CHEMETRON Fire Systems™

A UTC Fire & Security Company

Bulletin #12-04C

Date: February 1, 2012

To: All Chemetron Fire Systems Distributors

From: Joseph Ciol, Product Manager

Subject: Design Concentrations for Clean Agent Systems

With the release of the 2012 edition of NFPA 2001 and following up on Bulletin #11-35C, we are making the following recommendations for minimum design concentrations in clean agent fire extinguishing systems protecting Class A and Class C hazards. Please continue to refer to our DIOM manuals for the design concentrations of Class B hazards.

	Minimum Design Concentration	
Clean Agent	**Class A**	**Class C**
FM-200® (HFC-227ea)	6.7%	7.0%
Novec™ 1230 (FK-5-1-12)	4.5%	4.7%
Argonite™ (IG-55)	37.9%	42.7%

Important Note: Where NFPA 2001, 2008 edition is enforced it is acceptable to use the minimum design concentrations based on the requirements of this edition. The governing authority or authority having jurisdiction (AHJ) must specifically approve the design approach selected.

Flooding factors for a range of hazard temperatures and agent concentrations are included here with this bulletin.

We thank you for your support and business.

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Flooding Factors - 3M™ Novec™ 1230 Fluid

Temp T (^{o}F)	Specific Vapor Volume (ft.^{3}/lb.)[c]	Weight Requirements of Hazard Volume, W/V (lb/ft.^{3}) Design Concentrations (% by Volume) US Units										
		3.00	4.00	4.50	4.70	5.00	6.00	7.00	8.00	9.00	10.00	11.00
-20	0.9368	0.0330	0.0445	0.0503	0.0526	0.0562	0.0681	0.0803	0.0928	0.1056	0.1186	0.1319
-10	0.9612	0.0322	0.0433	0.0490	0.0513	0.0548	0.0664	0.0783	0.0905	0.1029	0.1156	0.1286
0	0.9856	0.0314	0.0423	0.0478	0.0500	0.0534	0.0648	0.0764	0.0882	0.1003	0.1127	0.1254
10	1.0100	0.0306	0.0413	0.0467	0.0488	0.0521	0.0632	0.0745	0.0861	0.0979	0.1100	0.1224
20	1.0344	0.0299	0.0403	0.0456	0.0477	0.0509	0.0617	0.0728	0.0841	0.0956	0.1074	0.1195
30	1.0588	0.0292	0.0394	0.0445	0.0466	0.0497	0.0603	0.0711	0.0821	0.0934	0.1049	0.1167
40	1.0832	0.0286	0.0385	0.0435	0.0455	0.0486	0.0589	0.0695	0.0803	0.0913	0.1026	0.1141
50	1.1077	0.0279	0.0376	0.0425	0.0445	0.0475	0.0576	0.0680	0.0785	0.0893	0.1003	0.1116
60	1.1321	0.0273	0.0368	0.0416	0.0436	0.0465	0.0564	0.0665	0.0768	0.0874	0.0981	0.1092
70	1.5650	0.0267	0.0360	0.0407	0.0426	0.0455	0.0552	0.0651	0.0752	0.0855	0.0961	0.1069
80	1.8090	0.0262	0.0353	0.0399	0.0418	0.0446	0.0541	0.0637	0.0736	0.0838	0.0941	0.1047
90	1.2053	0.0257	0.0346	0.0391	0.0409	0.0437	0.0530	0.0624	0.0721	0.0821	0.0922	0.1025
100	1.2297	0.0252	0.0339	0.0383	0.0401	0.0428	0.0519	0.0612	0.0707	0.0804	0.0904	0.1005
110	1.2540	0.0247	0.0332	0.0376	0.0393	0.0420	0.0509	0.0600	0.0693	0.0789	0.0886	0.0986
120	1.2785	0.0242	0.0326	0.0369	0.0386	0.0412	0.0499	0.0589	0.0680	0.0774	0.0869	0.0967
130	1.3029	0.0237	0.0320	0.0362	0.0379	0.0404	0.0490	0.0578	0.0667	0.0759	0.0853	0.0949
140	1.3273	0.0233	0.0314	0.0355	0.0372	0.0397	0.0481	0.0567	0.0655	0.0745	0.0837	0.0931
150	1.3518	0.0229	0.0308	0.0349	0.0365	0.0389	0.0472	0.0557	0.0643	0.0732	0.0822	0.0914
160	1.3762	0.0225	0.0303	0.0342	0.0358	0.0382	0.0464	0.0547	0.0632	0.0719	0.0807	0.0898
170	1.4006	0.0221	0.0297	0.0336	0.0352	0.0376	0.0456	0.0537	0.0621	0.0706	0.0793	0.0882
180	1.4250	0.0217	0.0292	0.0331	0.0346	0.0369	0.0448	0.0528	0.0610	0.0694	0.0780	0.0867
190	1.4494	0.0213	0.0287	0.0325	0.0340	0.0363	0.0440	0.0519	0.0600	0.0682	0.0767	0.0853
200	1.4738	0.0210	0.0283	0.0320	0.0335	0.0357	0.0433	0.0511	0.0590	0.0671	0.0754	0.0839
210	1.4982	0.0206	0.0278	0.0315	0.0329	0.0351	0.0426	0.0502	0.0580	0.0660	0.0742	0.0825
220	1.5226	0.0203	0.0274	0.0309	0.0324	0.0346	0.0419	0.0494	0.0571	0.0650	0.0730	0.0812

