

# 115A

## 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. Monitor TrueCap® 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 Monitor 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 a Monitor 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

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
ABS resin, pellet	45	1-4193	1-4146	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	1-4141	1-4146	2.7	B
Adipic acid, powder	45	1-4193	1-4146		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	1-4141	1-4141	3	CEF
Almonds, shelled	30-35	1-4193	1-4141	9	B
Alum powder	50	1-4145	1-4146		B
Alumina	60	1-4193	1-4146	9-11	B
Aluminum hydrate	18	1-4141	1-4141		C
Aluminum oxide	60-100	1-4145	1-4156	6.5	A
Aluminum silicate	35-45	1-4193	1-4146	3	B
Aluminum, powder	45-80	1-4145	1-4146	1.6	B
Aluminum, shavings	7-15	1-4144	1-4144	120	CF
Ammonia	0	n/a	n/a	25	G
Ammonium nitrate, prill	45-60	1-4193	1-4146	14	B
Ammonium sulphate	40-58	1-4193	1-4146		B
Apple seed	32	1-4146	1-4146	7	A
Asbestos fibers	20-25	1-4144	1-4144	3	CF
Ash, coal, damp	45-50	1-4193	1-4146	25-80	CF
Ash, coal, dry	35-45	1-4193	1-4146	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
Bakelite, powder	30-40	1-4193	1-4146	3.5	C
Baking powder	40-45	1-4193	1-4146	3.6	B
Baking soda	70-80	1-4193	1-4146	5.7	B
Ball clay	25	1-4193	1-4146	3	BE
Bark, wood refuse	10-20	1-4144	1-4144	3-15	CF
Barley, flour	25-30	1-4193	1-4146	2.9	B
Barley, ground	25-30	1-4193	1-4146	4	B
Barley, kernal	35-40	1-4193	1-4146	6.6	A
Barley, malted	31	1-4193	1-4146	7	B
Bauxite, crushed	75-85	1-4145	1-4156		B
Beans, caster	36	1-4193	1-4146	6	A
Beans, coffee	22-40	1-4193	1-4146	1.9	A
Beans, lima	45	1-4193	1-4146	7	A
Beans, navy	48	1-4193	1-4146	7.7	A
Beans, soy	45-47	1-4193	1-4146	8.1	AD
Bentonite, lump	25-40	1-4156	1-4146		C
Bentonite, powder	50-60	1-4145	1-4146	2.5	C

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Bicarbonate of soda	41	1-4193	1-4146	5.7	A
Biphenyl		n/a	n/a	20	L
Blood, dry	35-45	1-4193	1-4146		C
Bone meal	55-60	1-4193	1-4146		B
Borate of lime	50-70	1-4193	1-4146		B
Borax	50-70	1-4193	1-4146		B
Boric acid powder	55	1-4193	1-4146		B
Bran, oat	25	1-4146	1-4141	3.1	BF
Bran, wheat	15-20	1-4146	1-4141	8	B
Brewers grain	27	1-4146	1-4141	6	B
Brewers grits	33	1-4146	1-4146	6.4	B
Bromine		n/a	n/a	3.1	G
Bronze chips	30-50	1-4193	1-4146		C
Buckwheat	34-42	1-4146	1-4146		A
Buckwheat flour	40	1-4193	1-4146	3.7	C
Butane		n/a	n/a	1.4	G
Butter	54	n/a	n/a		
Buttermilk powder	25-30	1-4146	1-4141	1.7	BE
Butyl chloride		n/a	n/a	10	L
Cake mix	30-40	1-4193	1-4146	3.2	B
Calcium carbide	75	1-4145	1-4156		B
Calcium carbonate	75	1-4145	1-4156	9.1	C
Calcium fluoride		n/a	n/a	7.4	G
Calcium oxide	27	1-4146	1-4141	11.8	C
Carbide powder	100	1-4145	1-4156	6	B
Carbon black powder	4-25	1-4146	1-4141	1.4-6	CE
Carbon black, pellet	20-45	1-4193	1-4146	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	1-4193	1-4146	15	AE
Carbon, graphite	40	1-4193	1-4146	12	BE
Casein powder	35-40	1-4193	1-4146	6	BH
Cashew nuts	32-37	1-4193	1-4146	2.2	B
Caster beans	36	1-4193	1-4146		A
Cat food	20-25	1-4146	1-4146	4	BF
Cellophane, flocking	5	1-4141	1-4141	1.4	CF
Cellulose acetate	10	1-4141	1-4141	3.3	CF
Cellulose, flocking	1.5-3	n/a	n/a	1.4	CF
Cement powder, portland	85-95	1-4193	1-4146	1.5	BE
Cement, clinker	75-90	1-4145	1-4135*		CF
Cereal flake	12	1-4141	1-4141	3	BF
Chalk, fine	70-75	1-4145	1-4146		C

