Comparison tables: BBOB 2010 noisy testbed

The BBOBies

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Abstract

This document provides tabular results of the workshop for Black-Box Optimization Benchmarking at GECCO 2010, see `http://coco.gforge.inria.fr/doku.php?id=bbob-2010`. More than 30 algorithms have been tested on 24 benchmark functions in dimensions between 2 and 40. A description of the used objective functions can be found in [3, 1]. The experimental set-up is described in [2].

The performance measure provided in the following tables is the expected number of objective function evaluations to reach a given target function value (ERT, expected running time), divided by the respective value for the best algorithm. Consequently, the best (smallest) value is 1 and the value 1 appears in each column at least once. See [2] for details on how ERT is obtained. Bold entries in the table correspond to values below 3 or the top-three best values.

Table 1: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	2.1	5.6	10	13	14	16	17	18	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.7**	**1.8**	**2.0**	**2.8**	4.1	5.0	5.7	7.2	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.6**	**1.7**	**2.3**	3.2	4.2	4.6	6.1	7.6	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.0**	**1**	**2.1**	3.0	3.6	4.2	5.2	6.8	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.0**	**2.3**	3.1	3.6	6.8	7.2	8.3	9.4	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.2**	**1.8**	**2.4**	**3.0**	3.5	4.1	4.6	5.6	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.4**	**1.2**	**1.6**	**2.3**	3.1	3.5	4.2	5.1	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.4**	**1.2**	**1.4**	**1.8**	**2.4**	**2.8**	**3.0**	**3.8**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.0**	**1.8**	**1.6**	**2.3**	**2.8**	3.4	3.5	4.5	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1.4**	**1.2**	**1.0**	**1.0**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	10	13	6.1	6.6	6.0	8.0	20	26	53	1541	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.3**	**1.8**	**1.8**	3.3	4.1	4.7	5.7	7.1	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.5**	**2.3**	**2.8**	3.2	4.2	4.9	6.3	7.5	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.0**	**2.2**	5.0	10	15	19	22	28	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.1**	**1.3**	**1**	**1**	**1.2**	**1.2**	**1.2**	**1.2**	NEWUOA
Basic RCGA	**1**	**1**	**1**	**2.3**	16	27	33	46	64	118	Basic RCGA
SPSA	24	41	75	113	135	391	381	365	365	395	SPSA

Table 2: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	1.8	7.4	14	25	35	41	42	44	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.8**	**1.5**	**2.0**	**1.9**	**1.8**	**2.3**	**2.7**	3.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.7**	**1.3**	**1.2**	**1.6**	**1.8**	**1.9**	**2.2**	3.1	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.6**	**1.0**	**1.6**	**1.7**	**1.7**	**1.9**	**2.3**	3.1	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.6**	**1.3**	**1.6**	**1.7**	**2.0**	**2.1**	**2.8**	4.3	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.0**	**1.3**	**1.5**	**1.4**	**1.4**	**1.5**	**1.6**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.0**	**1.1**	**1.2**	**1.4**	**1.3**	**1.5**	**1.8**	**2.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.6**	**1.2**	**1**	**1**	**1**	**1.0**	**1.3**	**1.6**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.7**	**1.1**	**1.2**	**1.0**	**1.1**	**1.1**	**1.3**	**1.8**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.2**	**2.0**	**1**	**1.0**	**1.5**	**1.1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	13	16	8.2	3.4	15	12	13	12	207	1347	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.1**	**1.6**	**2.3**	**1.9**	**1.9**	**2.2**	**2.4**	3.2	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.4**	**1.6**	**2.2**	**1.7**	**1.6**	**2.0**	**2.3**	**3.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.2**	**2.0**	4.1	5.6	6.7	7.2	9.5	12	CMA+DE-MOS
NEWUOA	**1**	**1**	3.6	5.2	3.6	**2.3**	**1.8**	**1.6**	**1.5**	**1.5**	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1.6**	9.2	15	15	20	30	51	Basic RCGA
SPSA	9.1	16	14	113	103	85	69	238	256	1437	SPSA

Table 3: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	1.4	6.0	10	14	19	22	31	47	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.2**	**2.2**	**2.5**	3.1	3.3	3.9	3.5	3.3	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.0**	**1.2**	**1.9**	**2.7**	3.1	3.6	3.1	3.1	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.6**	**1.3**	**2.0**	**2.7**	**2.9**	3.3	**3.0**	**2.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.0**	**2.1**	3.5	3.3	3.3	3.6	3.3	3.3	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.6**	**1.4**	**2.1**	**2.2**	**2.3**	**2.7**	**2.4**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.8**	**1**	**1.7**	**2.1**	**2.2**	**2.6**	**2.2**	**2.1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.5**	**1.1**	**1.3**	**1.6**	**1.7**	**1.9**	**1.7**	**1.6**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.8**	**1.5**	**1.7**	**1.8**	**2.0**	**2.2**	**2.0**	**1.8**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.0**	**1.2**	**1.0**	**1**	**1**	**1**	**1.1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	12	19	12	4.5	5.6	6.5	8.5	17	13	27	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.1**	**1.6**	**2.1**	**2.8**	**2.9**	3.6	3.2	3.0	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.5**	**2.2**	**2.7**	**2.9**	3.3	3.8	3.5	3.3	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.6**	**1.7**	6.4	10	13	14	13	14	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.1**	**1.0**	**1**	**1.0**	**1.0**	**1.1**	**1**	**1.1**	NEWUOA
Basic RCGA	**1**	**1**	**1**	**2.5**	10	17	27	38	42	62	Basic RCGA
SPSA	22	38	237	128	124	126	361	918	1785	1794	SPSA

Table 4: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	1.5	2.5	7.9	42	113	212	242	260	271	297	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	**1.7**	3.3	**2.6**	4.9	7.9	8.9	10	9.5	9.5	13	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	3.2	**2.0**	3.7	4.2	4.9	5.1	5.0	4.9	4.7	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.3**	**1.5**	**1.7**	**2.4**	3.8	4.8	5.6	5.7	5.9	5.8	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.4	3.8	3.1	6.4	10	13	15	28	28	33	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.7**	**2.8**	**2.3**	**2.2**	**2.4**	**1.6**	**1.6**	**1.6**	**1.6**	**1.5**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.8**	**2.5**	**1.9**	3.1	**2.0**	**1.4**	**1.3**	**1.3**	**1.3**	**1.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.0**	**1**	**1**	**1.3**	**1.5**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.1**	**1.3**	**1.2**	**2.0**	**2.5**	**2.1**	**2.0**	**1.9**	**1.9**	**1.8**	(1,4s)-CMA-ES
avg NEWUOA	**2.1**	**2.2**	**1.5**	**1.3**	**1.1**	**2.0**	**2.7**	3.1	3.2	3.8	avg NEWUOA
CMA-EGS (IPOP,r1)	18	14	6.9	3.3	22	41	102	95	144	174	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**1.7**	**1.2**	**1**	**1**	**1.0**	**1.1**	**1.1**	**1.1**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.1**	**2.6**	**1.7**	**2.5**	**2.3**	**1.8**	**2.0**	**2.0**	**2.1**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.8**	**2.2**	**1.9**	**2.6**	**2.4**	**2.6**	**2.8**	3.1	3.3	CMA+DE-MOS
NEWUOA	**2.9**	**2.3**	**2.2**	**2.3**	**2.9**	3.7	5.2	6.1	5.9	5.6	NEWUOA
Basic RCGA	**1.3**	**1.6**	**2.6**	3.2	29	50	125	249	806	*10e-5/5e4*	Basic RCGA
SPSA	244	232	287	294	3694	*39e-2/1e5*	.	.	.	.	SPSA

Table 5: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.4	3.6	11	55	186	278	354	383	402	449	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.4**	**2.6**	**1.8**	4.8	8.8	12	17	28	33	30	(1,2)-CMA-ES
(1,2m)-CMA-ES	**2.0**	**1.9**	**2.9**	**2.3**	**2.2**	5.6	9.3	18	18	17	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.1**	**1.1**	3.2	8.7	12	16	20	18	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.0**	**1.8**	**2.9**	4.8	4.2	11	23	60	60	71	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.8**	**2.2**	**1.4**	4.7	**2.8**	3.2	3.4	3.2	3.1	**2.9**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.1**	**1.3**	**1**	3.0	**1.8**	**2.4**	**2.1**	**2.2**	**2.1**	**2.0**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.3**	**1.5**	**1.4**	**2.3**	**2.5**	**3.0**	**2.9**	**3.0**	3.3	3.0	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.4**	3.3	**1.3**	3.3	**3.0**	4.1	3.9	3.9	3.8	3.5	(1,4s)-CMA-ES
avg NEWUOA	**2.7**	**2.1**	**1.7**	**1.8**	**2.2**	5.7	11	17	52	95	avg NEWUOA
CMA-EGS (IPOP,r1)	21	12	4.5	**2.3**	39	159	515	1122	1659	3153	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.5	**1.8**	**1.6**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.7**	**2.1**	**1.4**	**2.2**	**2.2**	3.6	3.1	**2.9**	**2.9**	**2.8**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.3**	**1.5**	**1**	**1.6**	**1.9**	**1.8**	**1.9**	**2.0**	**2.2**	CMA+DE-MOS
NEWUOA	**2.6**	**1.5**	**1.9**	**2.2**	3.0	4.2	9.2	15	14	30	NEWUOA
Basic RCGA	**1.4**	**2.2**	**2.0**	**1.5**	13	33	89	236	569	*18e-5/5e4*	Basic RCGA
SPSA	217	170	78	204	1418	5355	*34e-2/1e5*	.	.	.	SPSA

Table 6: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.4	3.4	7.0	22	93	155	184	208	222	246	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	3.3	4.3	11	19	10	8.5	8.0	7.5	7.2	6.7	(1,2)-CMA-ES
(1,2m)-CMA-ES	**2.1**	**2.8**	**2.6**	4.4	3.6	3.5	3.7	3.5	3.6	3.5	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.6**	**1.9**	**2.1**	**1.4**	3.6	**2.8**	3.0	**3.0**	**2.9**	**2.8**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.0**	**2.0**	**1.5**	30	23	19	18	20	19	21	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.3**	**1.9**	**2.4**	3.9	**2.0**	**1.5**	**1.5**	**1.4**	**1.4**	**1.5**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.2**	**1**	**1.6**	**2.2**	**1.5**	**1.2**	**1.3**	**1.2**	**1.3**	**1.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.0**	**1.8**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.2**	**1.0**	**1**	3.4	**2.2**	**1.7**	**1.6**	**1.5**	**1.5**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1.9**	**1.3**	**1.4**	**1.6**	**1.6**	**1.9**	3.1	3.3	4.7	7.8	avg NEWUOA
CMA-EGS (IPOP,r1)	23	21	37	32	11	8.8	8.3	7.6	39	39	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.4**	**2.1**	3.2	**2.7**	**1.6**	**1.6**	**1.5**	**1.5**	**1.5**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**1.3**	**1.5**	3.2	**2.5**	**2.4**	**2.5**	**2.5**	**2.5**	**2.6**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.3**	**2.4**	4.4	**2.9**	3.2	3.6	3.5	3.9	4.4	CMA+DE-MOS
NEWUOA	**1.3**	**1.2**	**1.0**	**2.2**	**1.5**	**2.1**	3.1	3.2	5.3	7.6	NEWUOA
Basic RCGA	**1**	**1.9**	**2.6**	4.2	14	94	295	381	726	2913	Basic RCGA
SPSA	426	532	1013	2191	2546	9115	*40e-2/1e5*	.	.	.	SPSA

