

CLASS 4600

Cellulose Resins

4600 - 4609 Nitrocellulose, 0-1/4" viscosity
4610 - 4619 Nitrocellulose, 1/4-1/2"
4620 - 4629 Nitrocellulose, 1/2-6"
4630 - 4639 Nitrocellulose, 6-30"
4640 - 4649 Nitrocellulose 30" - up
4650 - 4659 Carboxymethyl and methyl cellulose
4660 - 4669 Ethyl cellulose, 0-100 cps. viscosity
4670 - 4679 Ethyl cellulose, 100 cps. and up viscosity
4680 - 4689 Cellulose acetate
4690 - 4699 Cellulose acetobutyrate and miscellaneous

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Nitrocellulose

<u>Classified Number</u>	<u>Previous Number</u>	<u>Viscosity</u>	<u>Type</u>	<u>Alcohol</u>	<u>Bulk Value</u>	<u>Fl. Point Degree F</u>	<u>Remarks</u>
4601	1935	18-23 cps.	RS	Ethanol	9.48	55	
46028		18-23 cps.	RS	Isopropanol	9.52	70	
46045		25-30 cps.	RS	Ethanol	9.48	55	
4600		30-35 cps.	RS	Butanol	9.38	115	
4602	2666	30-35 cps.	RS	Ethanol	9.48	55	
46018		30-35 cps.	RS	Isopropanol	9.52	70	
4605		1/4 sec.	RS	Butanol	9.38	115	
4606	1423	1/4 sec.	RS	Ethanol	9.48	55	
46050		1/4 sec.	RS	Ethanol	9.48	55	Off grade
46019		1/4 sec.	RS	Isopropanol	9.52	70	
46031	2667	1/4 sec.	SS	Ethanol	9.48	55	
4610	2318	3/8 sec.	RS	Ethanol	9.48	55	
46051		3/8 sec.	RS	Isopropanol	9.52	70	
4615	1943	1/2 sec.	RS	Butanol	9.38	115	
4616	1226	1/2 sec.	RS	Ethanol	9.48	55	
46020		1/2 sec.	RS	Isopropanol	9.52	70	
46024		1/2 sec.	RS	Isopropanol	9.52	70	Off grade
4608		1/2 sec.	SS	Butanol	9.38	115	
4626	1228	5-6 sec.	RS	Ethanol	9.48	55	
46Y7		5-6 sec.	RS	Butanol	9.38	115	
46030	1943	5-6 sec.	SS	Butanol	9.38	115	
4636	1227	12-20 sec.	RS	Ethanol	9.48	55	
4646	1229	50-60 sec.	RS	Ethanol	9.48	55	
46027		60-80 sec.	RS	Isopropanol	9.52	70	
4640	1402	150-175 sec.	RS	Ethanol	9.48	55	
4645	1941	500-1000 sec.	RS	Ethanol	9.48	55	

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Nitrocellulose Base Solutions

Classified Number	Previous Number	N/C Viscosity	Type N/C	% NVM	Wt./ Gal.	Viscosity	Remarks
(46D1)	CB(2385)	30-35 cps.	RS	35	8.50	C35-50"-50C.C.	
(46O3)	(3612)	30-35 cps.	RS	30	8.32	C80-90 sec.	
(46O8)	(2612)	1/4 sec.	RS	25	8.20	C65-75 sec.	XCL C12
(46D11)	(2608)	3/8 sec.	RS	30	8.27	FB 23-25 sec.	
(4617)	(1832)	1/2 sec.	RS	25	7.95	C40-50 -50C.C.	XCL 1
(46C32)	(1887)	1/2 sec.	RS	30	7.98	FB 30-40 sec.	Butanol wet N/C
(46C44)		1/2 sec.	RS	30	8.05	FB 23-25 sec.	Off grade N/C
(4628)	(2651)	5-6 sec.	RS	15	7.45	FB 16-19 sec.	
(46D20)	(2684)	(5-6 sec.) (50-60 sec.)	RS	20	7.55	FB 95-105 sec.	
(4648)	(2632)	50-60 sec.	RS	10	7.36	FB 21-24 sec.	XCL C7
(46D40)		50-60 sec.	RS	17.8	7.30	FB 17-20 sec.	
						100% Red.(1242)	
(46D44)		60-80 sec.	RS	17.8		FB 9-12 sec.	
						100% Red.(1242)	
(46C34)	(1644)	150-175 sec.	RS	19.3	7.35	FB 20 sec.	
						100% Red.(1202)	
(46C55)		1/2 sec.	RS	37.5	8.52	C100-115 sec.	Off grade N/C
						100% Red.(1242)	

