Bondable Magnet Wire

Bondable magnet wire, also referred to as self-bonding magnet wire, is film insulated wire top-coated with a thermoplastic adhesive. When activated, the thermoplastic bonds turn to turn windings to produce self-supporting coils or coils of unusual or difficult configuration. Use of bondable magnet wire may offer advantages over conventional magnet wire in certain winding applications, eliminating the need for bobbins as well as taping or varnishing steps. Activation of the bondcoat may be achieved with either heat, or in some cases solvent, or a combination of the two. Although bondcoats may be added to any conventional film, consideration should be given to the resoftening temperature of the adhesive in that it may not withstand the operating temperature of higher rated primary insulations.

Bonding Methods

Solvent Bonding
Some bondcoats can be activated by applying certain solvents during or after the coil winding process. Application of the solvent, usually via saturated wick during winding, causes the bondcoat to reflow. The process requires the use of a fixture to hold the coil in place while the solvent is drying. Once dry, the coil should be heated to dry off any residual solvent which might cause long-term coil failure, as well as to complete the bonding process.

Heat Bonding
All bondcoats can be heat bonded, either by oven-heating or by directing hot air on to the wire during winding. In either case, the principle is to heat the winding slightly above the bondcoat's reflow temperature and then cool it below its rated bond strength temperature. Oven bonding is accomplished by heating the coil for a period of time sufficient to obtain uniform heating throughout the winding, followed by a cooling cycle. Heating time is generally 10 to 30 minutes, depending on the size of the winding. Disadvantages of oven bonding are the longer bonding time as well as the potential need for many winding fixtures. Hot air bonding, though done typically at slower winding speed, has the advantage of the elimination of a secondary bonding operation. This method is cost effective and usually associated with low temperature bondcoats and wire sizes smaller than 34 AWG.

Resistance Bonding
Resistance bonding is done by applying electric current to the winding to electrically heat it to the proper bond temperature. Bonding voltage and time are dependent on wire size and coil design, and therefore will need to be developed experimentally for each specific application. This method has the advantages of being quick and generating uniform heat distribution. It is typically used for wire sizes heavier than 34 AWG.

Bondable Overcoats

TYPE	SOLVENT ACTIVATION	BONDING TEMPERATURE (°C)*	SOFTENING TEMPERATURE (°C)**
Polyvinyl Butyral	Alcohol	110 -140	105
Epoxy	MEK	150 - 200	130
Polyester	MEK	190 - 210	130
Polyamide	None	200 - 230	180

*May vary based on wire size and coil design
**Most room temperature bond strength lost at this point