Table 7: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	1.6	12	22	37	59	75	141	206	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	17	8.1	6.3	6.0	6.8	10	10	13	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.5**	**2.9**	**2.6**	**2.8**	**2.2**	**2.1**	**1.3**	**1.6**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.3**	**1.2**	**1.2**	**2.2**	**2.1**	**2.5**	**1.5**	**2.0**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	3.1	**1.4**	3.3	9.2	10	12	6.9	9.3	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	5.9	**2.0**	4.9	3.9	**2.9**	**2.8**	**1.9**	**1.9**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	4.1	**1.2**	**2.8**	**2.3**	**1.8**	**1.7**	**1.5**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1.3**	**1.2**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	3.4	6.3	5.0	3.6	3.3	**2.8**	**1.8**	**2.0**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	7.7	18	15	20	18	35	29	45	avg NEWUOA
CMA-EGS (IPOP,r1)	9.2	14	11	3.9	7.1	5.5	34	112	138	311	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.9**	**1.5**	**1.7**	**2.0**	**1.5**	**1.6**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	3.1	**1.1**	**1.7**	**1.9**	**1.5**	**1.6**	**1.0**	**1.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.4**	**1.1**	3.9	6.9	8.0	7.8	5.1	4.6	CMA+DE-MOS
NEWUOA	**1**	**1**	15	12	20	22	23	32	41	43	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1.1**	5.8	13	13	12	12	20	Basic RCGA
SPSA	16	21	272	814	2429	6194	5209	18783	*27e-3/1e5*	.	SPSA

Table 8: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	2.1	15	164	586	1170	2574	3799	6046	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.2**	7.4	13	3.4	4.5	21	*26e-4/1e4*	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	13	17	5.5	7.9	60	*29e-4/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	13	7.8	3.4	13	56	*60e-4/1e4*	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	7.3	12	6.1	11	*56e-4/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	21	12	**2.5**	**2.6**	11	55	37	*61e-5/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	37	13	3.6	**2.9**	6.9	18	*50e-5/1e4*	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	5.9	14	3.7	7.0	8.3	17	*48e-5/1e4*	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	62	26	5.4	4.6	7.0	18	39	*51e-5/1e4*	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	37	42	13	22	24	*14e-3/6e3*	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1612	6028	1734	309	88	82	78	61	183	243	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**2.4**	5.9	**2.2**	**1**	**1**	**1**	**1**	**1.0**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.6**	**3.8**	**1**	**1.2**	**1.4**	**1.0**	**1.1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.0**	**1**	**1.4**	**2.1**	**2.4**	**4.2**	**4.3**	**4.9**	CMA+DE-MOS
NEWUOA	**1**	**1**	52	56	15	27	36	*13e-3/6e3*	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1.3**	7.2	24	31	28	45	*21e-5/5e4*	Basic RCGA
SPSA	27	126	88	100	62	107	*28e-4/1e5*	.	.	.	SPSA

Table 9: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	1.5	6.5	18	32	46	65	85	114	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.5**	**1.5**	**2.5**	**1.6**	**1.6**	3.1	**2.8**	**2.9**	3.9	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.6**	**1.4**	**1.0**	**1.5**	**1.7**	**1.7**	**1.8**	**2.3**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1.0**	**1**	**1.2**	**1.4**	**1.3**	**1.3**	**1.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	3.9	**2.7**	**1.8**	6.7	6.9	5.5	4.6	6.5	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.6**	**1.6**	**1.1**	**1.0**	**1.3**	**1.3**	**1.4**	**1.6**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	3.1	**1.9**	**1.4**	**1.1**	**1.4**	**1.4**	**1.3**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.5**	**1.4**	**1.1**	**1.0**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.3**	**1**	**1.0**	**1**	**1.2**	**1.1**	**1.1**	**1.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.0**	**1.9**	5.5	7.3	6.6	8.3	8.3	13	avg NEWUOA
CMA-EGS (IPOP,r1)	14	21	13	5.1	3.9	7.4	85	71	503	12353	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.9**	**1.5**	**1.2**	**1.2**	**1.5**	**1.8**	**1.7**	**2.0**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.2**	**1.1**	**1.4**	**1.2**	**1.5**	**1.6**	**1.9**	**2.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.4**	**1.7**	3.1	6.2	6.5	8.0	8.1	10	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.0**	**2.7**	4.3	5.9	7.6	10	12	15	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1.9**	5.4	10	14	18	20	28	Basic RCGA
SPSA	19	32	169	97	98	365	1216	1808	5210	*72e-6/1e5*	SPSA

Table 10: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.4	3.7	11	31	474	1082	2208	3495	3971	4118	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.4**	**1**	7.5	5.9	**2.3**	3.7	3.6	9.2	36	*22e-5/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	6.2	4.3	**2.5**	3.2	**1.4**	**2.0**	**2.3**	3.4	4.9	17	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.3**	**2.0**	**1.7**	3.1	**1**	**1.9**	4.3	5.0	18	36	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.2**	9.2	5.3	10	**2.8**	**2.9**	3.3	5.5	8.0	34	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.3**	**1.3**	**1.2**	3.4	**2.7**	3.6	**2.9**	**2.9**	3.7	5.5	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.0**	**1.8**	**1.0**	**1**	**1.1**	**1**	**1**	**1**	**1.2**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.1**	**1.4**	**2.3**	**2.9**	**1.4**	**2.6**	**2.1**	**2.5**	**2.8**	3.7	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.7**	**1.6**	**1.2**	4.5	**1.9**	**2.0**	**1.5**	**1.7**	**3.0**	3.0	(1,4s)-CMA-ES
avg NEWUOA	**1.6**	6.1	3.4	**2.8**	**1.6**	**1.8**	3.6	7.1	6.2	*12e-4/5e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	88	71	29	13	8.6	121	650	*99e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.4**	**1.4**	**1.2**	**2.0**	4.0	3.2	**1.7**	**1.1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	3.1	**2.1**	**1.5**	4.5	**2.7**	3.1	**1.7**	**1.2**	**1.1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.3**	**2.1**	159	11	9.0	4.8	3.2	**2.8**	**2.9**	CMA+DE-MOS
NEWUOA	9.4	8.7	5.3	8.1	**1.9**	**2.7**	4.8	22	*19e-4/5e3*	.	NEWUOA
Basic RCGA	**1**	**1.2**	**1**	**2.3**	3.4	13	17	24	58	174	Basic RCGA
SPSA	222	118	109	464	908	*38e-2/1e5*	.	.	.	.	SPSA

Table 11: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.5	4.2	13	91	1411	5390	24725	35229	39383	42765	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	7.1	6.4	5.5	5.5	3.1	3.1	*21e-3/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.4**	7.3	8.3	**2.3**	**2.9**	13	*30e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	7.9	15	10	5.8	**1.9**	5.9	*17e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	14	6.9	8.2	6.8	**1.7**	5.9	*15e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	25	19	11	3.1	**1.4**	**1.8**	**1.3**	**2.0**	3.8	*61e-4/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	23	13	10	4.3	**1.5**	**1.4**	**2.8**	*47e-4/1e4*	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	7.9	4.8	**3.4**	**2.9**	**1.6**	3.5	**2.8**	*12e-3/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	3.5	14	10	5.0	**2.3**	**1.7**	**1.9**	*17e-4/1e4*	.	.	(1,4s)-CMA-ES
avg NEWUOA	29	43	42	19	13	17	*26e-2/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	228	538	181	42	5.6	7.3	8.5	42	37	*22e-4/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.8**	**2.4**	6.9	**2.2**	**1**	**1.6**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	3.8	4.6	**2.2**	**1.2**	**1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.2**	**1.9**	**1.4**	5.3	3.8	**1.0**	**1.0**	**1.2**	**1.4**	CMA+DE-MOS
NEWUOA	55	29	19	16	4.8	5.3	*68e-3/6e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1**	**2.3**	**2.0**	**1.5**	6.6	19	*32e-5/5e4*	Basic RCGA
SPSA	29	20	48	99	44	273	*51e-3/1e5*	.	.	.	SPSA

Table 12: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.5	3.5	11	32	195	366	416	445	474	530	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.4**	**2.4**	**2.3**	5.8	10	6.8	7.2	7.9	10	8.9	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.2**	**1.4**	8.4	19	6.2	4.8	5.9	5.8	5.6	5.2	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.8**	**2.1**	**1.9**	10	3.3	**2.9**	3.1	3.1	3.0	**2.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.7	3.9	**2.0**	24	14	21	34	50	47	80	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.5**	**2.2**	**1.2**	**2.5**	**1.3**	**1.3**	**1.4**	**1.5**	**1.5**	**1.5**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.8**	**2.2**	**1.1**	**1**	**1**	**1.0**	**1.1**	**1.2**	**1.2**	**1.2**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.6**	**1.4**	**1.6**	3.4	**1.4**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.2**	**1.3**	**1.1**	**2.9**	**1.8**	**1.3**	**1.4**	**1.4**	**1.4**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1.8**	**1.5**	**1.3**	**2.5**	**1.8**	6.5	30	164	*19e-4/5e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	14	16	6.8	10	8.0	113	428	*12e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.2**	**1**	**1.2**	3.7	**1.6**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.0**	**1.3**	**1**	**1.2**	**1.0**	**1.3**	**1.6**	**1.6**	**1.6**	**1.8**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	**1.7**	**2.6**	**1.7**	**2.5**	**2.9**	3.1	3.4	3.8	CMA+DE-MOS
NEWUOA	**2.0**	**1.5**	**1.2**	**3.0**	**1.9**	**2.5**	14	156	146	*70e-5/5e3*	NEWUOA
Basic RCGA	**1.8**	**1.7**	**2.2**	**2.1**	6.7	61	118	158	348	645	Basic RCGA
SPSA	4746	2169	744	766	1076	3836	3379	*21e-2/1e5*	.	.	SPSA

Table 13: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.63	1.7	5.3	59	277	482	643	643	643	841	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.5**	5.3	3.6	**2.0**	**2.0**	3.3	4.7	4.7	4.7	6.2	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.8**	**2.9**	**2.0**	**1.1**	**1.2**	**1.1**	**1.4**	**1.4**	**1.4**	**2.1**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.2**	3.1	**2.0**	**1.8**	**1.8**	**2.7**	3.0	3.0	3.0	**2.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	11	5.3	4.4	**2.5**	**2.1**	**2.6**	5.3	5.3	5.3	5.8	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.6**	**1.2**	**1.3**	3.9	**2.1**	**1.9**	**2.2**	**2.2**	**2.2**	**2.2**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.4**	10	3.9	**1.7**	**1.9**	**1.7**	**2.2**	**2.2**	**2.2**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.7**	**2.4**	**1.6**	**1.9**	**2.4**	**1.7**	**1.4**	**1.4**	**1.4**	**1.1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.3**	3.5	5.7	**2.2**	**2.6**	**2.5**	**1.9**	**1.9**	**1.9**	**2.1**	(1,4s)-CMA-ES
avg NEWUOA	**1.6**	7.9	4.3	**1.6**	**1.5**	**2.7**	3.5	3.5	3.5	4.4	avg NEWUOA
CMA-EGS (IPOP,r1)	28	18	7.6	11	55	142	160	160	160	289	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.9**	**1.9**	**1**	**2.7**	**2.7**	**1.7**	**1.9**	**1.9**	**1.9**	**1.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	**1.7**	5.0	**2.3**	**1.5**	**1.3**	**1.3**	**1.3**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.3**	**1.4**	**1.0**	**1**	**1**	**1**	**1**	**1**	**1**	CMA+DE-MOS
NEWUOA	**1.9**	5.4	5.4	**1.5**	**2.6**	4.1	4.6	4.6	4.6	4.6	NEWUOA
Basic RCGA	**1.2**	**1**	**2.1**	**1**	13	23	22	22	22	21	Basic RCGA
SPSA	14	12	8.3	278	142	512	393	393	393	396	SPSA

