

Sphere Function					
Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	0	0	0	0
PSO	20	0	0	0	0
PSO	30	0	0.00E+00	0.00E+00	0
PSO	40	0	0.00E+00	0.00E+00	0
CA	10	0	0	0	0
CA	20	0	0	0	0
CA	30	5.93E-170	8.31E-164	4.81E-165	0
CA	40	1.31E-63	3.84E-58	1.70E-59	6.99E-59
FA	10	6.00E-179	2.28E-178	1.52E-178	0
FA	20	8.18E-178	1.52E-177	1.13E-177	0
FA	30	2.06E-177	4.50E-177	3.61E-177	0
FA	40	6.42E-177	1.02E-176	8.04E-177	0
BBO	10	2.09E-21	4.69E-19	8.23E-20	1.30E-19
BBO	20	5.63E-13	5.96E-11	1.32E-11	1.33E-11
BBO	30	2.15E-07	2.36E-06	6.82E-07	4.01E-07
BBO	40	6.40E-05	0.00021085	0.00013377	3.41E-05
DE	10	0	0	0	0
DE	20	2.10E-236	3.31E-234	8.64E-235	0
DE	30	1.47E-158	6.68E-157	1.92E-157	1.73E-157
DE	40	3.85E-117	3.29E-116	1.29E-116	8.34E-117
D-EA	10	8.68E-05	45.253	4.9312	11.922
D-EA	20	0.0028629	30.592	3.0612	8.2898
D-EA	30	0.012551	35.605	4.3719	9.9253
D-EA	40	0.098844	35.517	3.7405	8.8358
P-EA	10	0.00E+00	1.91E-06	4.45E-07	6.50E-07
P-EA	20	9.54E-07	5.72E-06	3.31E-06	1.39E-06
P-EA	30	3.81E-06	1.05E-05	6.74E-06	1.75E-06
P-EA	40	7.63E-06	1.91E-05	1.14E-05	2.56E-06

Schewefel Function					
Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	572.45	1993.8	1512.8	302.62
PSO	20	2526.8	4757.6	3636.4	591.1
PSO	30	4263.9	7165.9	5879.3	734.55
PSO	40	6139.3	9830.9	7925.2	890.69
CA	10	-1979.5	-23.482	-649.22	621.07
CA	20	-6443.2	-208.74	-1591.12	1535.053
CA	30	-11613	-61.875	-2685.1	2732.8
CA	40	-9677	-24.188	-2955.6	2772.6
FA	10	0.00012728	712.15	366.8	192.67
FA	20	712.15	2059	1437.7	350.98
FA	30	1284.6	3873.6	2540.3	522.54
FA	40	2057.5	5064	3903.9	625.92
BBO	10	0.00012728	1026.5	397.43	234.24
BBO	20	690.89	2665	1563.5	469.4
BBO	30	2131.9	4106	3026.9	500.24
BBO	40	3375.7	6317.1	4824.3	799.94
DE	10	0.00012728	0.00012728	0.00012728	0
DE	20	0.00025455	0.00025455	0.00025455	0
DE	30	0.00038183	0.00038183	0.00038183	0
DE	40	0.0005091	0.0005091	0.0005091	0
D-EA	10	4157	4278.9	4189.7	25.155
D-EA	20	8235.3	8459.7	8373.1	38.238
D-EA	30	12464	12644	12569	32.232
D-EA	40	16622	16782	16731	39.34
P-EA	10	0.00010326	0.00062508	0.00023687	0.00010987
P-EA	20	0.0013646	246.47	75.276	82.593
P-EA	30	139.23	971.67	477.17	170.4
P-EA	40	504.27	1682.8	1072.4	280.98

Salomon					
Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	0.099873	0.19987	0.13654	0.049013
PSO	20	0.19987	0.39987	0.26321	0.07184
PSO	30	0.29987	0.89987	0.50321	0.1129
PSO	40	0.49987	0.99987	0.67321	0.14126
CA	10	0.19988	0.2188	0.20152	0.0039389
CA	20	0.60986	0.99997	0.83404	0.079214
CA	30	1.7933	2.2324	2.0259	0.1266
CA	40	3.3407	4.6084	3.9355	0.32555
FA	10	0.099873	0.099873	0.099873	6.13E-15
FA	20	0.099873	0.099873	0.099873	8.85E-15
FA	30	0.099873	0.19987	0.10654	0.025371
FA	40	0.099873	0.19987	0.18987	0.030513
BBO	10	0.099873	0.19987	0.11987	0.040684
BBO	20	0.19987	0.29987	0.24654	0.050742
BBO	30	0.29987	0.49987	0.38654	0.050742
BBO	40	0.39987	0.59987	0.50654	0.063968
DE	10	0.099873	0.099873	0.099873	1.73E-12
DE	20	0.099873	0.19987	0.10321	0.018257
DE	30	0.19987	0.19987	0.19987	5.71E-09
DE	40	0.19987	0.29987	0.24322	0.050388
D-EA	10	0.95488	4.4751	2.6394	0.87264
D-EA	20	1	4.5372	2.8257	0.94391
D-EA	30	0.47452	5.0562	2.8974	1.2089
D-EA	40	0.55258	4.6346	3.0234	1.1841
P-EA	10	0.099873	0.19987	0.15937	0.046742
P-EA	20	0.19987	0.49987	0.34661	0.069556
P-EA	30	0.39987	0.79987	0.5494	0.10837
P-EA	40	0.49987	0.99987	0.72712	0.15343

