VS	LVD-800-3V	10.45.6	B
Potassium chloride	75	LVD-800-1VS	LVD-800-3V	5	B
Potassium nitrate	76	LVD-800-1VS	LVD-800-3V	5	B
Potassium sulphate	42-48	LVD-800-1VS	LVD-800-3V	5.9	C
Potato flake	12	LVD-800-3VL	LVD-800-3VL	2.1	BF
Potato starch	40	LVD-800-1VS	LVD-800-3V	3.4	CH
Propane, liquid		n/a	n/a	1.6	L
Pumice	40-45	LVD-800-1VS	LVD-800-3V	3.4	C
PVC polyvinyl chloride	48-52	LVD-800-1VS	LVD-800-3V	1.8	A
Quartz, sand	80-100	LVD-800-1V	LVD-800-4V	4.3	B
Rape seed	45-50	LVD-800-1VS	LVD-800-3V		B
Rice	45-50	LVD-800-1VS	LVD-800-3V	3	A
Rice bran	20	LVD-800-3V	LVD-800-3VL	1.4	B
Rice flour	30	LVD-800-1VS	LVD-800-3V	3.2	B
Rice grits	42-45	LVD-800-1VS	LVD-800-3V		B
Rubber, ground	25-50	LVD-800-3V	LVD-800-3V	2.1	C
Rye	44	LVD-800-1VS	LVD-800-3V		A

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Rye, flour	30	LVD-800-1VS	LVD-800-3V	3.2	B
Salt, coarse crushed	45-55	LVD-800-1VS	LVD-800-3V	2.8	A
Salt, granulated	70-80	LVD-800-1VS	LVD-800-3V	5.9	A
Saltpeter	75	LVD-800-1VS	LVD-800-3V		A
Sand, damp	100	LVD-800-1V	LVD-800-4V	8-18	C
Sand, dry	80-100	LVD-800-1V	LVD-800-4V	2.8	A
Sand, silica	95	LVD-800-1V	LVD-800-4V	2.5	A
Sandstone, crushed	80-95	LVD-800-1V	LVD-800-4V	9	B
Sawdust	4-12	LVD-800-3VL	LVD-800-3VL	1.2	CF
Sea water	64	n/a	n/a	88	L
Semolina	35-40	LVD-800-1VS	LVD-800-3V	6	B
Sesame seed	27-37	LVD-800-3V	LVD-800-3V	1.2	B
Shellac powder	30-35	LVD-800-1VS	LVD-800-3V	2	B
Silica flour	35-40	LVD-800-1VS	LVD-800-3V	6	B
Silica gel	30-45	LVD-800-1VS	LVD-800-3V	8	A
Silica sand	95	LVD-800-1V	LVD-800-4V	2.5	A
Silicone oil		n/a	n/a	2.2	L
Silver chloride		n/a	n/a	11.2	L
Slag, furnace	60	LVD-800-1VS	LVD-800-3V		B
Slakes lime	32	LVD-800-3V	LVD-800-3V	2.0	C
Slate, crushed	80-90	LVD-800-1V	LVD-800-4V	6	B
Soap powder	20-25	LVD-800-3V	LVD-800-3VL	1.4	B
Soda ash	30-45	LVD-800-1VS	LVD-800-3V		B
Sodium bicarbonate	41	LVD-800-1VS	LVD-800-3V	5.7	B
Sodium chloride	70	LVD-800-1V	LVD-800-4V	6.1	A
Sodium hydroxide, flake	47	LVD-800-1VS	LVD-800-3V		CF
Sodium nitrate	68-80	LVD-800-1V	LVD-800-4V	5.2	A
Sodium sulphate	80	LVD-800-1V	LVD-800-4V	5	B
Sorghum seed	42-50	LVD-800-1VS	LVD-800-3V	6.2	B
Soybean flour	27-35	LVD-800-1VS	LVD-800-3V	3.5	B
Soybean hulls	6	LVD-800-3VL	LVD-800-3VL	1.8	BF
Soybean meal	36-50	LVD-800-1VS	LVD-800-3V	6.5	B
Soybean, flakes	18-25	LVD-800-3V	LVD-800-3V	1.8	B
Soybean, whole	47	LVD-800-1VS	LVD-800-3V	8	A
Soybean, cracked	35	LVD-800-1VS	LVD-800-3V	6.5	B
Spelt flour	25-30	LVD-800-1VS	LVD-800-3V	5.6	C
Starch powder	25-35	LVD-800-1VS	LVD-800-3V	3	C
Steel, chips	150	LVD-800-4V	LVD-800-4V		B
Sucrose	43	LVD-800-1VS	LVD-800-3V	3.3	C
Sugar, brown	45	LVD-800-1VS	LVD-800-3V	2.3	C
Sugar, dextrose, powder	50	LVD-800-1VS	LVD-800-3V	2.1	B
Sugar, granulated	53	LVD-800-1VS	LVD-800-3V	1.5	A
Sugar, milk	32	LVD-800-1VS	LVD-800-3V	2.9	B