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Chalk, lump	85-90	1-4145	1-4156		C
Charcoal	15-30	1-4144	1-4146	1.5	C
Chlorine	0	n/a	n/a	2	G
Chloroform	0	n/a	n/a	5.5	G
Chromium ore	135	1-4145	1-4135*	7.7	B
Cinders, coal	40-50	1-4145	1-4146		C
Citric acid	55	1-4145	1-4146		B
Clay, attapulugus	55	1-4145	1-4146	2.5	B
Clay, ball	25	1-4141		3	B
Clay, bentonite	51	1-4145	1-4146	2.3	BE
Clay, calcined	80	1-4145	1-4156	2.2	BE
Clay, dicalite	20-50	1-4146	1-4141	2.5	BE
Clay, kaoline	20-60	1-4146	1-4141	3	BE
Clay, sno-brite	15-50	1-4146	1-4141	3	BE
Clay, whitex	15-50	1-4146	1-4141	3	BE
Clinker, cement	80	1-4145	1-4135*		BD
Clinker, coal	80-90	1-4145	1-4156		BD
Coal, ground	40	1-4193	1-4146	4	B
Coal, lump	45-55	1-4156	1-4156		CF
Coconut, shredded	20-22	1-4193	1-4146	2	CF
Coffee bean, green	32-45	1-4193	1-4141	3.5	B
Coffee bean, roasted	22-30	1-4193	1-4141	1.9	A
Coffee, ground	20	1-4193	1-4141	1.9	B
Coke, calcined, petrol	35-45	1-4193	1-4141	1.5	B
Copper ore	135	1-4193	1-4141		BD
Copper oxide	190	1-4145	1-4135*	18.1	C
Cork, ground	5-15	1-4141	1-4141	1.5	CF
Corn bran	13	1-4146	1-4141	6	BF
Corn cob, ground	35	1-4193	1-4146	2.3	BF
Corn, cracked	35-40	1-4193	1-4146	7.7	B
Corn, flaked	6	1-4146	1-4141	1.8	BF
Corn, gern	21	1-4146	1-4141	5	B
Corn, gluten	26-33	1-4193	1-4146	2.5	B
Corn, grits	40-45	1-4193	1-4146	6.4	A
Corn, ground	30-35	1-4193	1-4146	6	B
Corn, meal	32-40	1-4193	1-4146	7	B
Corn, starch	25-35	1-4193	1-4146	3.4	B
Corn, sugar, liquid	88	n/a	n/a	115	L
Corn, sugar, powder	31	1-4193	1-4146	2.1	BH
Corn, whole kernel	45	1-4193	1-4146	5	A
Cotton blossoms	15-25	n/a	n/a	1.4	CF
Cottonseed	22-40	1-4193	1-4141	1.4	B
Cottonseed hulls	12	1-4146	1-4141		CF