Special Lacquers and Base Lacquers

(46C25)	CB(2068)	30-35 cps.	RS	38	7.85	C40-50 sec.	Extending Clear
(46C26)	CB(2175)	1/4 sec.	RS	27	8.04		Special for Black
(46D10)		3/8 sec.	RS	25	8.30	FB 8-13 sec.	Slow for brushing
(46C29)	(1866)	30-35 cps.-	RS	30	8.50	FB 40-45 sec.	Silk screen & RBL
		1/2 sec.					Butanol wet N/C
(46C43)		1/2 sec.-5-6 sec	RS	19.5	7.55	C55-65 sec.	Special B.L.
(46D21)		1/2 sec.-5-6 sec	RS	43	8.10		In acetone
(46C5)	(2692)	1/4 sec.-					
		12-20 sec.	RS	24	7.70	C30-35 sec.	Opex Silver,B.L.
(46D22)		5-6 sec.	RS	32	8.05	FB 90-110 sec.	In acetone
(46D42)			-	19.9	7.70	-	Celluloid scrap
(46F9)			-	45.5	8.66	-	GE Cement #1276

Miscellaneous Cellulosic Solutions

Classified Number	Type	Name	Cellulose R. M.	Remarks
(46P12)	M/C	Multicolor Solution Concentrate	46C1	
(46A2)	E/C	Crystal Toner Base	4665	
(46P3)	E/C	Ethyl Cellulose Solution	46P4	
(46C41)	C/A	20% Cellulose Acetate Clear Base	46C38	In acetone
(46P8)	CAB	CAB Solution	4690	
(46A6)	EHEC	20% EHEC Base	46A4	
(46A8)	EHEC	Crystal Toner Base	4645	

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Methyl Cellulose

Classified Number	Previous Number	Viscosity	Type or Grade	Composition % Methoxy	Source	Remarks
46C39		15 cps.	Tech.	27.5 - 32.0	Dow	
46C36		50 cps.	HG	27.5 - 32.0	Dow	
46A7		100 cps.		27.5 - 32.0	Dow	
46C37		400 cps.		27.5 - 32.0	Dow	
46Y6		400 cps.	HG	27.5 - 32.0	Dow	
46C1		4000 cps.		27.5 - 32.0	Dow	
46C49		4000 cps.	HG	27.5 - 32.0	Dow	

Carboxymethyl Cellulose

			Type	
46A4		Low	70	Hercules
46C14		Medium	70 Regular	Hercules
46A3		High	70 Premium	Hercules

Ethyl Cellulose

		Type	% Ethoxy	
46F11		100	G	44.5 - 45.5 Hercules
46C9		14	K	45.5 - 46.8 Hercules
46C12		100	K	45.5 - 46.8 Hercules
46C13		200	K	45.5 - 46.8 Hercules
4660		7	N	46.8 - 48.5 Hercules & Dow
4661	2191	10	N	46.8 - 48.5 Hercules & Dow
4666	1918	22	N	46.8 - 48.5 Hercules & Dow
46P4	1947	50	N	46.8 - 48.5 Hercules
46P11		75	N	46.8 - 48.5 Muehlstein E/C Scrap
4665	1926	100	N	46.8 - 48.5 Hercules & Dow
46P10		100	N	46.8 - 48.5 Cent. Ind. E/C Scrap
46F10		10	T	48.5 - 50.0 Hercules
46F7		100	T	48.5 - 50.0 Hercules