Flooding Factors - 3M™ Novec™ 1230 Fluid SI Units

Temp T (^{o}C)	Specific Vapor Volume (m^3/kg)[d]	Weight Requirements of Hazard Volume, W/V (kg/m^3) Design Concentrations (% by Volume) SI Units										
		3.00	4.00	4.50	4.70	5.00	6.00	7.00	8.00	9.00	10.00	11.00
-20	0.0609140	0.5077	0.6327	0.7735	0.8096	0.8640	1.0478	1.2356	1.4274	1.6235	1.8239	2.0289
-15	0.6022886	0.4965	0.6314	0.7565	0.7918	0.8450	1.0247	1.2084	1.3960	1.5878	1.7838	1.9842
-10	0.0636570	0.4858	0.6301	0.7402	0.7747	0.8268	1.0027	1.1824	1.3660	1.5536	1.7454	1.9415
-5	0.0650285	0.4756	0.6288	0.7246	0.7584	0.8093	0.9815	1.1575	1.3372	1.5209	1.7086	1.9006
0	0.0664000	0.4658	0.6275	0.7096	0.7427	0.7926	0.9613	1.1336	1.3096	1.4895	1.6734	1.8614
5	0.0677715	0.4564	0.6262	0.6953	0.7277	0.7766	0.9419	1.1106	1.2831	1.4594	1.6395	1.8237
10	0.0691430	0.4473	0.6249	0.6815	0.7133	0.7612	0.9232	1.0886	1.2577	1.4304	1.6070	1.7876
15	0.0705145	0.4386	0.6236	0.6683	0.6994	0.7464	0.9053	1.0675	1.2332	1.4026	1.5758	1.7528
20	0.0718860	0.4303	0.6224	0.6555	0.6861	0.7322	0.8880	1.0471	1.2097	1.3759	1.5457	1.7194
25	0.0732575	0.4222	0.6211	0.6433	0.6733	0.7185	0.8714	1.0275	1.1871	1.3501	1.5168	1.6873
30	0.0746290	0.4145	0.6198	0.6314	0.6609	0.7053	0.8554	1.0087	1.1653	1.3253	1.4890	1.6563
35	0.0760005	0.4070	0.6186	0.6201	0.6490	0.6926	0.8400	0.9905	1.1443	1.3014	1.4621	1.6264
40	0.0773720	0.3998	0.6173	0.6091	0.6375	0.6803	0.8251	0.9729	1.1240	1.2784	1.4362	1.5976
45	0.0787435	0.3928	0.6161	0.5985	0.6264	0.6685	0.8107	0.9560	1.1044	1.2561	1.4112	1.5698
50	0.0801150	0.3861	0.6148	0.5882	0.6157	0.6570	0.7969	0.9396	1.0855	1.2346	1.3871	1.5429
55	0.0814865	0.3796	0.6136	0.5783	0.6053	0.6460	0.7835	0.9238	1.0673	1.2139	1.3637	1.5170
60	0.0828580	0.3733	0.6123	0.5688	0.5953	0.6353	0.7705	0.9085	1.0496	1.1938	1.3412	1.4919
65	0.0842295	0.3672	0.6111	0.5595	0.5856	0.6250	0.7580	0.8938	1.0325	1.1744	1.3194	1.4676
70	0.0856010	0.3614	0.6099	0.5506	0.5762	0.6149	0.7458	0.8794	1.0160	1.1556	1.2982	1.4441
75	0.0869725	0.3557	0.6087	0.5419	0.5671	0.6053	0.7341	0.8656	1.0000	1.1373	1.2778	1.4213
80	0.0883440	0.3501	0.6074	0.5335	0.5584	0.5959	0.7227	0.8522	0.9845	1.1197	1.2579	1.3993
85	0.0897155	0.3448	0.6062	0.5253	0.5498	0.5868	0.7117	0.8391	0.9694	1.1026	1.2387	1.3779
90	0.0910870	0.3396	0.6050	0.5174	0.5415	0.5779	0.7010	0.8265	0.9548	1.0860	1.2201	1.3572
95	0.0924585	0.3346	0.6038	0.5097	0.5335	0.5694	0.6906	0.8142	0.9407	1.0699	1.2020	1.3370
100	0.0938300	0.3297	0.6026	0.5023	0.5257	0.5610	0.6805	0.8024	0.9269	1.0543	1.1844	1.3175