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Cottonseed meats	40	1-4193	1-4146		B
Cottonseed oil	58	n/a	n/a	3.1	L
Cottonseed, meal	35-40	1-4193	1-4146		B
Cream powder	38	1-4193	1-4146	2	BE
Creosote		n/a	n/a	2	L
Cresol		n/a	n/a	5	L
Cullett, glass	120	1-4145	1-4135*	3.7	BF
Dextrin	50-55	1-4193	1-4146	2.2	CF
Dextrose	31	1-4193	1-4146	3.1	CH
Diatomaceous earth	11-14	1-4141	1-4141	2.5	BE
Dicalcium phosphate	43	1-4193	1-4146		C
Diesel fuel	52	n/a	n/a	1.8	L
Dirt, dry	65-80	1-4193	1-4156	25-85	B
Distillars grain	30	1-4193	1-4146	6	B
Dog food, IAMS minichunk	26	1-4193	1-4146	4.5	A
Dolomite, lump	88-99	1-4145	1-4156		BF
Dolomite, powdered	45	1-4193	1-4146	8	B
Down, goose	1	n/a	n/a	1.2	CF
Ebonite, crushed	65-70	1-4145	1-4156	2.5	B
Emery, crushed	95	1-4145	1-4156	16.5	B
Epsom salt	40-50	1-4193	1-4146		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	1-4193	1-4146	6.7	A
Feathers, goose	1	n/a	n/a	1.2	CF
Feed pellets, animal	32-38	1-4193	1-4146	4-7	B
Feldspar, ground	65-70	1-4145	1-4156		B
Ferrous sulphate	50-75	1-4145	1-4146	14.2	B
Fertilizer, phosphate	60	1-4135	1-4146	14	B
Fish meal	25-40	1-4193	1-4146	8	B
Flax seed	40-45	1-4193	1-4146	18	A
Flour, barley	25-30	1-4146	1-4146	15	B
Flour, corn	30-34	1-4146	1-4146	2.5	B
Flour, patent	20	1-4146	1-4141	2.5	B
Flour, wheat	30-35	1-4146	1-4146	5.0	B
Flourospar	90	1-4145	1-4156	6.8	B
Fluff, poly-fim floc	1.5-2	n/a	n/a	1.4	CF
Fly ash	35-45	1-4193	1-4146	1.5	B
Freon		n/a	n/a	2.4-3.1	L
Froot loops, kellogs	8	1-4141	1-4141	1.6	A

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Fullers earth	35-45	1-4193	1-4146	3	B
Gasoline	45	n/a	n/a	2	L
Gelatine, granulated	32	1-4193	1-4146		B
Gilsonite	37	1-4193	1-4146		B
Glass bead	120	1-4145	1-4156	3.1	A
Glass cullett crushed	120	1-4145	1-4135*	3.7	B
Gluten, wheat	30-35	1-4193	1-4146	2.7	B
Glycerine	78	n/a	n/a	47	L
Golf tees	15	1-4146	1-4146	1.8	BF
Graphite, ground	25-30	1-4193	1-4141	12	B
Grass seed	10-35	1-4146	1-4141	3	=
Gravel	75-85	1-4145	1-4135*	18	B
Grits, corn	40-45	1-4193	1-4146	6.4	B
Grits, rice	42-45	1-4193	1-4146	5	B
Gun powder	50	1-4193	1-4146	88	A
Gypsum, lump	90-100	1-4145	1-4135*	1.8	B
Gypsum, powder	60-80	1-4145	1-4156	2.5	C
Hay	5-24	1-4146	1-4146	2	CF
HDPE, poethylene	35-40	1-4193	1-4146	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	1-4193	1-4146	6.4	B
Hops	35	1-4193	1-4146	7	BF
Hops, spent dry	35	1-4193	1-4146	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	1-4156	1-4156	16	B
Illmenite, ground	120	1-4145	1-4156	6	C
Iodine		n/a	n/a	11	L
Iron chips	165	1-4145	1-4135*		C
Iron ore	150	1-4145	1-4135*		B
Iron oxide	180	1-4145	1-4156	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	1-4193	1-4146	6.2	B
Kalsomine, powder	32	1-4146	1-4141		B