Table 14: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.70	1.5	5.0	81	572	904	2236	2236	2236	3587	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.1**	15	6.2	4.1	3.9	13	30	30	30	40	(1,2)-CMA-ES
(1,2m)-CMA-ES	12	23	13	3.2	**2.8**	8.5	8.3	8.3	8.3	*32e-4 /1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	6.3	22	23	5.0	3.5	9.0	20	20	20	*63e-4 /1e4*	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	12	18	11	3.4	5.1	10	9.3	9.3	9.3	19	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.4**	24	15	3.1	**2.3**	5.6	5.7	5.7	5.7	20	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.1**	10	6.8	4.0	3.5	8.7	6.1	6.1	6.1	10	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	3.2	38	28	5.3	**2.7**	**4.6**	8.3	8.3	8.3	12	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	24	12	5.1	4.3	17	9.1	9.1	9.1	5.7	(1,4s)-CMA-ES
avg NEWUOA	**1.0**	36	26	4.3	16	29	40	40	40	25	avg NEWUOA
CMA-EGS (IPOP,r1)	441	329	187	52	37	45	25	25	25	54	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	7.5	7.6	**2.7**	**1.7**	**2.3**	**2.0**	**2.0**	**2.0**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.4**	**2.3**	**2.3**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.5**	**1.2**	**1**	5.5	5.8	**2.7**	**2.7**	**2.7**	**3.7**	CMA+DE-MOS
NEWUOA	**1.4**	22	61	14	23	97	39	39	39	*21e-2 /6e3*	NEWUOA
Basic RCGA	**1.3**	**1**	**1**	**1.7**	11	30	24	24	24	21	Basic RCGA
SPSA	71	147	95	49	50	120	141	141	141	*63e-4 /1e5*	SPSA

Table 15: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.60	1.9	5.0	25	100	183	203	203	203	274	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.7**	**2.0**	**1.6**	**1.8**	**2.1**	4.2	6.7	6.7	6.7	19	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.3**	**2.0**	**1.3**	**1.8**	**2.3**	5.3	5.3	5.3	16	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.6**	**1.1**	**1.7**	**1.3**	**1.6**	**2.9**	5.8	5.8	5.8	13	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.4**	**1**	**1.7**	**1.9**	**1.8**	7.3	8.8	8.8	8.8	18	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.2**	**1.2**	**1.5**	**1.3**	**1.2**	**2.2**	**2.4**	**2.4**	**2.4**	**3.0**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.9**	**1.3**	**1**	**1.3**	**1.5**	**2.2**	**2.2**	**2.2**	**2.2**	**2.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.6**	**1.2**	**1.1**	**1.5**	**1.0**	**1.2**	**1.9**	**1.9**	**1.9**	**1.8**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.1**	**2.3**	**1.9**	**1**	**1**	**1.9**	**2.1**	**2.1**	**2.1**	**2.6**	(1,4s)-CMA-ES
avg NEWUOA	**1.2**	**1.5**	**2.1**	**1.9**	3.2	4.3	5.3	5.3	5.3	6.9	avg NEWUOA
CMA-EGS (IPOP,r1)	11	6.4	4.5	4.5	111	319	535	535	535	1214	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**1.7**	**1.2**	**1.4**	**1.5**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.3**	**2.4**	**1.7**	3.7	**2.5**	**2.4**	**2.4**	**2.4**	**2.4**	**2.2**	IPOP-CMA-ES
CMA+DE-MOS	**1.2**	**1.1**	**1.3**	**1.5**	**2.1**	**2.0**	6.2	6.2	6.2	5.2	CMA+DE-MOS
NEWUOA	**1.7**	**1.4**	**1.4**	3.0	3.2	4.4	6.8	6.8	6.8	7.1	NEWUOA
Basic RCGA	**1.3**	**1.0**	**1.7**	15	27	99	110	110	110	134	Basic RCGA
SPSA	39	26	35	113	169	263	756	756	756	2395	SPSA

Table 16: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.7	15	114	527	1491	1573	1917	1974	2050	2169	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.3	5.6	**2.8**	**2.2**	**1.6**	4.6	7.4	16	33	66	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.4**	4.3	4.8	**2.6**	**2.5**	8.4	8.3	13	16	21	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**2.0**	**2.4**	**1**	**1.8**	4.5	6.4	16	34	69	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	9.2	18	3.4	**2.5**	**2.0**	11	*12e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.3**	**1**	3.3	**1.9**	**1.8**	**2.9**	3.0	**3.0**	4.1	3.9	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.3**	**1.1**	**2.1**	**2.4**	**1.8**	3.2	3.5	3.8	4.5	5.0	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.0**	3.7	3.1	**1.9**	**1.1**	**2.2**	**2.5**	3.1	3.5	3.9	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.8**	**1.1**	**1.4**	**2.3**	**1.6**	3.2	3.6	4.2	4.9	5.9	(1,4s)-CMA-ES
avg NEWUOA	5.5	**2.9**	**2.7**	**1.4**	**1.7**	6.4	9.0	40	*14e-3/5e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	46	61	110	103	187	416	733	*34e-2/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.2**	**1.3**	5.3	**2.1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.2**	**1.8**	6.0	4.0	**1.9**	**2.3**	**2.2**	**2.2**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.5**	**1.7**	7.2	7.9	3.6	3.6	3.1	3.2	**3.2**	**3.3**	CMA+DE-MOS
NEWUOA	3.8	**2.1**	**1.4**	**1.7**	**2.0**	7.0	41	*50e-3/5e3*	.	.	NEWUOA
Basic RCGA	**1.3**	**2.1**	**1**	10	25	56	116	176	170	337	Basic RCGA
SPSA	14	8.8	13	29	60	297	780	*43e-3/1e5*	.	.	SPSA

Table 17: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	5.3	21	137	2224	5898	6907	9411	10034	11058	13526	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.3	7.1	5.4	**1.8**	3.0	*12e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	5.9	6.2	4.9	**1.6**	3.1	22	16	*11e-2/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	8.0	6.4	6.0	**1.1**	3.8	*14e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	9.2	7.0	5.8	**2.6**	7.3	*31e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	10	7.7	6.0	**1.2**	**1.1**	10	*36e-3/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	13	5.1	4.4	**1**	3.3	10	*12e-2/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	13	11	5.8	**1.4**	**1.8**	6.1	15	*59e-3/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	7.1	7.2	**2.9**	**1.4**	**1.5**	3.9	16	*33e-3/1e4*	.	.	(1,4s)-CMA-ES
avg NEWUOA	14	27	15	3.1	4.6	*78e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	45	93	70	10	34	104	154	*17e-2/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.9	4.6	**3.1**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.9**	**3.9**	6.2	**1.4**	**1.1**	**1.5**	**1.4**	**1.4**	**1.6**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1**	**1.1**	**2.3**	**3.1**	**2.8**	**3.1**	**3.2**	**3.7**	CMA+DE-MOS
NEWUOA	39	21	18	3.7	14	*97e-2/6e3*	.	.	.	.	NEWUOA
Basic RCGA	**1.6**	**1.3**	3.6	6.7	8.5	13	17	*73e-3/5e4*	.	.	Basic RCGA
SPSA	52	34	48	39	72	216	158	*35e-2/1e5*	.	.	SPSA

Table 18: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.4	5.8	29	105	143	172	189	213	232	273	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	3.6	5.3	20	9.3	8.5	7.9	7.9	8.5	8.5	8.2	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.3**	**2.4**	16	8.8	7.8	6.9	6.6	6.1	6.1	5.7	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.1**	4.8	7.3	4.1	3.6	4.1	4.2	4.2	4.0	3.7	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.5**	5.9	47	26	30	35	38	35	33	29	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.7**	**2.8**	4.4	**2.3**	**1.9**	**2.0**	**2.0**	**1.8**	**1.9**	**1.8**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.7**	**2.8**	3.2	**1.7**	**1.8**	**1.7**	**1.7**	**1.8**	**1.7**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.7**	3.1	**2.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.1**	**1.7**	**1.7**	**1.4**	**1.5**	**1.4**	**1.4**	**1.4**	**1.4**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1.1**	**1**	**1**	**1.9**	5.7	13	32	338	*90e-5/5e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	20	61	22	22	247	897	2123	1886	6047	5147	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.4**	3.5	**2.8**	**1.6**	**1.7**	**1.6**	**1.8**	**1.8**	**1.8**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.8**	**2.8**	4.4	**2.4**	**2.6**	3.5	3.8	3.6	3.6	3.5	IPOP-CMA-ES
CMA+DE-MOS	**1.2**	4.4	3.1	**2.3**	**2.8**	**2.9**	3.4	3.8	4.2	5.1	CMA+DE-MOS
NEWUOA	**1**	**1.1**	**2.0**	**2.0**	5.1	15	54	109	312	*11e-4/5e3*	NEWUOA
Basic RCGA	**1.9**	**2.3**	27	49	214	370	432	1652	1517	*16e-3/5e4*	Basic RCGA
SPSA	29	171	434	369	2051	8144	*20e-2/1e5*	.	.	.	SPSA

Table 19: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.53	0.97	12	50	117	366	1153	1602	2770	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	**1.8**	**1.8**	4.5	5.0	5.5	6.1	11	52	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.9**	**2.3**	3.8	**2.9**	**2.1**	**1.7**	**1.8**	4.9	25	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	**1.4**	**2.4**	**2.0**	**1.8**	**2.9**	**2.5**	4.3	16	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.5**	**1.6**	**2.2**	3.1	5.2	6.8	12	91	*90e-6/1e4*	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**2.0**	**2.4**	**1.8**	**2.8**	**1.4**	**1.6**	**1.2**	**2.8**	16	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.5**	3.1	**1.6**	**1.1**	**2.1**	**1.7**	**2.4**	11	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.8**	**2.1**	**2.5**	**1**	**1.2**	**1**	**1.1**	**1.9**	25	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.3**	**2.1**	5.8	**2.6**	**2.3**	**1.4**	**1.8**	3.2	16	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	**2.1**	8.1	5.7	11	8.4	5.4	10	*67e-6/5e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	12	19	12	**1.7**	**1.3**	10	115	68	273	*34e-6/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.2**	**3.0**	**1.2**	**1**	**1.1**	**1.4**	**1.5**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	**2.8**	3.6	**1.6**	**1.1**	**1.6**	**2.1**	**2.4**	**3.4**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.4**	**1.3**	3.6	4.3	**2.2**	**1**	**1**	**1**	CMA+DE-MOS
NEWUOA	**1**	**2.4**	**2.2**	6.9	6.1	13	6.8	8.2	24	14	NEWUOA
Basic RCGA	**1**	**1.1**	**1**	**1**	**2.3**	6.6	6.5	8.8	15	35	Basic RCGA
SPSA	15	30	25	418	820	1984	1191	*21e-3/1e5*	.	.	SPSA

Table 20: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.50	1e+02 0.50	1e+01 1.1	1e+00 9.1	1e-01 445	1e-02 1182	1e-03 3214	1e-04 8792	1e-05 16925	1e-07 53115	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.7**	12	21	**2.5**	8.0	*76e-4/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.1**	12	12	**2.0**	15	*12e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**2.9**	13	12	**2.1**	8.7	*52e-4/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.1**	7.4	20	3.9	14	46	*15e-3/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.3**	**1.6**	26	**1.9**	7.8	**13**	*56e-4/1e4*	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.5**	22	16	**2.1**	**4.6**	44	*25e-4/1e4*	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.5**	10	16	**2.1**	4.6	*54e-4/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	5.9	**1.6**	8.4	*79e-4/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	9.5	23	46	17	16	*94e-3/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	423	709	383	139	15	70	220	*53e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1.2**	**5.4**	**1**	**1**	**1**	**1**	**1.2**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.5**	**2.2**	15	**1.5**	**1.6**	**1.3**	**1.1**	**1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	**1.2**	**2.8**	**1.3**	4.7	15	**16**	**9.2**	**10**	CMA+DE-MOS
NEWUOA	**1**	3.1	30	38	17	36	*98e-3/6e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1.3**	**1.3**	**1**	**2.9**	14	17	24	42	*31e-5/5e4*	Basic RCGA
SPSA	57	173	94	94	45	270	*13e-3/1e5*	.	.	.	SPSA