Flooding Factors - FM-200®

Temp T (^oF)	Specific Vapor Volume ($ft.^3/lb.$)[c]	Weight Requirements of Hazard Volume, W/V ($lb/ft.^3$) Design Concentrations (% by Volume) US Units										
		6.00	**6.70**	**7.00**	**8.00**	**9.00**	**10.00**	**11.00**	**12.00**	**13.00**	**14.00**	**15.00**
30	0.9368	0.0316	0.0355	0.0372	0.0430	0.0489	0.0549	0.0611	0.0674	0.0739	0.0805	0.0872
40	0.9612	0.0309	0.0347	0.0364	0.0420	0.0478	0.0537	0.0597	0.0659	0.0722	0.0787	0.0853
50	0.9856	0.0302	0.0339	0.0356	0.0411	0.0468	0.0525	0.0584	0.0645	0.0707	0.0770	0.0834
60	1.0100	0.0295	0.0332	0.0348	0.0402	0.0458	0.0514	0.0572	0.0631	0.0691	0.0753	0.0816
70	1.0344	0.0289	0.0325	0.0341	0.0394	0.0448	0.0503	0.0560	0.0618	0.0677	0.0738	0.0799
80	1.0588	0.0283	0.0319	0.0334	0.0386	0.0439	0.0493	0.0549	0.0605	0.0663	0.0723	0.0783
90	1.0832	0.0278	0.0312	0.0327	0.0378	0.0430	0.0483	0.0538	0.0593	0.0650	0.0708	0.0767
100	1.1077	0.0272	0.0306	0.0321	0.0371	0.0422	0.0474	0.0527	0.0582	0.0637	0.0694	0.0752
110	1.1321	0.0267	0.0300	0.0315	0.0364	0.0414	0.0465	0.0517	0.0570	0.0625	0.0681	0.0738
120	1.5650	0.0262	0.0295	0.0309	0.0357	0.0406	0.0456	0.0507	0.0560	0.0613	0.0668	0.0724
130	1.8090	0.0257	0.0289	0.0303	0.0350	0.0398	0.0447	0.0498	0.0549	0.0602	0.0656	0.0710
140	1.2053	0.0252	0.0284	0.0298	0.0344	0.0391	0.0439	0.0489	0.0539	0.0591	0.0644	0.0697
150	1.2297	0.0248	0.0279	0.0292	0.0337	0.0384	0.0431	0.0480	0.0530	0.0580	0.0632	0.0685
160	1.2540	0.0244	0.0274	0.0287	0.0332	0.0377	0.0424	0.0472	0.0520	0.0570	0.0621	0.0673
170	1.2785	0.0239	0.0269	0.0282	0.0326	0.0371	0.0417	0.0463	0.0511	0.0560	0.0610	0.0661
180	1.3029	0.0235	0.0265	0.0277	0.0320	0.0365	0.0410	0.0456	0.0503	0.0551	0.0600	0.0650
190	1.3273	0.0231	0.0260	0.0273	0.0315	0.0358	0.0403	0.0448	0.0494	0.0542	0.0590	0.0639
200	1.3518	0.0228	0.0256	0.0268	0.0310	0.0353	0.0396	0.0441	0.0486	0.0533	0.0580	0.0629