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Kaoline, crushed	20-22	1-4146	1-4141	3	B
Kerosene	51	n/a	n/a	2.8	L
Lactose	32	1-4146	1-4141	2.9	B
LDPE, polyethylene	35	1-4193	1-4146	1.8	B
Lead oxide	30-150	1-4145	1-4156	25.9	B
Lignite	40-55	1-4193	1-4146		B
Lima beans dry	45	1-4193	1-4146	7	A
Lime, hydrated	25-30	1-4193	1-4146	4.8	C
Lime, pebble	55-65	1-4193	1-4146	12	B
Lime, quicklime	25-30	1-4193	1-4146	4.8	C
Lime, slaked	32	1-4193	1-4146	2.0	C
Limestone, crushed	85-95	1-4145	1-4135*	20	B
Limestone, dust	68	1-4145	1-4156	20	C
Linseed oil	58	n/a	n/a	3.2	L
Linseed, kernel	25	1-4193	1-4146	14	A
Maize, kernel	45	1-4193	1-4146	6.2	A
Malt sugar	30-35	1-4193	1-4146	3.6	B
Malt, dry, whole	30-35	1-4193	1-4146	6	B
Malt, ground, dry	20	1-4146	1-4141	7	CF
Malt, spent, damp	55-65	1-4193	1-4146	25-50	BF
Malt, spent, dry	10	1-4141	1-4141	4	BF
Maltodextrin powder	35	1-4193	1-4146	3.4	AEH
Maple syrup	85	n/a	n/a	90	L
Marble, crushed	85-95	1-4145	1-4135*	5.8	B
Margarine		n/a	n/a	2.8	L
Menthol	49	n/a	n/a	3.9	L
Metal dust	50-120	1-4193	1-4146	5-18	B
Methanol	49	n/a	n/a	33.6	L
Methyl alcohol	49	n/a	n/a	33	L
Mica	13-30	1-4146	1-4141	2.6	B
Milk powder	15-20	1-4146	1-4141	1.7	CH
Milk sugar	32	1-4193	1-4146	2.9	BH
Miller, ground	35	1-4193	1-4146	4.9	B
Millet seed	48	1-4193	1-4146	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	1-4141	1-4141	1.8	CF
Monosodium phosphate	50	1-4193	1-4146		C
Muriate of potash	77	1-4145	1-4156		C
Mustard seed	45	1-4193	1-4146	7	A
Naphthalene	56	n/a	n/a	2.5	L
Naphthalene flakes	45	1-4193	1-4146	2.5	CF
Navy beans, dry	48	1-4193	1-4146	7.7	A



MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Neoprene		1-4146	1-4146	6	B
Nitrate of soda	68	1-4193	1-4146		A
Nitric acid	94	n/a	n/a		LM
Nitrobenzene		n/a	n/a	26	L
Nitrocellulose	25	1-4141	1-4141	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
Nitrotolune		n/a	n/a	25	L
Nitrox oxide	0	n/a	n/a	1.6	G
Nylon	35-45	1-4193	1-4146	4	B
Oat flour	30-35	1-4193	1-4146	2.9	B
Oat hulls	8-12	1-4141	1-4141	1.5	BF
Oat meal	35-40	1-4193	1-4146	4.3	B
Oat middlings	35-45	1-4193	1-4146	4	B
Oats	25-35	1-4146	1-4146	5.8	A
Oats, bran	25	1-4146	1-4141	3	BF
Oats, ground	25-30	1-4146	1-4146	3.6	B
Oats, rolled	24	1-4146	1-4141	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	1-4145	1-4156		C
Oyster shells, ground	53	1-4193	1-4156		B
Paint, oil base		n/a	n/a	5-8	L
Paper, shreaded	5-12	1-4144	1-4144	2	CF
Paraffin wax	45	1-4193	1-4146	2.1	CF
Parafin oil		n/a	n/a	2.2	L
PC, polycarbonate	34-36	1-4193	1-4146	2.9	B
Peanut shell refuse	4	1-4146	1-4141	1.2	CF