Table 21: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.60	1.2	7.0	20	49	113	270	398	601	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	**1.4**	**1.9**	**2.6**	6.0	9.5	8.2	11	14	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.1**	**1.3**	**1.3**	**2.1**	**1.6**	**2.2**	4.1	5.0	7.0	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	**1.5**	**1.7**	**1.0**	**1.6**	**1.9**	**2.4**	3.1	3.9	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.1**	**2.5**	**2.5**	**1.8**	5.0	23	25	42	119	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.9**	**1.6**	**1.5**	**1.5**	**1.3**	**1.2**	**1.5**	**2.0**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**1.7**	**1.6**	**1.6**	**1.9**	**1.9**	**2.0**	**1.8**	**2.0**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.3**	**1**	**1**	**1**	**1.0**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.4**	**1.6**	**1.4**	**1.1**	**1.1**	**1**	**1.0**	**1.0**	**1.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	**1.6**	**2.9**	4.5	9.3	31	49	*31e-5/5e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	15	21	13	16	10	15	88	472	3535	*13e-5/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**1.6**	**1.6**	**1.5**	**1.7**	**1.9**	**1.6**	**1.7**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.7**	**2.5**	**1.9**	**1.6**	**1.5**	**2.3**	**2.8**	3.1	3.7	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.3**	**2.1**	5.9	5.5	5.6	4.1	4.1	4.6	CMA+DE-MOS
NEWUOA	**1**	**1.3**	**1.6**	**2.2**	3.1	11	20	80	170	*40e-5/5e3*	NEWUOA
Basic RCGA	**1**	**1.1**	**1**	**1.0**	8.3	9.1	20	21	51	147	Basic RCGA
SPSA	33	50	76	407	2835	2575	2803	*13e-3/1e5*	.	.	SPSA

Table 22: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	3.1	56	212	548	840	1164	1950	2867	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**2.9**	6.8	4.3	6.0	15	81	*53e-4/1e4*	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.3**	**1.1**	**2.8**	**2.0**	6.2	13	27	36	*98e-5/1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.7**	5.8	3.2	3.9	5.3	50	*32e-4/1e4*	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.6**	11	3.6	8.7	28	*16e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.3**	**2.7**	5.1	4.1	4.0	6.3	20	36	*23e-5/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.1**	**2.2**	3.2	3.1	3.6	**4.4**	8.6	8.5	52	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.4**	15	**1.9**	**2.6**	**3.1**	7.8	20	22	*38e-5/1e4*	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.9**	17	3.8	7.0	9.4	26	39	75	*32e-4/1e4*	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	6.7	8.3	40	70	*11e-2/5e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	12	16	7.6	18	46	117	261	*53e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	**1.7**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.3**	14	3.3	3.0	**1.5**	**1.4**	**1.4**	**1.1**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.4**	**1**	26	25	13	10	**8.4**	**5.7**	**4.8**	CMA+DE-MOS
NEWUOA	**1**	**1.7**	4.7	14	37	70	*99e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	8.6	27	18	28	36	50	*25e-6/5e4*	Basic RCGA
SPSA	21	38	29	688	*44e-2/1e5*	.	.	.	.	.	SPSA

Table 23: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	3.0	386	2371	6690	13816	22782	33525	78413	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.8**	13	**1.9**	62	*24e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.2**	**2.8**	9.3	**1.3**	10	*13e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	6.1	16	**2.0**	61	*23e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.2**	25	**2.7**	30	*18e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.8**	11	**2.3**	**4.7**	*83e-3/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**3.8**	**1.3**	14	*13e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.0**	15	**1.7**	6.0	**22**	*98e-3/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.8**	40	**1.9**	15	*11e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	10	34	6.6	38	*46e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	261	1354	288	34	27	46	*48e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.0**	10	**1.5**	**1.2**	**1**	**1**	**1**	**1**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	9.0	**1**	**1**	**1.3**	**1.4**	**1.1**	**1.1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.5**	**1**	11	52	33	**21**	**13**	**12**	**7.2**	CMA+DE-MOS
NEWUOA	**1**	**1**	29	8.8	38	*44e-2/6e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.5**	**1.5**	5.8	31	*11e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	32	64	71	21	296	*22e-2/1e5*	.	.	.	.	SPSA

Table 24: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.53	2.1	33	108	274	1110	1849	4139	9115	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**2.0**	3.3	13	20	32	62	*60e-4/1e4*	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.7**	**2.5**	3.3	**2.8**	5.6	11	*98e-5/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.8**	**2.6**	**2.7**	6.6	6.8	7.6	77	*89e-5/1e4*	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.6**	13	11	19	55	*16e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.6	**2.8**	7.5	6.5	7.9	7.2	24	*23e-5/1e4*	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**2.7**	4.4	**2.1**	3.4	**2.9**	10	34	*23e-5/1e4*	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.7**	22	4.9	**2.6**	**2.0**	**1.5**	11	35	*23e-5/1e4*	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.1**	**1.4**	**1.6**	10	6.7	6.2	7.2	79	*42e-5/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.6**	10	9.0	32	76	*98e-3/5e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	14	19	30	11	55	176	203	764	*19e-4/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.7**	**1.9**	**1**	**1.3**	**1.9**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.3**	**3.0**	**1.2**	**1**	**1**	**1.1**	**1.3**	**1.3**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.4**	**1.6**	3.0	21	25	9.1	**5.8**	**5.3**	**3.6**	CMA+DE-MOS
NEWUOA	**1**	**2.1**	4.7	6.3	20	57	*33e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	**2.9**	33	31	29	52	88	*19e-5/5e4*	Basic RCGA
SPSA	48	84	3825	818	683	2545	*37e-3/1e5*	.	.	.	SPSA

Table 25: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	0.50	1.9	12	86	269	1246	2703	3541	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	5.6	3.7	4.2	3.8	8.7	4.0	4.3	*63e-7/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	**1.5**	**2.1**	**1.4**	6.0	3.0	3.9	13	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1**	**1.4**	**2.3**	7.3	4.4	5.0	20	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.1**	**2.8**	5.5	**2.7**	12	4.4	5.4	41	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.2**	**1**	**1.6**	12	5.1	5.7	13	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.1**	**1.5**	**2.0**	**2.2**	8.5	3.5	**2.7**	4.3	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.4**	**2.4**	**2.7**	7.3	**2.1**	**2.2**	6.9	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.2**	**1.3**	**1.3**	**1.6**	13	5.9	4.4	19	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.3**	**1.8**	**1.9**	**1.6**	5.7	**1.9**	**1.1**	3.8	avg NEWUOA
CMA-EGS (IPOP,r1)	14	20	25	8.9	3.5	4.3	12	6.7	10	43	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.1**	**1.2**	**2.1**	**1.2**	**3.3**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.2**	**1.5**	**1.4**	**1.8**	**4.2**	**1.3**	**1.3**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**1.5**	**1.8**	**1**	**1**	3.3	**1.5**	**1.2**	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.0**	**1.6**	3.1	**1.2**	5.7	**2.1**	**1.8**	11	NEWUOA
Basic RCGA	**1**	**1**	**1.2**	**1.7**	**2.3**	**1.6**	5.8	4.6	3.6	14	Basic RCGA
SPSA	22	32	37	16	6.8	**1.9**	209	227	246	*45e-5/1e5*	SPSA

Table 26: 02-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	0.50	1.7	23	88	1657	3483	5350	27651	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.3**	15	6.4	12	7.0	19	27	*75e-5/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.1**	**1.2**	3.0	11	4.9	5.9	8.2	*23e-5/1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1**	5.0	6.8	9.2	7.7	28	*81e-5/1e4*	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.1**	11	5.3	16	8.7	12	26	*12e-4/1e4*	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.8**	7.2	7.6	3.7	8.8	12	5.1	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**2.1**	**2.4**	5.7	4.0	3.7	5.8	*64e-6/1e4*	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.1**	12	**2.4**	3.9	3.2	3.5	5.7	5.2	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	3.5	5.5	5.9	5.0	4.6	*18e-5/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	26	27	14	26	12	7.6	*18e-4/6e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	284	472	608	203	34	99	23	40	38	*32e-6/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.3**	4.9	3.3	**1.5**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.2**	**1.6**	**3.2**	**1.1**	**1.9**	**2.2**	**1.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**1.1**	**1.0**	**1**	**1**	**1.0**	**2.3**	**1.2**	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.1**	58	13	26	54	*32e-4/6e3*	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1.3**	**1**	**1.2**	**1.0**	**1.3**	**1.5**	**1.3**	Basic RCGA
SPSA	16	50	86	56	40	151	114	93	83	*18e-4/1e5*	SPSA

Table 27: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	0.50	1.6	8.3	83	520	1883	2428	2506	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	**3.0**	3.2	**2.8**	5.9	3.0	3.8	7.2	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.1**	**2.0**	**2.4**	**1.3**	**2.3**	**1.0**	**1.2**	**2.3**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1.5**	**2.0**	**1.3**	3.1	**1.7**	**1.9**	**2.3**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.2**	3.3	5.1	**2.8**	9.3	3.8	5.2	28	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.1**	**1**	3.0	4.0	**2.3**	**1.8**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.3**	**1.2**	**2.9**	3.5	**1.8**	**1.9**	**2.1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.1**	**1.3**	**1.2**	3.1	3.0	**1.3**	**1.1**	**1.4**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	**1**	4.9	**2.4**	**2.8**	**1**	**1.0**	**1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1.3**	**2.2**	4.3	**1.8**	4.0	**1.9**	3.4	*16e-6/5e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	12	17	19	8.6	4.2	**1.7**	**2.5**	5.0	16	96	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.4**	**1.9**	**2.3**	**2.7**	3.0	**1.2**	**1.1**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.3**	4.7	**1.3**	**1.9**	**1.1**	**1**	**2.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**1.2**	**1.9**	**1**	**1**	**1.6**	3.6	5.1	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.1**	**1.9**	5.7	**2.0**	3.7	**2.4**	**2.4**	6.9	NEWUOA
Basic RCGA	**1**	**1**	**1.2**	**1.1**	**2.5**	**1.6**	4.6	**2.8**	3.5	42	Basic RCGA
SPSA	26	39	94	195	296	140	206	176	*40e-5/1e5*	.	SPSA

Table 28: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	0.70	37	247	618	706	759	771	783	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	5.3	5.4	**2.6**	**1.6**	**1.9**	**2.0**	**2.1**	**2.7**	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.2**	**3.1**	**1.7**	**1.4**	**1.7**	**1.6**	**1.8**	**2.2**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**2.1**	**1.5**	**1**	**1.0**	**1.3**	**1.5**	**1.7**	**1.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	9.4	4.9	**1.5**	**1**	**1.9**	**2.7**	4.0	4.2	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.1**	12	3.9	**1.6**	**1.9**	**1.8**	**1.8**	**1.8**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.7**	6.8	3.2	**1.8**	**1.7**	**1.6**	**1.5**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.3**	8.0	**2.7**	**1.1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.6**	3.7	**2.7**	**1.5**	**1.4**	**2.0**	**2.2**	**2.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	3.8	12	**2.5**	**1.8**	**1.9**	**2.2**	**3.0**	7.2	avg NEWUOA
CMA-EGS (IPOP,r1)	13	19	20	9.1	12	5.0	13	21	94	223	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.6**	14	4.3	**2.0**	3.1	5.1	5.1	5.4	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	5.2	**2.9**	**2.3**	**2.0**	**2.0**	**2.0**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.8**	20	23	13	11	11	11	11	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.4**	9.5	**2.6**	**2.1**	**2.3**	3.3	3.9	5.6	NEWUOA
Basic RCGA	**1**	**1**	**1.4**	**1**	4.9	4.0	8.1	18	22	59	Basic RCGA
SPSA	10	22	45	173	179	206	609	567	*83e-4 /1e5*	.	SPSA