Flooding Factors - FM-200® SI Units

Temp T (^{o}C)	Specific Vapor Volume (m^3/kg)[d]	Weight Requirements of Hazard Volume, W/V (kg/m^3) Design Concentrations (% by Volume) SI Units										
		6.00	**6.70**	**7.00**	**8.00**	**9.00**	**10.00**	**11.00**	**12.00**	**13.00**	**14.00**	**15.00**
-10	0.1215	0.5236	0.5891	0.6175	0.7133	0.8113	0.9115	1.0139	1.1187	1.2258	1.3354	1.4477
-5	0.1241	0.5131	0.5773	0.6051	0.6990	0.7950	0.8932	0.9935	1.0962	1.2012	1.3086	1.4186
0	0.1268	0.5030	0.5659	0.5931	0.6852	0.7794	0.8756	0.9740	1.0746	1.1775	1.2828	1.3906
5	0.1294	0.4933	0.5550	0.5817	0.6720	0.7643	0.8587	0.9551	1.0538	1.1548	1.2580	1.3638
10	0.1320	0.4839	0.5444	0.5707	0.6593	0.7498	0.8424	0.9370	1.0338	1.1329	1.2342	1.3379
15	0.1347	0.4749	0.5343	0.5600	0.6470	0.7359	0.8267	0.9196	1.0146	1.1118	1.2112	1.3130
20	0.1373	0.4663	0.5246	0.5498	0.6352	0.7224	0.8116	0.9028	0.9961	1.0915	1.1891	1.2890
25	0.1399	0.4579	0.5151	0.5399	0.6238	0.7095	0.7971	0.8866	0.9782	1.0719	1.1678	1.2659
30	0.1425	0.4498	0.5061	0.5304	0.6128	0.6970	0.7830	0.8710	0.9610	1.0530	1.1472	1.2436
35	0.1450	0.4420	0.4973	0.5213	0.6022	0.6849	0.7695	0.8559	0.9443	1.0348	1.1274	1.2221
40	0.1476	0.4345	0.4888	0.5124	0.5919	0.6733	0.7564	0.8414	0.9283	1.0172	1.1082	1.2013
45	0.1502	0.4272	0.4807	0.5038	0.5820	0.6620	0.7437	0.8273	0.9127	1.0002	1.0896	1.1812
50	0.1527	0.4202	0.4728	0.4955	0.5725	0.6511	0.7315	0.8137	0.8977	0.9837	1.0717	1.1618
55	0.1557	0.4134	0.4651	0.4875	0.5632	0.6406	0.7196	0.8005	0.8832	0.9678	1.0543	1.1429
60	0.1578	0.4068	0.4577	0.4797	0.5542	0.6303	0.7082	0.7877	0.8691	0.9524	1.0375	1.1247
65	0.1604	0.4004	0.4505	0.4722	0.5455	0.6205	0.6971	0.7754	0.8555	0.9374	1.0213	1.1071
70	0.1629	0.3943	0.4436	0.4649	0.5371	0.6109	0.6863	0.7634	0.8423	0.9229	1.0055	1.0900
75	0.1654	0.3883	0.4368	0.4578	0.5289	0.6016	0.6759	0.7518	0.8295	0.9089	0.9902	1.0734
80	0.1679	0.3824	0.4303	0.4510	0.5210	0.5926	0.6657	0.7405	0.8170	0.8953	0.9754	1.0573
85	0.1704	0.3768	0.4239	0.4443	0.5133	0.5838	0.6559	0.7296	0.8050	0.8821	0.9610	1.0417
90	0.1730	0.3713	0.4178	0.4379	0.5059	0.5753	0.6464	0.7190	0.7933	0.8693	0.9470	1.0266