Values below derived from NEMA MW1000-2015 Standard

SIZE (AWG)	BARE WIRE DIAMETER (INCHES)			TYPE 1				TYPE 2				SIZE (AWG)
				MIN. INCREASE IN DIAMETER (INCHES)		OVERALL DIAMETER (INCHES)		MIN. INCREASE IN DIAMETER (INCHES)		OVERALL DIAMETER (INCHES)		
	MIN.	NOM.	MAX.	FILM	BOND COAT	MIN.	MAX.	FILM	BOND COAT	MIN.	MAX.	
14	.0635	.0641	.0647	.0016	.0006	.0657	.0682	.0032	.0006	.0673	.0698	14
15	.0565	.0571	.0577	.0015	.0006	.0586	.0610	.0030	.0006	.0601	.0625	15
16	.0503	.0508	.0513	.0014	.0006	.0523	.0545	.0029	.0006	.0538	.0560	16
17	.0448	.0453	.0458	.0014	.0006	.0468	.0488	.0028	.0006	.0482	.0502	17
18	.0399	.0403	.0407	.0013	.0006	.0418	.0437	.0026	.0006	.0431	.0450	18
19	.0355	.0359	.0363	.0012	.0006	.0373	.0391	.0025	.0006	.0386	.0404	19
20	.0317	.0320	.0323	.0012	.0005	.0334	.0351	.0024	.0005	.0346	.0363	20
21	.0282	.0285	.0288	.0011	.0005	.0298	.0315	.0022	.0005	.0309	.0326	21
22	.0250	.0253	.0256	.0011	.0005	.0266	.0281	.0021	.0005	.0276	.0292	22
23	.0224	.0226	.0228	.0010	.0005	.0239	.0253	.0020	.0005	.0249	.0263	23
24	.0199	.0201	.0203	.0010	.0005	.0214	.0227	.0019	.0005	.0223	.0236	24
25	.0177	.0179	.0181	.0009	.0005	.0191	.0203	.0018	.0005	.0200	.0212	25
26	.0157	.0159	.0161	.0009	.0005	.0171	.0182	.0017	.0005	.0179	.0191	26
27	.0141	.0142	.0143	.0008	.0005	.0154	.0165	.0016	.0005	.0162	.0173	27
28	.0125	.0126	.0127	.0008	.0005	.0138	.0147	.0016	.0005	.0146	.0155	28
29	.0112	.0113	.0114	.0007	.0004	.0123	.0133	.0015	.0004	.0131	.0141	29
30	.0099	.0100	.0101	.0007	.0004	.0110	.0121	.0013	.0004	.0116	.0128	30
31	.0088	.0089	.0090	.0006	.0004	.0098	.0108	.0012	.0004	.0104	.0114	31
32	.0079	.0080	.0081	.0006	.0004	.0089	.0097	.0011	.0004	.0094	.0103	32
33	.0070	.0071	.0072	.0005	.0003	.0078	.0087	.0010	.0003	.0083	.0092	33
34	.0062	.0063	.0064	.0005	.0003	.0070	.0078	.0009	.0003	.0074	.0083	34
35	.0055	.0056	.0057	.0004	.0003	.0062	.0070	.0009	.0003	.0067	.0075	35
36	.0049	.0050	.0051	.0004	.0003	.0056	.0063	.0008	.0003	.0060	.0067	36
37	.0044	.0045	.0046	.0004	.0003	.0051	.0057	.0007	.0003	.0054	.0061	37
38	.0039	.0040	.0041	.0003	.0002	.0044	.0051	.0007	.0002	.0048	.0055	38
39	.0034	.0035	.0036	.0003	.0002	.0039	.0045	.0006	.0002	.0042	.0049	39
40	.0030	.0031	.0032	.0003	.0002	.0035	.0041	.0005	.0002	.0037	.0044	40
41	.0027	.0028	.0029	.0003	.0002	.0032	.0037	.0005	.0002	.0034	.0040	41
42	.0024	.0025	.0026	.0002	.0002	.0028	.0033	.0005	.0002	.0031	.0036	42
43	.0021	.0022	.0023	.0002	.0001	.0024	.0029	.0004	.0001	.0026	.0032	43
44	.0019	.0020	.0021	.0002	.0001	.0022	.0026	.0004	.0001	.0024	.0029	44
45	.00169	.00176	.00183	.0002	.0001	.00199	.0024	.0004	.0001	.00219	.0027	45
46	.00151	.00157	.00164	.0002	.0001	.00181	.0021	.0003	.0001	.00191	.0024	46
47	.00135	.00140	.00146	.0001	.0001	.00155	.0019	.0003	.0001	.00175	.0021	47
48	.00119	.00124	.00129	.0001	.0001	.00139	.0017	.0002	.0001	.00149	.0019	48
49	.00107	.00111	.00116	.0001	.0001	.00127	.0015	.0002	.0001	.00137	.0017	49
50	.00095	.0009	.00103	.0001	.0001	.00115	.0014	.0002	.0001	.00125	.0016	50
51	.00085	.00088	.00092	.0001	.0001	.00105	.0013	-	-	-	-	51
52	.00075	.00078	.00081	.0001	.00005	.00090	.00115	-	-	-	-	52

Diameters shown are per NEMA MW1000-2015. For Diameters per NEMA MW1000-1997 see page 35 or visit our website at www.mwswire.com

Blue text above indicates changes from NEMA MW1000-1997 and page 35.

Bondable wire sizes finer than 52 AWG available upon request.

Bondable Wire Grades - Types Defined

TYPE	INSULATION AND BONDCOAT CONFIGURATION
1	Equal to Single Build* plus bondcoat
2	Equal to Heavy Build* plus bondcoat

The addition of a bondcoat will result in an increase in the finished diameter of the wire.

* For standard round magnet wire insulation build diameters (e.g. Single, Heavy, Triple & Quad) see page 5.