Michalewicz					
Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	-9.4721	-8.0072	-9.0374	0.36439
PSO	20	-18.994	-16.649	-17.687	0.57809
PSO	30	-28.065	-24.473	-26.689	1.0636
PSO	40	-37.35	-29.875	-35.007	1.7097
CA	10	-6.1475	-4.3883	-5.0572	0.50164
CA	20	-8.4372	-5.7854	-6.5095	0.52011
CA	30	-9.1387	-6.9385	-7.9949	0.56245
CA	40	-11.808	-8.3307	-9.776	0.86865
FA	10	-9.6184	-8.9667	-9.3933	0.15921
FA	20	-18.979	-16.637	-18.142	0.55129
FA	30	-27.933	-24.117	-26.824	0.91203
FA	40	-36.593	-32.983	-35.217	0.88383
BBO	10	-9.6552	-8.7551	-9.2826	0.21006
BBO	20	-19.217	-17.756	-18.549	0.37815
BBO	30	-28.834	-25.95	-27.338	0.68131
BBO	40	-36.921	-32.18	-35.141	1.0255
DE	10	-9.6602	-9.6602	-9.6602	2.27E-07
DE	20	-19.637	-19.632	-19.637	0.00089688
DE	30	-29.631	-29.274	-29.611	0.068866
DE	40	-35.729	-34.221	-34.995	0.42376
D-EA	10	-9.253	-6.2612	-7.9563	0.72366
D-EA	20	-17.242	-12.574	-14.587	1.185
D-EA	30	-22.955	-18.075	-20.466	1.1174
D-EA	40	-30.767	-23.112	-27.282	2.0508
P-EA	10	-9.7329	-9.4903	-9.6215	0.062597
P-EA	20	-19.507	-18.686	-19.212	0.18841
P-EA	30	-29.276	-27.99	-28.423	0.32205
P-EA	40	-38.103	-36.294	-37.234	0.44734

## Rastrigin

Algo	Dimens	minima	maxMinima	meanMinima	stdMinima
PSO	10	1.9899	17.909	9.5184	3.8551
PSO	20	10.945	50.743	24.708	8.4791
PSO	30	23.879	81.586	39.666	12.162
PSO	40	29.849	148.25	62.981	22.015
CA	10	2.9849	24.151	17.129	5.8585
CA	20	90.025	136.52	114.69	10.067
CA	30	208.26	298.81	252.28	19.16
CA	40	363.38	491.96	416.96	31.828
FA	10	0.99496	8.9546	3.4492	1.8427
FA	20	6.9647	30.844	17.478	6.4675
FA	30	21.889	61.687	42.485	11.715
FA	40	41.788	100.49	64.374	16.206
BBO	10	6.91E-08	11.939	3.9798	2.6518
BBO	20	4.9748	19.899	9.7953	3.0941
BBO	30	9.9497	34.854	21.205	6.1141
BBO	40	21.944	55.739	34.77	9.0567
DE	10	0	0	0	0
DE	20	0	0	0	0
DE	30	0	0	0	0
DE	40	4.29E-09	42.369	27.331	9.7532
D-EA	10	0.02062	82.675	13.995	20.469
D-EA	20	1.7334	79.332	28.2	20.197
D-EA	30	1.2495	116.35	48.725	27.731
D-EA	40	15.552	123.34	61.629	26.621
P-EA	10	0	0.0001892	2.52E-05	6.54E-05
P-EA	20	0	0.0007568	0.00030903	0.00020775
P-EA	30	0.0001892	0.99591	0.034017	0.18167
P-EA	40	0.0005676	1.9918	0.29989	0.648