Flooding Factors - Argonite

Temp T (^oF)	Specific Vapor Volume (ft^3/lb)[d]	Weight Requirements of Hazard Volume, W/V (lb/ft^3) Design Concentrations (% by Volume) US Units									
		34.00	38.00	40.00	42.00	42.70	46.00	50.00	54.00	58.00	62.00
-40	0.5637	0.0461	0.0530	0.0566	0.0604	0.0617	0.0683	0.0768	0.0861	0.0962	0.1073
-35	0.56324	0.0455	0.0524	0.0560	0.0597	0.0610	0.0675	0.0759	0.0851	0.0950	0.1060
-30	0.58732	0.0450	0.0518	0.0553	0.0590	0.0603	0.0667	0.0750	0.0841	0.0939	0.1048
-25	0.5994	0.0445	0.0512	0.0547	0.0583	0.0596	0.0659	0.0742	0.0831	0.0928	0.1036
-20	0.61148	0.0440	0.0506	0.0541	0.0576	0.0589	0.0652	0.0733	0.0822	0.0918	0.1024
-15	0.62355	0.0435	0.0500	0.0534	0.0570	0.0583	0.0645	0.0725	0.0812	0.0908	0.1012
-10	0.63553	0.0430	0.0495	0.0528	0.0564	0.0576	0.0637	0.0717	0.0803	0.0897	0.1001
-5	0.64771	0.0425	0.0489	0.0523	0.0557	0.0570	0.0630	0.0709	0.0795	0.0888	0.0990
0	0.65979	0.0421	0.0484	0.0517	0.0551	0.0564	0.0624	0.0702	0.0786	0.0878	0.0979
5	0.67186	0.0416	0.0479	0.0511	0.0545	0.0558	0.0617	0.0694	0.0777	0.0869	0.0969
10	0.68394	0.0412	0.0473	0.0506	0.0540	0.0552	0.0610	0.0687	0.0769	0.0859	0.0958
15	0.696602	0.0407	0.0469	0.0501	0.0534	0.0546	0.0604	0.0679	0.0761	0.0850	0.0948
20	0.7081	0.0403	0.0464	0.0495	0.0528	0.0540	0.0598	0.0672	0.0753	0.0841	0.0938
25	0.72017	0.0399	0.0459	0.0490	0.0523	0.0535	0.0591	0.0665	0.0745	0.0833	0.0929
30	0.73225	0.0395	0.0454	0.0485	0.0518	0.0529	0.0585	0.0659	0.0738	0.0824	0.0919
35	0.74433	0.0391	0.0450	0.0480	0.0512	0.0524	0.0579	0.0652	0.0730	0.0816	0.0910
40	0.75641	0.0387	0.0445	0.0476	0.0507	0.0518	0.0574	0.0645	0.0723	0.0808	0.0901
45	0.76848	0.0383	0.0441	0.0471	0.0502	0.0513	0.0568	0.0639	0.0716	0.0800	0.0892
50	0.78056	0.0379	0.0436	0.0466	0.0497	0.0508	0.0562	0.0633	0.0709	0.0792	0.0883
55	0.79264	0.0376	0.0432	0.0462	0.0492	0.0503	0.0557	0.0627	0.0702	0.0784	0.0875
60	0.80471	0.0372	0.0428	0.0457	0.0488	0.0499	0.0552	0.0620	0.0695	0.0777	0.0866
65	0.81679	0.0368	0.0424	0.0453	0.0483	0.0494	0.0546	0.0615	0.0689	0.0769	0.0858
70	0.82887	0.0365	0.0420	0.0449	0.0478	0.0489	0.0541	0.0609	0.0682	0.0762	0.0850
75	0.84095	0.0362	0.0416	0.0444	0.0474	0.0485	0.0536	0.0603	0.0676	0.0755	0.0842
80	0.85302	0.0358	0.0412	0.0440	0.0470	0.0480	0.0531	0.0597	0.0669	0.0748	0.0834
85	0.8651	0.0355	0.0408	0.0436	0.0465	0.0476	0.0526	0.0592	0.0663	0.0741	0.0826
90	0.87718	0.0352	0.0405	0.0432	0.0461	0.0471	0.0521	0.0587	0.0657	0.0734	0.0819
95	0.88926	0.0348	0.0401	0.0428	0.0457	0.0467	0.0517	0.0581	0.0651	0.0728	0.0812
100	0.90133	0.0345	0.0397	0.0425	0.0453	0.0463	0.0512	0.0576	0.0645	0.0721	0.0804