Table 29: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.50	1e+02 0.50	1e+01 0.73	1e+00 21	1e-01 621	1e-02 1124	1e-03 2090	1e-04 3863	1e-05 9428	1e-07 17273	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	11	13	**2.4**	3.0	4.5	7.0	4.9	8.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.2**	17	**1.7**	**1.8**	**2.1**	6.2	15	*12e-5/1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.6**	17	**1.9**	**2.5**	**1.8**	5.1	**2.6**	8.5	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	22	13	**1.1**	**2.5**	3.9	**2.6**	3.3	*60e-6/1e4*	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.5**	13	**1.6**	**1.9**	**1.8**	**1.9**	**1.0**	**2.0**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.0**	**11**	**1.0**	**1**	**1.3**	**2.0**	**1.2**	**2.6**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.0**	17	**1.6**	**1.2**	**1.9**	**2.2**	**1.8**	4.1	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	12	**1**	**1.7**	**1.7**	**2.1**	3.5	*31e-6/1e4*	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	63	40	5.6	6.3	4.3	11	9.3	5.1	avg NEWUOA
CMA-EGS (IPOP,r1)	288	439	335	144	9.4	22	18	29	18	85	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.9**	21	**2.3**	**1.5**	**1**	**1**	**1**	**1.7**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.1**	12	**2.2**	**2.2**	**2.5**	3.4	**1.5**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.8**	**2.2**	**2.3**	3.6	4.6	3.9	**1.7**	**1.1**	CMA+DE-MOS
NEWUOA	**1**	**1**	30	36	3.7	6.0	8.7	11	10	*37e-4/6e3*	NEWUOA
Basic RCGA	**1**	**1**	**1.0**	**1**	**2.4**	3.6	5.8	4.5	7.4	42	Basic RCGA
SPSA	5.1	48	118	156	12	25	25	34	47	*86e-6/1e5*	SPSA

Table 30: 02-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	0.93	24	97	637	1188	1341	1365	1392	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.6**	38	34	7.1	4.3	3.8	5.0	5.1	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.2**	29	16	3.4	**1.9**	**1.7**	**1.8**	**1.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.2**	13	15	4.2	**2.4**	**2.8**	**2.7**	**2.8**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.1**	39	55	12	6.6	6.0	6.2	6.9	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.6**	20	13	**2.4**	**1.5**	**1.3**	**1.3**	**1.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.0**	15	10	**2.7**	**1.6**	**1.4**	**1.4**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.2**	**6.1**	9.1	**2.0**	**1.1**	**1**	**1.2**	**1.2**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.1**	8.6	13	**2.1**	**1.1**	**1.0**	**1**	**1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.6**	7.8	**3.8**	**1**	**1**	**1.5**	**2.5**	5.1	avg NEWUOA
CMA-EGS (IPOP,r1)	8.8	12	9.0	7.4	23	7.1	10	44	84	202	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.2**	6.3	6.7	15	8.7	7.7	7.8	8.3	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	7.9	18	3.4	**2.0**	**1.9**	**1.9**	**1.9**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.4**	**1**	**1**	3.9	7.9	12	12	19	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.3**	9.3	**5.5**	**1.4**	**1.3**	**2.2**	3.0	10	NEWUOA
Basic RCGA	**1**	**1**	**1.7**	**1.1**	8.7	8.0	13	27	41	121	Basic RCGA
SPSA	22	34	69	630	523	116	82	175	315	496	SPSA

Table 31: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	1.9	6.9	11	13	14	15	16	18	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	3.6	3.2	4.2	6.2	6.9	7.2	8.4	9.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	**1.8**	3.5	4.1	5.0	5.8	6.5	7.8	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.2**	3.0	**2.0**	3.2	3.7	4.2	5.1	5.9	6.9	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	4.5	3.4	4.2	5.3	6.4	7.3	8.6	10	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.3**	**1.9**	**2.4**	3.1	3.6	4.4	5.2	5.8	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.7**	**1.9**	**2.0**	**2.7**	3.4	4.0	4.5	5.3	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.1**	**1.6**	**1.8**	**2.2**	**2.6**	**2.9**	**3.4**	**3.9**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.3**	**2.1**	**2.1**	**2.6**	**3.0**	3.3	3.9	4.6	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.1**	**2.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	14	21	10	8.0	64	204	320	485	985	888	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.6**	**2.4**	**2.9**	4.0	4.7	5.5	6.4	7.6	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.4**	**1.9**	**2.9**	4.0	4.8	5.7	6.5	8.0	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.6**	6.5	12	15	19	21	25	30	CMA+DE-MOS
NEWUOA	**1**	**1.5**	**1.8**	**1.3**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.5**	NEWUOA
Basic RCGA	**1**	**1.1**	**1.5**	6.2	21	39	58	92	127	223	Basic RCGA
SPSA	30	46	128	189	484	1054	1008	976	958	2591	SPSA

Table 32: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.1	9.1	17	24	30	32	33	35	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	3.3	**2.5**	**2.7**	**2.8**	**2.9**	3.5	4.2	5.0	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.9**	**1.7**	**2.1**	**2.0**	**2.2**	**2.6**	3.0	3.9	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.8**	**1.4**	**1.9**	**1.9**	**1.9**	**2.4**	**2.8**	3.4	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.5**	**2.6**	**2.4**	**2.8**	**2.9**	3.3	3.4	6.2	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.8**	**1.2**	**1.3**	**1.4**	**1.5**	**1.9**	**2.2**	**2.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.5**	**1.5**	**1.5**	**1.5**	**1.7**	**1.9**	**2.2**	**2.7**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.5**	**1**	**1**	**1.2**	**1.2**	**1.4**	**1.6**	**2.0**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.7**	**1.2**	**1.1**	**1.3**	**1.4**	**1.6**	**1.8**	**2.3**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.9**	**2.1**	**1.3**	**1.3**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	28	45	12	6.3	7.0	7.3	7.4	55	770	1945	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.4**	**1.7**	**1.9**	**2.0**	**2.3**	**2.6**	3.1	3.8	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.6**	**1.9**	**2.0**	**2.1**	**2.4**	**2.9**	3.3	4.0	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.5**	5.1	7.7	8.0	8.9	11	12	15	CMA+DE-MOS
NEWUOA	**1**	**1.5**	3.4	**2.6**	**2.5**	**2.8**	**2.4**	**3.0**	3.6	4.6	NEWUOA
Basic RCGA	**1**	**1.1**	**1**	7.4	13	16	27	42	66	110	Basic RCGA
SPSA	24	38	273	177	318	793	763	844	2129	39796	SPSA

Table 33: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.3	7.5	10	13	30	39	44	75	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	3.2	**2.9**	4.2	4.9	**3.0**	**3.0**	3.3	**2.6**	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.3**	**1.6**	**2.9**	3.8	**2.1**	**2.1**	**2.2**	**1.9**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.4**	**1.7**	**2.8**	3.7	**1.8**	**1.9**	**2.1**	**1.7**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.0**	**2.5**	3.3	3.9	**2.5**	**2.5**	**2.9**	**2.5**	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.1**	**2.0**	**2.5**	3.1	**1.6**	**1.8**	**1.9**	**1.6**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.3**	**1.2**	**2.5**	**3.0**	**1.6**	**1.6**	**1.7**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.1**	**1.6**	**2.1**	**1.1**	**1.2**	**1.2**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.0**	**1.3**	**2.1**	**2.6**	**1.4**	**1.4**	**1.4**	**1.2**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.9**	**1.7**	**1**	**1**	**1**	**1.2**	**1.6**	**1.7**	**1.7**	avg NEWUOA
CMA-EGS (IPOP,r1)	17	30	10	9.1	14	14	7.2	220	383	495	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.2**	**1.7**	**2.9**	4.0	**2.1**	**2.2**	**2.3**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.1**	**2.0**	3.1	4.0	**2.3**	**2.4**	**2.5**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.3**	6.4	13	15	8.7	8.9	11	10	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.8**	**1.2**	**1.6**	**1.7**	**1**	**1**	**1**	**1.8**	NEWUOA
Basic RCGA	**1**	**1.1**	**1.2**	7.6	25	35	29	38	49	55	Basic RCGA
SPSA	40	142	187	124	145	203	118	206	796	2188	SPSA

Table 34: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	2.9	6.0	8.8	65	224	271	288	300	310	332	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.0**	3.7	7.5	10	13	28	37	64	62	58	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.2**	**1.7**	4.4	4.7	5.1	6.5	6.3	6.5	6.3	6.1	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.7**	**2.0**	**2.7**	**2.7**	5.8	8.2	8.4	8.2	8.0	7.6	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	7.4	11	20	15	21	48	87	84	102	96	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.3**	**1.8**	**2.5**	5.6	**2.9**	**2.6**	**2.6**	**2.5**	**2.5**	**2.4**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.7**	**1.6**	**2.3**	**2.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.2**	**1.2**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.3**	**1.7**	**1.9**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.9**	**1.9**	**2.4**	5.9	3.9	4.5	4.4	4.3	4.2	4.0	(1,4s)-CMA-ES
avg NEWUOA	**1.2**	**1**	**1**	3.2	**2.3**	**2.6**	**2.6**	**3.0**	**2.9**	**2.7**	avg NEWUOA
CMA-EGS (IPOP,r1)	29	23	33	146	229	190	179	228	221	211	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.2**	**1.4**	3.1	**2.0**	**1.1**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**2.5**	3.7	**2.8**	**1.8**	**1.9**	**2.1**	**2.1**	**2.2**	**2.2**	IPOP-CMA-ES
CMA+DE-MOS	**1.6**	4.0	10	3.4	**2.7**	3.0	3.4	3.7	3.8	4.1	CMA+DE-MOS
NEWUOA	**1.3**	**1.1**	**1.1**	**1**	**2.4**	6.5	11	13	15	16	NEWUOA
Basic RCGA	**1.6**	4.8	12	42	152	440	1145	1120	*66e-3/5e4*	.	Basic RCGA
SPSA	294	361	32646	*15e+0/1e5*	.	.	.	.	.	.	SPSA

Table 35: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	2.0	8.4	14	113	560	760	845	908	929	975	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.9**	4.8	5.6	7.3	9.0	19	35	48	47	147	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.8**	5.0	4.0	**2.6**	4.4	12	23	27	35	33	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.9**	**1.7**	**1.9**	**1.7**	**3.0**	7.9	17	48	47	45	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.1	4.8	4.6	5.6	7.8	18	31	51	156	*91e-4/1e4*	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.4**	**1.6**	**2.5**	5.0	3.5	5.7	8.9	8.7	8.7	8.3	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.6**	**2.0**	**2.1**	**2.9**	**1.8**	3.1	**2.8**	3.2	3.2	3.1	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.4**	**1**	**1.0**	**2.9**	3.4	3.3	3.2	3.0	**3.0**	**2.9**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.8**	**1.7**	**1.5**	3.3	5.8	6.5	10	16	18	18	(1,4s)-CMA-ES
avg NEWUOA	**1.9**	**1.2**	**1.2**	**1.1**	**1**	4.5	11	42	88	*20e-4/6e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	14	6.1	8.9	189	261	555	773	719	1513	1442	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.1**	**1.8**	**2.2**	**2.6**	**1.2**	**1.1**	**1.0**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.0**	**1.9**	**2.7**	3.5	**2.8**	**2.3**	**2.2**	**2.1**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**2.4**	**2.8**	6.2	**2.1**	**1.1**	**1**	**1**	**1.0**	**1.1**	**1.2**	CMA+DE-MOS
NEWUOA	3.5	**1.5**	**1**	**1**	**1.2**	**2.9**	10	25	81	79	NEWUOA
Basic RCGA	**1**	3.3	9.2	17	66	154	282	808	*26e-3/5e4*	.	Basic RCGA
SPSA	359	118	97943	*18e+0/1e5*	.	.	.	.	.	.	SPSA