MATERIAL	DENSITY lbs/ft ³	LOW LEVEL PADDLE	HIGH LEVEL PADDLE	DIELECTRIC CONSTANT	SPECIAL PROPERTIES
Sugar, powdered	50-60	LVD-800-1VS	LVD-800-3V	2.0	C
Sugar, raw	55-65	LVD-800-1VS	LVD-800-3V	3	B
Sulfuric acid	112	n/a	n/a	88	L
Sulphur dioxide	0	n/a	n/a	17.6	G
Sulphur, crushed	55-70	LVD-800-1VS	LVD-800-3V	3.5	B
Sunflower seed	36	LVD-800-1VS	LVD-800-3V	4.1	A
Talcum powder	46-62	LVD-800-1VS	LVD-800-3V		B
Tar	72	n/a	n/a	1.8	L
Tea leaves	12	LVD-800-3VL	LVD-800-3VL		BF
Teflon, flake		LVD-800-3VL	LVD-800-3VL	2	CF
Terephalic acid powder	45	LVD-800-1VS	LVD-800-3V	1.5	B
Timothy seed	36	LVD-800-1VS	LVD-800-3V	5	A
Tin oxide	100	LVD-800-1V	LVD-800-2V		B
Titanium dioxide	40-50	LVD-800-1VS	LVD-800-3V	14	B
Tobacco, flake	2-5	LVD-800-3VL	LVD-800-3VL	1.7	CF
Toulene	54	n/a	n/a	2.4	L
Transmission oil	54	n/a	n/a	2.2	L
Trisodium phosphate	50-60	LVD-800-1VS	LVD-800-3V		BM
Urea, prill	34-42	LVD-800-1VS	LVD-800-3V	3.5	BM
Urethane		n/a	n/a	3.2	L
Vaseline		n/a	n/a	2.2	L
Vermiculite ore	80	LVD-800-1V	LVD-800-2V		B
Vermiculite, expanded	17	LVD-800-3VL	LVD-800-3VL		CF
Walnut meats	25	LVD-800-1VS	LVD-800-3V	2.6	BF
Walnut shells, ground	40-45	LVD-800-1VS	LVD-800-3V	3.7	B
Water	62	n/a	n/a	45-120	L
Wax	15-20	n/a	n/a	7.9	L
Wheat bran	12	LVD-800-3V	LVD-800-3VL	5.8	BF
Wheat gluten	30-35	LVD-800-1VS	LVD-800-3V	2.7	C
Wheat, craked	35-45	LVD-800-1VS	LVD-800-3V	5.2	B
Wheat, flaked	7-10	LVD-800-3V	LVD-800-3VL	1.5	BF
Wheat, flour	30-35	LVD-800-1VS	LVD-800-3V	5	B
Wheat, ground	40	LVD-800-1VS	LVD-800-3V	4.9	B
Wheat, whole kernel	45-55	LVD-800-1VS	LVD-800-3V	7	A
Whey powder	35-46	LVD-800-1VS	LVD-800-3V	1.7	CH
Wood chips	20-30	LVD-800-1VT	LVD-800-3V	1.7	CF
Wood flour	15-25	LVD-800-3V	LVD-800-3VL		C
Wood shavings	3-10	LVD-800-1VT	LVD-800-1VT	1.5-2.0	CF
Xanthum gum	48	LVD-800-1VS	LVD-800-3V	6	B
Zinc ore	125	LVD-800-1V	LVD-800-4V		B
Zinc oxide	10-30	LVD-800-3V	LVD-800-3V	1.7	C
Zinc, calcined, crushed	70-90	LVD-800-1V	LVD-800-4V		B

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