Flooding Factors - Argonite SI Units

Temp T (^oC)	Specific Vapor Volume (m^3/kg)[d]	Weight Requirements of Hazard Volume, W/V (kg/m^3) Design Concentrations (% by Volume) SI Units									
		34.00	**38.00**	**40.00**	**42.00**	**42.70**	**46.00**	**50.00**	**54.00**	**58.00**	**62.00**
-40	0.5637	0.7380	0.8491	0.9073	0.9675	0.9891	1.0945	1.2312	1.3793	1.5409	1.7186
-35	0.56324	0.7225	0.8312	0.8882	0.9472	0.9683	1.0714	1.2053	1.3503	1.5084	1.6825
-30	0.58732	0.7076	0.8141	0.8699	0.9277	0.9483	1.0494	1.1804	1.3224	1.4774	1.6478
-25	0.5994	0.6933	0.7977	0.8524	0.9089	0.9292	1.0282	1.1566	1.2957	1.4475	1.6145
-20	0.61148	0.6796	0.7819	0.8355	0.8910	0.9108	1.0078	1.1337	1.2701	1.4189	1.5826
-15	0.62355	0.6664	0.7667	0.8193	0.8737	0.8931	0.9883	1.1117	1.2454	1.3913	1.5519
-10	0.63553	0.6537	0.7521	0.8037	0.8570	0.8761	0.9695	1.0905	1.2217	1.3649	1.5223
-5	0.64771	0.6415	0.7381	0.7887	0.8410	0.8598	0.9513	1.0702	1.1989	1.3394	1.4939
0	0.65979	0.6298	0.7245	0.7742	0.8256	0.8440	0.9339	1.0505	1.1769	1.3148	1.4665
5	0.67186	0.6184	0.7115	0.7603	0.8107	0.8288	0.9171	1.0316	1.1557	1.2911	1.4401
10	0.68394	0.6075	0.6989	0.7468	0.7964	0.8141	0.9009	1.0134	1.1353	1.2683	1.4146
15	0.696602	0.5969	0.6867	0.7338	0.7825	0.8000	0.8852	0.9958	1.1155	1.2462	1.3900
20	0.7081	0.5867	0.6750	0.7213	0.7692	0.7863	0.8701	0.9787	1.0965	1.2249	1.3663
25	0.72017	0.5769	0.6637	0.7092	0.7563	0.7731	0.8555	0.9623	1.0781	1.2044	1.3433
30	0.73225	0.5673	0.6527	0.6975	0.7438	0.7603	0.8413	0.9464	1.0603	1.1845	1.3211
35	0.74433	0.5581	0.6421	0.6861	0.7317	0.7480	0.8277	0.9310	1.0430	1.1652	1.2996
40	0.75641	0.5492	0.6318	0.6752	0.7200	0.7360	0.8144	0.9161	1.0263	1.1466	1.2789
45	0.76848	0.5405	0.6219	0.6645	0.7086	0.7244	0.8016	0.9017	1.0102	1.1285	1.2587
50	0.78056	0.5322	0.6122	0.6542	0.6977	0.7132	0.7892	0.8877	0.9945	1.1110	1.2392
55	0.79264	0.5240	0.6029	0.6442	0.6870	0.7023	0.7771	0.8742	0.9794	1.0941	1.2203
60	0.80471	0.5162	0.5938	0.6346	0.6767	0.6918	0.7654	0.8611	0.9646	1.0776	1.2020
65	0.81679	0.5085	0.5850	0.6252	0.6667	0.6815	0.7541	0.8483	0.9503	1.0617	1.1842
70	0.82887	0.5011	0.5765	0.6160	0.6569	0.6716	0.7431	0.8359	0.9365	1.0462	1.1669
75	0.84095	0.4939	0.5682	0.6072	0.6475	0.6619	0.7324	0.8239	0.9230	1.0311	1.1501
80	0.85302	0.4869	0.5602	0.5986	0.6383	0.6525	0.7220	0.8122	0.9099	1.0165	1.1338
85	0.8651	0.4801	0.5523	0.5902	0.6294	0.6434	0.7119	0.8009	0.8972	1.0023	1.1179
90	0.87718	0.4735	0.5447	0.5821	0.6207	0.6345	0.7021	0.7898	0.8848	0.9885	1.1025
95	0.88926	0.4670	0.5373	0.5742	0.6123	0.6259	0.6926	0.7791	0.8728	0.9750	1.0875
100	0.90133	0.4608	0.5301	0.5665	0.6040	0.6175	0.6833	0.7686	0.8611	0.9620	1.0729