Table 36: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.7	6.9	10	55	97	153	267	285	299	324	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.0**	3.7	3.8	4.4	6.7	5.6	3.9	4.0	4.0	3.9	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.2**	**2.1**	3.7	5.3	5.2	4.2	**2.7**	**2.7**	**2.8**	**2.7**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	**2.4**	4.0	3.5	3.5	**2.8**	**1.9**	**1.9**	**1.9**	**1.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.4	10	9.4	17	16	13	8.3	8.5	8.3	7.9	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.0**	**2.8**	3.0	4.0	3.5	**2.7**	**1.8**	**1.7**	**1.7**	**1.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.1**	**1.7**	3.2	3.7	3.3	**2.5**	**1.6**	**1.6**	**1.6**	**1.6**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.2**	**2.1**	**2.1**	**2.0**	**1.6**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.3**	**1.4**	**2.2**	3.1	**2.9**	**2.3**	**1.4**	**1.4**	**1.4**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1.2**	**1.1**	**1.1**	**1**	**1**	**1**	**2.0**	3.2	6.8	9.4	avg NEWUOA
CMA-EGS (IPOP,r1)	15	18	16	17	13	10	6.8	6.8	7.0	8.0	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**1.6**	**2.6**	**1.5**	**2.3**	**2.0**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.2**	**2.4**	3.2	**2.2**	3.5	3.0	**2.0**	**2.0**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.3**	4.1	10	3.6	5.2	4.6	**2.9**	3.1	3.2	3.5	CMA+DE-MOS
NEWUOA	**1.1**	**1**	**1**	**1.4**	3.0	4.3	6.0	8.9	10	23	NEWUOA
Basic RCGA	**1.2**	4.8	14	60	488	1071	2698	*43e-3/5e4*	.	.	Basic RCGA
SPSA	448	624	792	3788	*19e-1/1e5*	.	.	.	.	.	SPSA

Table 37: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.2	19	36	63	104	131	164	231	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	19	10	15	27	28	47	208	*28e-6/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	6.4	**1.6**	**2.7**	**2.5**	**2.2**	**2.9**	3.2	4.1	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	6.1	**1.9**	3.1	4.2	4.9	4.9	7.5	8.1	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	5.1	7.0	18	21	51	122	97	635	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	7.8	**2.8**	4.0	4.0	3.7	4.7	6.4	5.7	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	3.2	**1.0**	**1**	**1**	**1.0**	**1.3**	**1.1**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.1**	12	**2.1**	**1.6**	**2.0**	**1.7**	**2.1**	3.2	4.1	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	**1.8**	**2.1**	4.6	3.5	4.2	4.5	10	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	14	17	64	141	377	624	*16e-3/6e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	24	37	11	4.1	8.6	17	51	239	568	6078	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.0**	4.7	**1.1**	**1.4**	**1.2**	**1**	**1.1**	**1.0**	**1.0**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.5**	**1**	**1.1**	**1.2**	**1.0**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.4**	**2.8**	7.5	8.7	7.5	7.6	7.3	6.9	CMA+DE-MOS
NEWUOA	**1**	**1.1**	11	24	86	79	157	561	*57e-4/5e3*	.	NEWUOA
Basic RCGA	**1**	**1**	**1.4**	6.5	13	13	14	21	26	30	Basic RCGA
SPSA	36	53	173	7105	19257	22083	13722	*11e-1/1e5*	.	.	SPSA

Table 38: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.33	1e+02 0.33	1e+01 3.0	1e+00 276	1e-01 835	1e-02 1871	1e-03 3202	1e-04 4057	1e-05 6265	1e-07 8649	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	22	3.4	42	*15e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	23	15	**3.0**	10	37	*84e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	34	**3.0**	18	80	*10e-2/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	19	4.9	15	78	*88e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.1**	19	**1.2**	4.7	38	*42e-3/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	19	**2.2**	**4.6**	**14**	*18e-3/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.1**	**6.3**	**1.7**	7.3	37	*38e-3/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	22	**2.4**	6.8	76	*39e-3/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.5**	77	10	99	*39e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1294	1758	1698	32	35	25	**19**	**31**	**40**	84	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	8.7	**1**	**1.4**	**1.1**	**1.1**	**1**	**1.0**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.1**	62	**1.3**	**1**	**1**	**1**	**1.1**	**1**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	7.9	108	89	68	61	42	**35**	CMA+DE-MOS
NEWUOA	**1**	**1**	68	6.7	28	*41e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.3**	**1.2**	19	20	25	41	118	*18e-4/5e4*	Basic RCGA
SPSA	111	264	175	20	45	384	*28e-3/1e5*	.	.	.	SPSA

Table 39: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.5	8.6	21	35	47	64	79	107	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.6**	**2.8**	3.0	**2.6**	3.9	3.7	4.2	5.3	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.9**	**2.3**	**1.9**	**2.2**	**2.3**	**2.3**	**2.6**	**2.9**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.7**	**1.4**	**1.3**	**1.3**	**1.5**	**1.5**	**1.6**	**1.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	4.2	6.1	3.7	4.3	4.8	4.5	6.5	6.5	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.2**	**1.5**	**1.4**	**1.5**	**1.6**	**1.8**	**1.8**	**2.4**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.9**	**1.6**	**1.6**	**1.7**	**1.8**	**1.8**	**1.9**	**2.1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.1**	**1.3**	**1.1**	**1.2**	**1.2**	**1.2**	**1.3**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.5**	**1.6**	6.0	8.9	12	24	33	56	94	avg NEWUOA
CMA-EGS (IPOP,r1)	15	30	10	7.6	6.7	45	557	3410	*20e-5/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.3**	**2.1**	**2.0**	**2.0**	**2.2**	**2.1**	**2.2**	**2.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.2**	**1.9**	**1.8**	**1.9**	**2.4**	**2.3**	**2.5**	**2.8**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.2**	4.9	6.3	7.7	8.9	10	13	13	CMA+DE-MOS
NEWUOA	**1**	**1.3**	**2.5**	5.0	10	17	46	148	192	*17e-5/5e3*	NEWUOA
Basic RCGA	**1**	**1.1**	**1.6**	8.4	16	20	27	28	35	40	Basic RCGA
SPSA	37	157	214	184	2213	2243	5203	6984	*43e-4/1e5*	.	SPSA

Table 40: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.5	10	33	387	2139	5592	8069	8206	8334	8625	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	6.4	9.4	5.6	**2.3**	**1.6**	3.1	18	*12e-3/1e4*	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.2	3.8	3.2	**1.1**	**1.3**	**1.2**	**2.5**	8.5	*19e-4/1e4*	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.8**	3.6	**2.1**	**1.2**	**1**	**1.7**	4.0	8.2	*43e-4/1e4*	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.0**	6.0	5.9	3.6	3.1	4.6	*17e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.5**	**1.8**	**1.1**	**2.2**	**1.7**	3.1	4.1	5.4	8.4	17	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.4**	5.7	3.5	**1.9**	**1.2**	**1.8**	5.5	**5.4**	17	*43e-4/1e4*	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	12	7.1	**2.4**	**1**	**1.0**	**1.4**	**2.5**	8.7	8.6	8.3	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.1**	**1**	**1.5**	**1.6**	**1.2**	**1**	3.7	17	*48e-4/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	7.5	16	8.6	5.3	8.2	*34e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	49	74	100	48	101	251	*20e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	**1**	**1.0**	**2.6**	**1.4**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.5**	**1.5**	**1.2**	**1.3**	4.7	3.2	**2.3**	**2.4**	**2.4**	**2.4**	IPOP-CMA-ES
CMA+DE-MOS	**1.5**	3.9	3.5	3.9	19	9.2	6.5	6.5	**6.4**	**6.3**	CMA+DE-MOS
NEWUOA	10	17	14	7.1	4.2	13	*22e-2/5e3*	.	.	.	NEWUOA
Basic RCGA	**1.7**	4.6	3.9	4.6	20	28	*94e-3/5e4*	.	.	.	Basic RCGA
SPSA	103	107	931	*35e-1/1e5*	.	.	.	.	.	.	SPSA

Table 41: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.4	35	136	997	31367	2.54e5	3.08e5	3.46e5	3.49e5	3.63e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	13	9.4	10	148	*19e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	5.5	4.3	6.9	14	*98e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	18	5.2	8.8	18	*14e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	15	14	16	36	*29e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.9	3.2	**2.1**	4.5	**1.3**	*27e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	6.3	4.9	**2.5**	**3.1**	**1**	*32e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	13	4.0	4.0	3.5	*35e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	15	3.7	5.1	13	*85e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	40	32	24	*45e-1/6e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	187	31	40	17	10	**2.7**	*13e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	10	6.1	**2.1**	**1**	**1.3**	**1**	**1**	**1.1**	**1.2**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.8**	**1.0**	**1**	**1.1**	5.2	**1.3**	**1.1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1.5**	**1**	7.4	14	5.3	**1.2**	6.4	*98e-3/1e5*	.	.	CMA+DE-MOS
NEWUOA	25	21	36	37	**2.5**	*74e-1/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	5.0	3.7	**1.4**	**1.4**	**1.1**	*91e-3/5e4*	.	.	Basic RCGA
SPSA	86	42	81	*16e-1/1e5*	.	.	.	.	.	.	SPSA

Table 42: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	2.8	6.4	12	151	397	482	530	559	578	610	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	3.8	8.6	13	21	14	15	14	14	15	15	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.5**	**3.0**	**2.6**	4.3	3.3	3.5	3.4	3.5	3.5	3.6	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.5**	**2.4**	**2.7**	3.8	**2.3**	**2.4**	**2.5**	**2.5**	**2.5**	**2.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.2**	5.0	6.8	20	16	28	31	37	56	54	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.4**	**1.5**	**1.7**	**1**	**1.3**	**1.5**	**1.6**	**1.7**	**1.7**	**1.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.5**	**1.5**	**1.8**	**2.3**	**1.5**	**1.5**	**1.6**	**1.6**	**1.5**	**1.6**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.4**	**1.3**	**1.5**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.5**	**1.8**	**2.1**	3.4	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**1.9**	(1,4s)-CMA-ES
avg NEWUOA	**1.4**	**1.1**	**1.6**	**1.6**	**2.3**	16	151	*20e-3/6e3*	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	28	27	18	229	752	2915	*26e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.5**	**2.0**	**3.0**	**1.2**	**1.0**	**1.2**	**1.3**	**1.3**	**1.4**	**1.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.1**	**2.6**	**2.9**	3.5	**2.4**	**2.6**	**2.7**	**2.7**	**2.7**	**2.8**	IPOP-CMA-ES
CMA+DE-MOS	**1.7**	4.5	7.7	**1.8**	**2.4**	**2.7**	**2.9**	3.2	3.4	3.9	CMA+DE-MOS
NEWUOA	**1**	**1**	**1**	**1.2**	**1.8**	15	66	130	*44e-4/5e3*	.	NEWUOA
Basic RCGA	**1.3**	4.1	8.6	14	95	159	654	1267	*23e-3/5e4*	.	Basic RCGA
SPSA	647	2011	2223	9313	*29e-1/1e5*	.	.	.	.	.	SPSA

Table 43: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.36	1.5	10	172	544	613	832	832	832	860	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**2.4**	8.4	5.9	**2.6**	3.1	10	14	14	14	19	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.3**	**1**	**2.3**	**1.0**	**1**	4.9	5.3	5.3	5.3	8.4	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	**1.8**	7.7	**1.8**	**1.6**	**3.0**	9.5	9.5	9.5	18	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.5**	18	10	**2.1**	4.3	30	54	54	54	166	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.5**	**2.3**	3.7	**1.2**	**2.4**	3.9	4.6	4.6	4.6	5.0	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.9**	**1.9**	**1**	**1.4**	**2.3**	4.4	4.4	4.4	4.4	4.5	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.2**	3.3	5.7	**1.2**	**1.9**	4.6	**3.6**	**3.6**	**3.6**	**4.2**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.2**	**2.1**	**2.1**	**1.1**	**2.0**	3.7	4.3	4.3	4.3	7.6	(1,4s)-CMA-ES
avg NEWUOA	**1.5**	4.2	7.3	3.8	10	43	97	97	97	*57e-3/6e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	26	11	19	4.7	98	491	508	508	508	1700	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	19	6.4	**1.8**	**1.9**	**1.0**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.6**	**2.1**	**1.7**	**1.6**	**2.3**	**3.1**	**2.3**	**2.3**	**2.3**	**2.4**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	**1.2**	**1**	4.1	5.7	4.6	4.6	4.6	4.6	CMA+DE-MOS
NEWUOA	**1.4**	11	6.9	3.5	6.1	20	91	91	91	*74e-3/5e3*	NEWUOA
Basic RCGA	**1**	**1.2**	**1.9**	**2.8**	23	65	50	50	50	51	Basic RCGA
SPSA	37	18	16	408	1203	2309	*71e-2/1e5*	.	.	.	SPSA