Cellulose Acetate

Classified Number	Previous Number	Viscosity ASTM	Type or Grade Type	Composition	Source	Remarks
				% Combined Acetic Acid		
4680	1925	FB 2-3 sec.	LL2	55.0 - 56.0	Hercules	
46C33	1931	FB 30-60"	PM 203	52.5 - 53.5	Hercules	
		FB 30-60"	107 N		DuPont	
46C38			Spinning		Celanese	
46C52		FB 25-60 sec.	FM-1	55.9 - 56.4	Hercules	

Cellulose Acetate Butyrate

		Viscosity	Type or Grade	% Acetyl	% Butyryl	Source
46C40		FB 10-20 sec.	EAB 171-15	29.5	17.0	Eastman
4690	2192	FB 10-20 sec.	AB 171-15	29.5	17.0	Eastman
46C48		1/2 sec.	EAB 381-1/2	13.0	37.0	Eastman

Ethyl Hydroxyethyl Cellulose

46A5	20-50 cps.	Low visc.	Hercules
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Hydroxyethyl Cellulose

	Sol'n. Conc.	Salt Content	
46A9	250-300 cps.	5% @ 20°C.	8% No acetate Carbide & Carbon Cellosize WP-3
46C54	200-300 cps.	2% @ 20°C.	8% No acetate Carbide & Carbon Cellosize WP-300

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Cellulose Esters and Ethers - General Information

Nitrocellulose

Nitrocellulose is available in three grades, viz. R.S., S.S., and Film Scrap. All R.S. Nitrocellulose is supplied with SD No. 2B denatured ethyl alcohol, isopropyl alcohol, or butyl alcohol, in the ratio of 70% dry cotton to 30% alcohol. The rex number indicates the wet nitrocellulose. During the war the ratio was 65:35.

All S.S. Nitrocellulose is to be wet with butyl alcohol because of its partial solubility in ethyl alcohol.

R.S. Nitrocellulose is the most commonly used. Esters and ketones are active solvents, alcohols are potential solvents, and hydrocarbons may be used as extenders or diluents for solvent blends.

S.S. Nitrocellulose is soluble in ethyl alcohol with the addition of a small percentage of active solvent (e.g. ester, ketone, or other).

The viscosities are determined by the ASTM falling ball method in the following solution concentrations:

Viscosities over 1/2 second	- 12.2% by weight
Viscosities over 1/2 second	- 20 % by weight
Viscosities below 1/2 second	- 25 % by weight

The solvent blend used for these viscosity determinations is as follows:

Ethyl Acetate (1202)	- 20%
Ethyl Alcohol (403)	- 25%
Toluene (317)	- 55%

Cellulose Acetate is supplied in dry form. Viscosities are determined in a 20% solution in acetone (530) by the ASTM falling ball method.

Cellulose Acetate Butyrate is supplied in dry form. Viscosities are determined in a 20% solution in acetone (530) by the ASTM falling ball method. The code numbers shown for cellulose acetate butyrate are derived as follows: AB stands for the flake form and EAB designates the granular form of the mixed ester. The first two digits following represents the approximate higher butyral content of the material, the next digits represent the degree of hydrolysis; the final digits following the dash represent the average viscosity of the type.

Ethyl Cellulose is supplied in dry powder form. It is available in a wide range of viscosities and ethoxy content. Viscosities of standard and high ethoxy ethyl cellulose are determined in a 5% solution of 80% toluene (317) and 20% alcohol (406). Viscosities of low and medium ethoxy ethyl cellulose are run in a 5% solution of 70% toluene and 30% alcohol.

Hercules Powder Company and Dow Chemical are our two main suppliers. Hercules supplies five types, (D, G, K, N, and T) based on ethoxy content, and Dow furnishes two types, standard and medium. These types are sub-divided into viscosity grades, the designation being in centipoises in 5% concentration.

Cellulose Esters and Ethers - General Information (Con't.)

<u>Ethoxy</u>	<u>Classification</u>	<u>Ethoxy Range</u>	<u>Hercules</u>	<u>Dow</u>
Low		Below 46%	D43.5 - 44.5 G44.5 - 45.5	Medium
Standard		46.0% - 49.0%	K45.5 - 46.8 N46.8 - 48.5	Standard
High		49.0% - 50.0%	T48.5 - 50.0	