Ackley					
Algo	Dimensi	minima	maxMinima	meanMinima	stdMinima
PSO	10	8.88E-16	4.44E-15	4.32E-15	6.49E-16
PSO	20	4.44E-15	1.4235	0.047451	0.2599
PSO	30	7.99E-15	1.3404	0.11423	0.35267
PSO	40	2.22E-14	2.1705	0.62258	0.77183
CA	10	8.88E-16	1.1551	0.038505	0.2109
CA	20	4.44E-15	1.84	0.061333	0.33594
CA	30	7.99E-15	7.99E-15	7.99E-15	0
CA	40	1.51E-14	20.595	5.2199	7.7174
FA	10	4.44E-15	7.99E-15	6.69E-15	1.74E-15
FA	20	7.99E-15	1.51E-14	9.41E-15	2.89E-15
FA	30	7.99E-15	2.22E-14	1.44E-14	3.89E-15
FA	40	1.51E-14	2.93E-14	1.82E-14	5.17E-15
BBO	10	2.43E-10	3.15E-09	9.69E-10	6.57E-10
BBO	20	7.26E-06	3.76E-05	1.99E-05	9.38E-06
BBO	30	0.0021324	0.0062484	0.0033662	0.00093804
BBO	40	0.033534	0.062054	0.049341	0.0075719
DE	10	8.88E-16	4.44E-15	4.20E-15	9.01E-16
DE	20	4.44E-15	4.44E-15	4.44E-15	0
DE	30	4.44E-15	7.99E-15	6.57E-15	1.77E-15
DE	40	7.99E-15	7.99E-15	7.99E-15	0
D-EA	10	7.7953	17.338	13.83291	2.229134145
D-EA	20	1.3112	15.09	8.693	3.2981
D-EA	30	1.0629	13.817	7.7403	3.0308
D-EA	40	0.58303	12.938	6.5468	3.4055
P-EA	10	0.0012403	0.0033038	0.0024988	0.00042259
P-EA	20	0.0019658	0.0033038	0.0027419	0.00031819
P-EA	30	0.0020307	0.0031408	0.0026382	0.00028941
P-EA	40	0.0021548	0.0033629	0.0026831	0.00025611

Griewank					
Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	0.017236	0.14768	0.073065	0.032356
PSO	20	0	0.11765	0.024007	0.0245
PSO	30	0	0.066158	0.011959	0.017868
PSO	40	0	0.080382	0.010886	0.016402
CA	10	0.11082	0.52439	0.30213	0.11852
CA	20	0	0.12023	0.045309	0.029916
CA	30	0	0.11049	0.014598	0.021431
CA	40	0	0.041768	0.010998	0.010207
FA	10	0.007396	0.095895	0.034952	0.024234
FA	20	0	0.027093	0.0048467	0.006322
FA	30	0	0	0	0
FA	40	0	0.007396	0.00024653	0.0013503
BBO	10	3.33E-16	0.027093	0.014855	0.0075324
BBO	20	4.79E-09	0.063821	0.014068	0.014855
BBO	30	0.0002344	0.054168	0.021569	0.016186
BBO	40	0.037367	0.12404	0.068636	0.017588
DE	10	0	0	0	0
DE	20	0	0	0	0
DE	30	0	0	0	0
DE	40	0	0	0	0
D-EA	10	0.088675	1.1177	0.45468	0.27851
D-EA	20	0.073823	1.4592	0.49478	0.36466
D-EA	30	0.028021	1.9932	0.55922	0.43181
D-EA	40	0.035501	1.501	0.37691	0.34913
P-EA	10	7.34E-07	0.081209	0.038272	0.02266
P-EA	20	3.06E-07	0.11452	0.028415	0.030614
P-EA	30	4.01E-07	0.11043	0.031511	0.028502
P-EA	40	4.60E-07	0.12258	0.034726	0.034005

Rotated Hyper-Ellipsoid

Algo	Dimensio	minima	maxMinima	meanMinima	stdMinima
PSO	10	0	0	0	0
PSO	20	0	0	0	0
PSO	30	0	0	0	0
PSO	40	0	2.1739e-322	1.4822e-323	0
CA	10	0	0	0	0
CA	20	0	0	0	0
CA	30	2.13E-166	6.87E-161	3.80E-162	1.39E-161
CA	40	4.28E-60	1.86E-54	7.52E-56	3.37E-55
FA	10	7.48E-176	1.90E-175	1.23E-175	0
FA	20	1.28E-174	2.20E-174	1.78E-174	0
FA	30	6.45E-174	1.02E-173	8.02E-174	0
FA	40	1.97E-173	2.87E-173	2.43E-173	0
BBO	10	9.40E-19	9.16E-16	1.03E-16	1.83E-16
BBO	20	2.00E-09	1.67E-07	1.98E-08	3.12E-08
BBO	30	0.00036647	0.0030651	0.0014952	0.00079528
BBO	40	0.20191	0.64451	0.33386	0.091434
DE	10	0	0	0	0
DE	20	6.28E-233	9.97E-231	1.87E-231	0
DE	30	1.53E-155	1.55E-153	3.50E-154	3.58E-154
DE	40	8.99E-114	1.22E-112	3.10E-113	2.41E-113
D-EA	10	337.5	8634.7	2327.2	1766.5
D-EA	20	12.276	13020	4400.7	2858.5
D-EA	30	1291.9	12813	5613.7	3613.7
D-EA	40	5.2428	22053	7677.8	6372.4
P-EA	10	2.86E-06	4.58E-05	2.37E-05	1.03E-05
P-EA	20	6.96E-05	0.00015068	0.00010297	2.32E-05
P-EA	30	0.000103	0.00032234	0.00021604	4.48E-05
P-EA	40	0.00028896	0.0004549	0.00037076	4.66E-05