Table 44: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	1.7	13	475	1847	3819	3949	3949	3949	4189	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.1**	**2.9**	21	8.1	23	*31e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.1**	4.7	11	4.9	24	*30e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	36	20	16	26	*22e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.1**	20	19	8.5	*52e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.3**	38	13	**2.6**	8.7	38	*11e-2/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.8**	**1.3**	**4.2**	**1.8**	**6.5**	**17**	35	35	35	*83e-3/1e4*	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.8**	15	16	**2.8**	13	*16e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	17	8.3	12	4.5	12	*22e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	82	66	19	*11e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	877	1311	351	90	167	*14e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.4**	19	16	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.1**	7.1	4.5	**1.7**	**1.8**	**1.3**	**1.4**	**1.4**	**1.4**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.1**	**1.2**	6.6	12	19	**19**	**19**	**19**	**20**	CMA+DE-MOS
NEWUOA	**1**	29	45	22	*11e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1.5**	**1**	**1**	5.7	14	23	28	28	28	51	Basic RCGA
SPSA	271	117	142	45	776	*29e-2/1e5*	.	.	.	.	SPSA

Table 45: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.36	0.89	3.9	35	172	223	266	266	266	323	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.6**	3.4	5.1	3.0	9.1	52	71	71	71	*54e-4/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.4**	**2.2**	**1.8**	**2.4**	3.3	7.3	13	13	13	27	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	**1.6**	3.0	**1.7**	**1.8**	6.3	15	15	15	51	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.4**	4.0	4.5	3.8	3.9	29	55	55	55	218	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.4**	3.8	**3.0**	**1.7**	**1.9**	3.5	4.8	4.8	4.8	8.4	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.3**	3.0	**2.8**	**1**	**1.5**	**1.7**	3.8	3.8	3.8	5.3	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.1**	**1.5**	**2.2**	**1.4**	**1**	**1.7**	**1.8**	**1.8**	**1.8**	**2.7**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.0**	4.7	**2.2**	**1.8**	3.2	3.4	3.4	3.4	6.8	(1,4s)-CMA-ES
avg NEWUOA	**1.4**	3.2	**1.1**	**3.0**	5.7	17	29	29	29	40	avg NEWUOA
CMA-EGS (IPOP,r1)	23	18	21	139	450	2056	5308	5308	5308	4382	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**2.9**	**2.1**	**1.0**	**1.0**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.6**	3.4	6.7	**2.7**	**2.1**	**3.0**	**2.6**	**2.6**	**2.6**	**2.4**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**2.1**	**2.4**	**2.4**	5.8	9.3	8.5	8.5	8.5	7.3	CMA+DE-MOS
NEWUOA	**2.2**	**3.0**	**1**	4.6	10	83	240	240	240	198	NEWUOA
Basic RCGA	**1**	**1**	6.3	64	110	182	154	154	154	166	Basic RCGA
SPSA	49	46	50	658	643	1925	*43e-3/1e5*	.	.	.	SPSA

Table 46: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	14	58	333	1187	1812	2090	2154	2224	2285	2404	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	6.3	6.1	**2.9**	7.0	78	*68e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**2.9**	4.8	**2.4**	**3.0**	6.8	10	15	15	64	*54e-3/1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.8	5.3	4.5	4.2	5.6	33	*45e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	6.4	15	6.8	9.3	38	34	70	*61e-2/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.1**	**1**	**2.1**	**2.8**	9.1	14	20	21	20	29	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.1**	**2.5**	**1.7**	**2.3**	3.5	4.8	6.0	11	20	19	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	4.9	3.9	**1.9**	**1.3**	3.2	4.4	6.1	11	14	*96e-5/1e4*	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	7.8	3.1	**1.4**	**1.7**	3.2	6.9	14	20	*18e-3/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	8.9	11	11	21	*30e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	659	573	334	1262	*97e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.1	**2.7**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.1**	3.2	**1.8**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	**1.2**	3.3	**2.4**	**2.4**	**2.5**	**2.7**	**2.7**	**3.0**	CMA+DE-MOS
NEWUOA	5.4	7.8	7.5	31	41	*49e-1/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1.2**	8.0	10	20	42	63	*67e-3/5e4*	.	.	.	Basic RCGA
SPSA	45	375	687	1203	*20e+0/1e5*	.	.	.	.	.	SPSA

Table 47: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	13	204	1405	4535	7374	8317	11323	13136	14079	17704	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	20	4.9	9.0	32	*84e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	6.0	4.9	3.8	32	*56e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	5.3	**2.9**	7.5	10	*93e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	18	6.1	7.5	*95e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	6.2	**2.6**	**2.9**	15	*34e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	4.9	**1.7**	3.2	**7.1**	**6.3**	18	*18e-1/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	15	**2.6**	**1.5**	*23e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	10	**2.2**	3.2	10	20	*22e-1/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	31	18	19	*44e+0/6e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	260	59	205	310	190	*20e+0/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**4.8**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	9.2	**2.0**	**1.3**	**1.1**	**1.2**	**1.5**	**1.2**	**1.1**	**1.1**	**1.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	3.7	8.5	8.2	**14**	**13**	**11**	**10**	**8.4**	CMA+DE-MOS
NEWUOA	22	10	55	*23e+0/5e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.2**	**2.1**	4.2	10	29	87	64	*57e-2/5e4*	.	.	Basic RCGA
SPSA	146	45	75	*81e-1/1e5*	.	.	.	.	.	.	SPSA

Table 48: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.6	9.4	38	160	218	236	261	280	304	350	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	12	13	9.1	6.3	7.8	7.9	7.9	8.2	7.9	10	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.2	6.4	4.0	3.2	3.7	4.2	4.2	4.2	4.3	4.0	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.1	5.4	5.3	**2.4**	**2.2**	**2.2**	**2.6**	**2.6**	**2.6**	**2.5**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	7.1	10	29	19	25	29	34	32	30	31	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.2	4.7	**2.5**	**1.4**	**1.4**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.6**	5.0	3.1	**1.5**	**1.3**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.4**	**2.4**	**1.9**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.7**	4.3	3.2	**1.3**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1**	**2.1**	5.8	31	99	*43e-4/6e3*	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	38	59	688	1269	2993	5962	*21e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.4	3.6	3.2	**1.3**	**1.1**	**1.2**	**1.2**	**1.2**	**1.3**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	4.4	5.8	5.9	**2.9**	**2.8**	**2.9**	**2.8**	**2.8**	**2.9**	**2.9**	IPOP-CMA-ES
CMA+DE-MOS	3.4	7.3	5.8	**2.2**	**2.1**	**2.5**	**3.0**	3.6	3.9	4.7	CMA+DE-MOS
NEWUOA	**1.3**	**1.0**	**1.6**	**1.6**	7.0	53	140	*19e-3/5e3*	.	.	NEWUOA
Basic RCGA	**2.4**	57	136	231	732	1533	2870	*75e-2/5e4*	.	.	Basic RCGA
SPSA	128	184	1352	2830	*41e-1/1e5*	.	.	.	.	.	SPSA

Table 49: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	0.84	21	54	141	514	1648	2711	4116	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	5.8	4.6	14	24	62	*24e-4/1e4*	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	4.1	3.5	4.3	6.0	4.1	9.4	25	*14e-5/1e4*	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	**1.9**	**1.6**	3.8	4.2	5.9	40	*18e-5/1e4*	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.1**	24	7.4	10	56	143	*50e-4/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**2.1**	8.0	4.6	3.9	4.3	3.1	4.7	26	*63e-6/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	4.1	3.4	**2.4**	**2.2**	**3.0**	3.5	5.8	36	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.8**	11	**1.8**	**2.5**	**2.6**	3.4	3.3	9.0	*48e-6/1e4*	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.7	37	3.9	5.3	4.6	6.3	11	52	*18e-5/1e4*	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	20	8.7	41	73	*13e-3/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	24	36	22	26	64	197	251	422	*11e-4/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.1**	4.8	**1.1**	**1.4**	**1.3**	**1**	**1**	**1.1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.9**	7.3	**1**	**1**	**1**	**1.2**	**1.4**	**1.5**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	**1.3**	6.8	6.6	**2.8**	**1.2**	**1**	**1.3**	CMA+DE-MOS
NEWUOA	**1**	**2.2**	11	19	71	167	149	*31e-3/5e3*	.	.	NEWUOA
Basic RCGA	**1**	**1.3**	**2.1**	7.1	16	11	12	10	36	*17e-6/5e4*	Basic RCGA
SPSA	35	55	163	6303	27530	10543	*10e-1/1e5*	.	.	.	SPSA

Table 50: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	0.84	95	1133	2242	6359	12487	21134	44226	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	41	37	8.7	16	*11e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	4.0	50	**2.2**	8.1	*54e-3/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	57	8.9	15	65	*14e-2/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.3**	19	10	15	29	*13e-2/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.1	7.8	3.1	6.9	64	*71e-3/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.4**	23	3.5	**3.8**	*44e-3/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.7**	**4.6**	4.8	5.3	63	*31e-3/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	47	5.1	7.6	*51e-3/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	24	104	19	21	*36e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	779	1826	1833	241	80	76	73	118	*11e-3/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.2**	12	**2.3**	**1**	**1.7**	**1.1**	**1**	**1.1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.3**	7.4	3.0	**1.0**	**1**	**1**	**1.1**	**1**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	**1**	42	40	**25**	**19**	**18**	**8.8**	CMA+DE-MOS
NEWUOA	**1**	**1.7**	104	18	33	*42e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.5**	**2.6**	**1.6**	10	**27**	54	*85e-4/5e4*	.	.	Basic RCGA
SPSA	99	281	477	70	179	*12e-2/1e5*	.	.	.	.	SPSA

Table 51: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	0.84	11	25	55	154	272	397	621	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	**2.3**	**2.0**	**2.5**	3.7	4.7	5.3	7.5	9.4	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.6**	**1.4**	**1.7**	**2.2**	**2.6**	3.7	4.2	5.3	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.6**	**1.4**	**1.7**	**1.3**	**1.7**	**2.6**	**2.7**	3.2	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.6**	**2.2**	3.5	4.3	11	11	13	23	42	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.3**	**1.3**	**1**	**1.2**	**1.8**	**1.7**	**2.0**	**1.8**	**2.0**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	3.4	**1.6**	**1.4**	**1.6**	**1.6**	**1.8**	**1.6**	**1.9**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.4**	**2.0**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.5**	4.0	**1.5**	**1.3**	**1.4**	**1.4**	**1.5**	**1.5**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.3**	**2.5**	4.5	8.3	41	482	*47e-4/5e3*	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	18	34	25	10	7.2	404	1338	5180	*11e-4/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.5**	**1.5**	**1.4**	**1.6**	**1.4**	**1.5**	**1.7**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.1**	3.7	**1.6**	**1.9**	**2.3**	**2.5**	3.1	3.7	4.6	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	**1.9**	7.1	7.2	4.9	4.4	4.4	4.6	CMA+DE-MOS
NEWUOA	**1**	**1.2**	**2.8**	4.6	12	65	*62e-4/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1.4**	**1.3**	3.3	20	16	55	78	310	*19e-6/5e4*	Basic RCGA
SPSA	36	101	241	3498	5677	3438	9408	*24e-2/1e5*	.	.	SPSA