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Peanuts, shelled	35-45	1-4193	1-4146	2	B
Peanuts, unshelled	15-24	1-4193	1-4146	1.5	B
Peas, dry	45-50	1-4193	1-4146	9.8	A
Peat	25-50	1-4193	1-4156	80	CF
Pentane	0	n/a	n/a	1.8	G
Perlite, expanded	3	1-4141	1-4141	1.3	C
Petroleum oil	51	n/a	n/a	2.1	L
Phosphate rock, crushed	60-80	1-4145	1-4156		C
Phosphate sand	90-100	1-4145	1-4156		B
Plaster of Paris	50-55	1-4193	1-4146	2.5	C
Plastic pellet	34-48	1-4193	1-4146	1-3	B
Ployethylene, pellet	34-36	1-4193	1-4146	1.5	A
Ployvinyl chloride, powder	30	1-4193	1-4146	1.4	B
Polycarbonate		1-4193	1-4146	2.9	B
Polyester resin		1-4193	1-4146	2.8	B
Polyethylene pellet	35-37	1-4193	1-4146	1.6	A
Polypropylene powder	25	1-4146	1-4141	2.2	B
Polypropylene, pellet	34-36	1-4193	1-4146	1.5-1.8	A
Polystyrene, expanded beads	1.5	n/a	n/a	2.2	BF
Polystyrene, pellet	40	1-4193	1-4146	2.2	A
Polyvinyl alcohol		n/a	n/a	1.5	L
Polyvinyl chloride, pellet	48-52	1-4193	1-4146	1.8	A
Popcorn, popped	2-3	1-4141	1-4141	1.2	BF
Popcorn, shelled	45-50	1-4193	1-4146	10.4	A
Potash	50-60	1-4193	1-4146	5.6	B
Potassium chloride	2-3	1-4141	1-4141	1.2	B
Potassium carbonate	45-50	1-4193	1-4146	10.45.6	B
Potassium chloride	75	1-4193	1-4146	5	B
Potassium nitrate	76	1-4193	1-4146	5	B
Potassium sulphate	42-48	1-4193	1-4146	5.9	C
Potato flake	12	1-4141	1-4141	2.1	BF
Potato starch	40	1-4193	1-4146	3.4	CH
Propane, liquid		n/a	n/a	1.6	L
Pumice	40-45	1-4193	1-4146	3.4	C
PVC polyvinyl chloride	48-52	1-4193	1-4146	1.8	A
Quartz, sand	80-100	1-4145	1-4156	4.3	B
Rape seed	45-50	1-4193	1-4146		B
Rice	45-50	1-4193	1-4146	3	A
Rice bran	20	1-4146	1-4141	1.4	B
Rice flour	30	1-4193	1-4146	3.2	B
Rice grits	42-45	1-4193	1-4146		B
Rubber, ground	25-50	1-4146	1-4146	2.1	C
Rye	44	1-4193	1-4146		A