Quartic					
Algo	Dimen	minima	maxMinima	meanMinima	stdMinima
PSO	10	1.31E-05	0.00011717	5.39E-05	2.27E-05
PSO	20	9.85E-05	0.00045725	0.0002078	7.82E-05
PSO	30	0.00026691	0.0016173	0.00072878	0.00032946
PSO	40	0.00059446	0.0045247	0.0015518	0.0006818
CA	10	0.00028521	0.0024143	0.0013363	0.00058814
CA	20	0.0055925	0.017852	0.01139	0.0029012
CA	30	0.022869	0.06444	0.042542	0.0089055
CA	40	0.063016	0.14355	0.10431	0.020839
FA	10	2.34E-07	2.83E-06	1.33E-06	7.55E-07
FA	20	3.34E-06	1.66E-05	8.53E-06	3.49E-06
FA	30	6.91E-06	3.44E-05	2.16E-05	7.24E-06
FA	40	2.59E-05	8.49E-05	4.94E-05	1.47E-05
BBO	10	1.13E-05	6.14E-05	2.86E-05	1.25E-05
BBO	20	3.06E-05	0.00022916	0.00012926	5.14E-05
BBO	30	0.0002123	0.00041813	0.00032635	5.38E-05
BBO	40	0.00044836	0.00097545	0.00071041	0.00015479
DE	10	6.64E-05	0.00035578	0.00019119	6.66E-05
DE	20	0.00030549	0.0012865	0.00085012	0.00024319
DE	30	0.0011122	0.0032615	0.002072	0.00052121
DE	40	0.0022933	0.00492	0.0038604	0.00062179
D-EA	10	0.00076195	0.64374	0.039002	0.11516
D-EA	20	0.00041411	1.2548	0.25658	0.40835
D-EA	30	0.0078209	2.9115	0.43054	0.6618
D-EA	40	5.2428	22053	7677.8	6372.4
P-EA	10	2.29E-05	0.00021024	8.86E-05	4.22E-05
P-EA	20	0.00020549	0.00061516	0.00035898	0.00011608
P-EA	30	0.00017883	0.0016658	0.00070751	0.00033056
P-EA	40	0.00052482	0.0020114	0.0012642	0.00035349

Rosenbrock

Algo	Dimension	minima	maxMinima	meanMinima	stdMinima
PSO	10	7.99E-09	0.0055142	0.00025944	0.001031
PSO	20	0.06638	10.192	4.4496	2.763
PSO	30	9.2273	20.979	14.039	2.8993
PSO	40	18.95	30.508	23.298	2.9768
CA	10	0.00086053	3.9885	0.40012	1.2165
CA	20	0.0025044	3.9921	1.2	1.8579
CA	30	0.0046061	7.0241	1.2198	2.0342
CA	40	0.028479	25.64	16.425	8.7626
FA	10	2.98E-28	2.72E-27	9.99E-28	4.76E-28
FA	20	1.56E-28	2.28E-27	9.71E-28	5.35E-28
FA	30	1.93E-28	3.9866	0.13289	0.72785
FA	40	3.75E-28	3.9866	0.13289	0.72785
BBO	10	3.79E-02	7.60E+00	3.02E-01	1.38E+00
BBO	20	10.229	19.379	11.826	1.462
BBO	30	24.522	28.684	25.339	0.69148
BBO	40	33.776	39.287	36.343	0.91369
DE	10	0.036907	1.3369	0.50473	0.32887
DE	20	7.2151	12.447	10.149	1.5244
DE	30	17.821	22.347	19.973	1.0738
DE	40	28.436	31.926	30.117	0.99319
D-EA	10	8.775	16.925	10.455	2.2465
D-EA	20	18.998	85.398	35.996	19.327
D-EA	30	29.131	120.14	50.865	22.456
D-EA	40	39.546	162.92	76.362	28.13
P-EA	10	5.9148	7.6153	6.9349	0.46097
P-EA	20	16.721	17.527	17.362	0.25146
P-EA	30	26.762	28.153	27.351	0.27201
P-EA	40	36.135	39.246	37.443	0.5627