Values below derived from NEMA MW1000-1997 Standard

SIZE (AWG)	BARE WIRE DIAMETER (INCHES)			TYPE 1				TYPE 2				SIZE (AWG)
				MIN. INCREASE IN DIAMETER (INCHES)		OVERALL DIAMETER (INCHES)		MIN. INCREASE IN DIAMETER (INCHES)		OVERALL DIAMETER (INCHES)		
	MIN.	NOM.	MAX.	FILM	BOND COAT	MIN.	MAX.	FILM	BOND COAT	MIN.	MAX.	
14	.0635	.0641	.0647	.0016	.0006	.0657	.0682	.0032	.0006	.0673	.0700	14
15	.0565	.0571	.0577	.0015	.0006	.0586	.0609	.0030	.0006	.0601	.0627	15
16	.0503	.0508	.0513	.0014	.0006	.0523	.0545	.0029	.0006	.0538	.0562	16
17	.0448	.0453	.0458	.0014	.0006	.0468	.0488	.0028	.0006	.0482	.0504	17
18	.0399	.0403	.0407	.0013	.0006	.0418	.0437	.0026	.0006	.0431	.0452	18
19	.0355	.0359	.0363	.0012	.0006	.0373	.0391	.0025	.0006	.0386	.0406	19
20	.0317	.0320	.0323	.0012	.0005	.0334	.0351	.0023	.0005	.0345	.0364	20
21	.0282	.0285	.0288	.0011	.0005	.0298	.0314	.0022	.0005	.0309	.0326	21
22	.0250	.0253	.0256	.0011	.0005	.0266	.0281	.0021	.0005	.0276	.0293	22
23	.0224	.0226	.0228	.0010	.0005	.0239	.0253	.0020	.0005	.0249	.0264	23
24	.0199	.0201	.0203	.0010	.0005	.0214	.0227	.0019	.0005	.0223	.0238	24
25	.0177	.0179	.0181	.0009	.0005	.0191	.0203	.0018	.0005	.0200	.0214	25
26	.0157	.0159	.0161	.0009	.0005	.0171	.0182	.0017	.0005	.0179	.0193	26
27	.0141	.0142	.0143	.0008	.0005	.0154	.0164	.0016	.0005	.0162	.0173	27
28	.0125	.0126	.0127	.0008	.0005	.0138	.0147	.0016	.0005	.0146	.0156	28
29	.0112	.0113	.0114	.0007	.0004	.0123	.0133	.0015	.0004	.0131	.0142	29
30	.0099	.0100	.0101	.0007	.0004	.0110	.0119	.0014	.0004	.0117	.0128	30
31	.0088	.0089	.0090	.0006	.0004	.0098	.0108	.0013	.0004	.0105	.0115	31
32	.0079	.0080	.0081	.0006	.0004	.0089	.0098	.0012	.0004	.0095	.0102	32
33	.0070	.0071	.0072	.0005	.0004	.0079	.0088	.0011	.0004	.0085	.0095	33
34	.0062	.0063	.0064	.0005	.0003	.0070	.0078	.0010	.0003	.0075	.0084	34
35	.0055	.0056	.0057	.0004	.0003	.0062	.0070	.0009	.0003	.0067	.0076	35
36	.0049	.0050	.0051	.0004	.0003	.0056	.0063	.0008	.0003	.0060	.0069	36
37	.0044	.0045	.0046	.0003	.0003	.0050	.0057	.0008	.0003	.0055	.0062	37
38	.0039	.0040	.0041	.0003	.0002	.0044	.0051	.0007	.0002	.0048	.0056	38
39	.0034	.0035	.0036	.0002	.0002	.0038	.0045	.0006	.0002	.0042	.0050	39
40	.0030	.0031	.0032	.0002	.0002	.0034	.0040	.0006	.0002	.0038	.0044	40
41	.0027	.0028	.0029	.0002	.0002	.0031	.0036	.0005	.0002	.0034	.0040	41
42	.0024	.0025	.0026	.0002	.0002	.0028	.0032	.0004	.0002	.0030	.0037	42
43	.0021	.0022	.0023	.0002	.0001	.0024	.0029	.0004	.0001	.0026	.0033	43
44	.0019	.0020	.0021	.0001	.0001	.0021	.0027	.0004	.0001	.0024	.0030	44
45	.00169	.00176	.00183	.0001	.0001	.00189	.0023	.0003	.0001	.00209	.0025	45
46	.00151	.00157	.00164	.0001	.0001	.00171	.0021	.0003	.0001	.00191	.0023	46
47	.00135	.00140	.00146	.0001	.0001	.00155	.0019	.0003	.0001	.00175	.0021	47
48	.00119	.00124	.00129	.0001	.0001	.00137	.0017	.0002	.0001	.00149	.0018	48
49	.00107	.00111	.00116	.0001	.0001	.00127	.0015	.0002	.0001	.00137	.0017	49
50	.00095	.00099	.00103	.0001	.0001	.00115	.0014	.0002	.0001	.00125	.0016	50

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TYPE	INSULATION AND BONDCOAT CONFIGURATION
1	Equal to Single Build* plus bondcoat
2	Equal to Heavy Build* plus bondcoat

The addition of a bondcoat will result in an increase in the finished diameter of the wire.

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