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Rye, flour	30	1-4193	1-4146	3.2	B
Salt, coarse crushed	45-55	1-4193	1-4146	2.8	A
Salt, granulated	70-80	1-4193	1-4146	5.9	A
Saltpeter	75	1-4193	1-4146		A
Sand, damp	100	1-4145	1-4156	8-18	C
Sand, dry	80-100	1-4145	1-4156	2.8	A
Sand, silica	95	1-4145	1-4156	2.5	A
Sandstone, crushed	80-95	1-4145	1-4156	9	B
Sawdust	4-12	1-4141	1-4141	1.2	CF
Sea water	64	n/a	n/a	88	L
Semolina	35-40	1-4193	1-4146	6	B
Sesame seed	27-37	1-4146	1-4146	1.2	B
Shellac powder	30-35	1-4193	1-4146	2	B
Silica flour	35-40	1-4193	1-4146	6	B
Silica gel	30-45	1-4193	1-4146	8	A
Silica sand	95	1-4145	1-4156	2.5	A
Silicone oil		n/a	n/a	2.2	L
Silver chloride		n/a	n/a	11.2	L
Slag, furnace	60	1-4193	1-4146		B
Slakes lime	32	1-4146	1-4146	2.0	C
Slate, crushed	80-90	1-4145	1-4156	6	B
Soap powder	20-25	1-4146	1-4141	1.4	B
Soda ash	30-45	1-4193	1-4146		B
Sodium bicarbonate	41	1-4193	1-4146	5.7	B
Sodium chloride	70	1-4145	1-4156	6.1	A
Sodium hydroxide, flake	47	1-4193	1-4146		CF
Sodium nitrate	68-80	1-4145	1-4156	5.2	A
Sodium sulphate	80	1-4145	1-4156	5	B
Sorghum seed	42-50	1-4193	1-4146	6.2	B
Soybean flour	27-35	1-4193	1-4146	3.5	B
Soybean hulls	6	1-4141	1-4141	1.8	BF
Soybean meal	36-50	1-4193	1-4146	6.5	B
Soybean, flakes	18-25	1-4146	1-4146	1.8	B
Soybean, whole	47	1-4193	1-4146	8	A
Soybean, cracked	35	1-4193	1-4146	6.5	B
Spelt flour	25-30	1-4193	1-4146	5.6	C
Starch powder	25-35	1-4193	1-4146	3	C
Steel, chips	150	1-4156	1-4156		B
Sucrose	43	1-4193	1-4146	3.3	C
Sugar, brown	45	1-4193	1-4146	2.3	C
Sugar, dextrose, powder	50	1-4193	1-4146	2.1	B
Sugar, granulated	53	1-4193	1-4146	1.5	A
Sugar, milk	32	1-4193	1-4146	2.9	B

MATERIAL	DENSITY	LOW LEVEL	HIGH LEVEL	DIELECTRIC	SPECIAL
	lbs/ft <sup>3</sup>	PADDLE	PADDLE	CONSTANT	PROPERTIES
Sugar, powdered	50-60	1-4193	1-4146	2.0	C
Sugar, raw	55-65	1-4193	1-4146	3	B
Sulfuric acid	112	n/a	n/a	88	L
Sulphor dioxide	0	n/a	n/a	17.6	G
Sulphur, crushed	55-70	1-4193	1-4146	3.5	B
Sunflower seed	36	1-4193	1-4146	4.1	A
Talcum powder	46-62	1-4193	1-4146		B
Tar	72	n/a	n/a	1.8	L
Tea leaves	12	1-4141	1-4141		BF
Teflon, flake		1-4141	1-4141	2	CF
Terephalic acid powder	45	1-4193	1-4146	1.5	B
Timothy seed	36	1-4193	1-4146	5	A
Tin oxide	100	1-4145	1-4135		B
Titanium dioxide	40-50	1-4193	1-4146	14	B
Tobacco, flake	2-5	1-4141	1-4141	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	1-4193	1-4146		BM
Urea, prill	34-42	1-4193	1-4146	3.5	BM
Urethane		n/a	n/a	3.2	L
Vaseline		n/a	n/a	2.2	L
Vermiculite ore	80	1-4145	1-4135		B
Vermiculite, expanded	17	1-4141	1-4141		CF
Walnut meats	25	1-4193	1-4146	2.6	BF
Walnut shells, ground	40-45	1-4193	1-4146	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	1-4146	1-4141	5.8	BF
Wheat gluten	30-35	1-4193	1-4146	2.7	C
Wheat, craked	35-45	1-4193	1-4146	5.2	B
Wheat, flaked	7-10	1-4146	1-4141	1.5	BF
Wheat, flour	30-35	1-4193	1-4146	5	B
Wheat, ground	40	1-4193	1-4146	4.9	B
Wheat, whole kernel	45-55	1-4193	1-4146	7	A
Whey powder	35-46	1-4193	1-4146	1.7	CH
Wood chips	20-30	1-4144	1-4146	1.7	CF
Wood flour	15-25	1-4146	1-4141		C
Wood shavings	3-10	1-4144	1-4144	1.5-2.0	CF
Xanthum gum	48	1-4193	1-4146	6	B
Zinc ore	125	1-4145	1-4156		B
Zinc oxide	10-30	1-4146	1-4146	1.7	C
Zinc, calcined, crushed	70-90	1-4145	1-4156		B