Table 52: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.7	88	481	990	1707	2112	3299	5708	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	5.3	5.1	9.2	66	*15e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.8**	3.7	**2.1**	6.3	34	*21e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.3**	4.6	4.2	12	68	*35e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.7**	6.9	7.0	70	*16e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.3**	4.4	4.8	7.6	69	*20e-3/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	3.3	**2.6**	**4.5**	14	*85e-4/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.3**	**2.2**	**1**	6.6	16	86	*18e-3/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.3**	7.9	6.9	13	149	*61e-3/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.1**	10	30	*37e-2/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	29	35	8.0	5.5	62	214	245	664	*52e-3/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	**2.1**	**1.9**	**1**	**1.0**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.1**	**1.4**	**1.4**	**1.3**	**1**	**1.1**	**1.4**	**1.2**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	**1.1**	3.7	12	22	22	**26**	**24**	**17**	CMA+DE-MOS
NEWUOA	**1**	**1.1**	6.2	29	153	*65e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1.1**	**1.1**	**1**	11	16	**12**	**20**	27	107	*67e-6/5e4*	Basic RCGA
SPSA	69	158	75	3555	*20e-1/1e5*	.	.	.	.	.	SPSA

Table 53: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.33	1e+02 0.36	1e+01 2.9	1e+00 898	1e-01 4071	1e-02 11932	1e-03 23354	1e-04 32415	1e-05 53261	1e-07 1.35e5	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	5.6	16	6.4	*73e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**2.2**	20	4.2	*62e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	19	27	**2.9**	*65e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.1**	28	8.8	*90e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.4**	16	4.1	35	*34e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**2.6**	**1.8**	*32e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.3**	17	3.0	*45e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	35	47	6.0	*59e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	12	67	19	*16e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	374	514	397	27	**31**	125	*75e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	14	**1.7**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.3**	4.8	**1**	**1.6**	**1.4**	**1.2**	**1.1**	**1.0**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	**1**	98	91	**32**	**22**	**21**	**13**	**5.2**	CMA+DE-MOS
NEWUOA	**1**	12	75	11	*12e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	**1.2**	7.7	83	*36e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	64	43456	13041	740	*14e-1/1e5*	.	.	.	.	.	SPSA

Table 54: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.36	2.2	30	253	572	1301	2699	5034	6734	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	24	16	41	*82e-3/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.4**	**1.3**	**1**	3.2	8.2	109	*70e-4/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.5**	**2.2**	4.8	4.5	15	*73e-4/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.2**	3.5	22	95	*13e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.8**	19	36	10	22	109	*79e-4/1e4*	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.5**	**1.9**	**2.6**	5.7	12	53	*10e-4/1e4*	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.3**	**2.0**	5.2	**1.5**	**2.9**	**10**	*91e-5/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.9**	12	5.6	5.1	11	114	*45e-4/1e4*	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.4**	6.2	17	72	*18e-2/5e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	15	22	8.6	13	37	206	*11e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.9**	**2.3**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**1.8**	**1.3**	**2.4**	**2.1**	**1.4**	**1.1**	**1.3**	**1.8**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	**1.3**	5.5	33	20	11	**5.7**	**4.3**	**3.7**	CMA+DE-MOS
NEWUOA	**1**	**1.4**	3.1	27	44	*14e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	**1**	10	27	21	32	57	145	*80e-5/5e4*	Basic RCGA
SPSA	27	48	3392	4731	5907	*11e-1/1e5*	.	.	.	.	SPSA

Table 55: 03-D, running time excess ERT/ERT_{best} on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.33	2.7	69	1010	5516	8125	9253	9555	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	**2.4**	**2.8**	9.4	*69e-4/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	**1.1**	**1**	5.7	27	18	*38e-4/1e4*	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1.3**	**1.4**	4.0	27	18	*53e-4/1e4*	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.3**	**1.3**	3.8	8.5	*68e-4/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1**	3.3	7.0	13	*55e-4/1e4*	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.3**	**2.5**	4.5	13	18	16	*31e-4/1e4*	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.1**	**1.4**	3.6	6.0	18	*31e-4/1e4*	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	**1.8**	**2.7**	7.8	27	*69e-4/1e4*	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1.4**	**1.2**	**1.6**	**2.3**	4.5	10	8.7	*40e-4/6e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	30	38	49	10	**2.8**	**2.7**	31	55	74	152	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.3**	**1.2**	**1.4**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.2**	**1.3**	**1.2**	**2.1**	**1.7**	**1.4**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**1.6**	**1.1**	**2.6**	4.4	5.1	4.5	**4.5**	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.8**	**1.3**	**1.6**	**1.3**	**4.2**	**2.8**	**2.5**	*19e-4/5e3*	NEWUOA
Basic RCGA	**1**	**1**	**1.3**	**1.2**	**1.4**	**1.5**	7.7	12	77	*54e-5/5e4*	Basic RCGA
SPSA	25	38	41	8.2	105	20	*36e-4/1e5*	.	.	.	SPSA

Table 56: 03-D, running time excess ERT/ERT_{best} on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.33	2.2	79	494	24438	73344	1.01e5	1.56e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1.1**	21	15	139	*26e-3/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	14	13	144	*22e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	23	6.1	64	*20e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	32	23	*38e-3/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.2**	**2.4**	5.2	87	*18e-3/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.7**	6.8	31	*10e-3/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1**	4.7	67	*12e-3/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	32	15	6.7	49	*12e-3/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1.7**	40	26	*49e-3/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	630	728	1797	401	34	78	6.3	9.2	*22e-4/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	12	3.9	**6.2**	**1.4**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**2.4**	**2.7**	7.7	**1.4**	**1.2**	**2.0**	**1.9**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**2.5**	**1**	**1**	24	*27e-4/1e5*	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	13	41	36	158	*48e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1.1**	**1.5**	**2.8**	**1**	**1.7**	**7.3**	*15e-5/5e4*	Basic RCGA
SPSA	18	46208	75111	31067	1298	1452	*54e-3/1e5*	.	.	.	SPSA

Table 57: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.33	1e+02 0.33	1e+01 0.33	1e+00 1.6	1e-01 60	1e-02 225	1e-03 10765	1e-04 16315	1e-05 16562	1e-07 17133	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.3**	**2.3**	**2.1**	32	*76e-4/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.1**	**1.5**	**1.0**	11	**2.2**	4.3	4.2	4.1	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**2.1**	3.6	18	6.6	*54e-4/1e4*	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	**2.7**	3.6	38	13	*73e-4/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.0**	**2.4**	31	6.6	8.8	8.7	8.4	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.1**	**2.0**	**2.3**	19	6.5	9.0	8.9	8.6	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1**	**1.2**	**7.6**	**2.7**	**1.8**	**1.8**	**1.7**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	**2.8**	**1.1**	24	**2.8**	4.1	4.1	4.0	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.1**	**2.4**	**1.6**	23	*61e-4/5e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	14	24	30	12	**1.3**	53	29	86	*17e-4/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.4**	**1**	19	**1.5**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	3.0	**1.1**	22	**1**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**2.5**	**1.1**	**1**	**1.6**	**1.5**	**1.5**	**1.6**	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.1**	3.9	**1.6**	8.1	**2.8**	3.9	3.9	*61e-4/4e3*	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**2.5**	**1.6**	**5.9**	**2.8**	7.6	14	41	Basic RCGA
SPSA	31	47	82	328	256	3030	*22e-3/1e5*	.	.	.	SPSA

Table 58: 03-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.3	231	845	1107	1130	1188	1199	1309	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	3.9	**2.2**	**1**	**1.9**	**2.6**	5.2	5.3	8.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.6**	**1**	**1.0**	**1**	**1.0**	**1.0**	**1.3**	**1.2**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.9**	**1.8**	**1.8**	**1.5**	**1.7**	**1.7**	**2.0**	**2.1**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.8**	**1.9**	**1.5**	**2.3**	**2.8**	**2.9**	**2.9**	4.8	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.1**	**1.7**	**1.1**	**1.0**	**1**	**1**	**1**	**1**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.6**	**2.0**	**1.8**	**1.6**	**1.6**	**1.8**	**1.8**	**2.1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.9**	**1.9**	**1.4**	**1.5**	**1.4**	**1.4**	**1.4**	**1.3**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.2**	**1.9**	**2.1**	**2.0**	**2.1**	**2.1**	**2.1**	**2.6**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	3.5	6.1	8.3	10	10	13	34	*45e-3/6e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	30	40	10	8.5	21	34	83	200	355	*90e-5/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	4.5	7.0	15	15	15	16	14	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.8**	4.5	5.4	4.3	8.6	8.3	8.5	8.0	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.9**	20	13	11	11	11	11	11	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.4**	4.3	4.0	5.6	20	64	*89e-4/5e3*	.	NEWUOA
Basic RCGA	**1**	**1**	**1.0**	11	15	23	28	27	33	46	Basic RCGA
SPSA	20	31	122	863	857	1317	1291	*13e-1/1e5*	.	.	SPSA

Table 59: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.33	1e+02 0.33	1e+01 2.3	1e+00 713	1e-01 3563	1e-02 7429	1e-03 23646	1e-04 48543	1e-05 49137	1e-07 51556	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	37	**2.6**	**1.7**	19	*23e-3/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	15	**2.1**	**1.5**	5.9	6.0	*61e-3/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	22	**3.0**	**2.5**	6.4	6.2	*27e-3/1e4*	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	20	4.3	3.6	10	*90e-3/1e4*	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	10	**2.3**	**1.3**	**2.0**	**1.8**	**3.0**	**3.0**	*11e-3/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	3.6	**1.2**	**1**	**1.9**	**1.9**	**1.4**	*47e-4/1e4*	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	6.7	**1.9**	**1.4**	**2.2**	6.0	*30e-3/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	16	**1.8**	**1.7**	**2.7**	6.3	3.1	*14e-3/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	36	5.7	3.8	5.3	3.5	**1.7**	*23e-2/6e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	181	2286	4398	38	24	16	14	10	30	29	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1.6**	**1**	**1.9**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	5.3	**2.0**	**1.5**	**1.1**	**1**	**2.1**	**2.2**	**5.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.7**	10	8.6	8.2	3.7	**2.6**	**2.7**	**3.6**	CMA+DE-MOS
NEWUOA	**1**	**1**	39	11	6.7	11	3.4	*79e-2/5e3*	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1.9**	3.7	3.9	3.8	**2.4**	**2.4**	6.6	Basic RCGA
SPSA	54	279	711	29	98	96	*14e-2/1e5*	.	.	.	SPSA

Table 60: 03-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.2	242	1310	1574	1587	1594	1605	1621	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.4**	13	5.7	4.8	4.8	4.8	5.8	5.8	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.3**	5.7	**1.8**	**1.5**	**1.7**	**1.7**	**1.8**	**1.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**2.7**	**1.3**	**1.9**	**1.9**	**2.4**	**2.4**	**2.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	3.4	11	6.9	6.1	6.1	7.1	7.1	7.1	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	18	3.2	**1.8**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.8**	3.6	**2.0**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	12	**2.9**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.0**	**2.6**	**1.9**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.2**	**1.3**	**1.6**	**1.7**	3.6	7.9	14	*90e-5/5e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	22	37	10	18	20	42	64	186	258	*99e-5/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.9**	6.3	6.1	10	18	19	19	19	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**2.6**	18	7.5	6.3	16	15	15	15	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.5**	30	44	77	123	123	216	214	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.7**	**1**	**1.2**	3.5	6.6	9.3	42	*86e-4/5e3*	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	4.9	11	26	44	44	56	76	Basic RCGA
SPSA	15	30	87	176	64	111	431	921	914	*51e-3/1e5*	SPSA

Table 61: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	5.2	11	14	17	19	20	21	23	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.2**	3.5	**3.0**	4.1	4.8	5.6	6.6	7.2	8.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	3.1	**1.8**	**2.3**	3.2	3.5	3.9	4.3	4.8	5.7	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.6**	**2.0**	**2.6**	**3.0**	3.3	3.8	4.3	5.0	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.9**	3.2	4.3	4.7	5.0	5.8	6.3	7.8	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.2**	**1.9**	**2.3**	**2.7**	3.0	3.6	4.0	4.6	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**1**	**1.4**	**1.8**	**2.3**	**2.7**	**2.9**	3.3	4.1	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.2**	**1.0**	**1.1**	**1.5**	**1.7**	**2.0**	**2.3**	**2.5**	**3.0**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.3	**1.1**	**1.4**	**1.7**	**2.0**	**2.3**	**2.6**	**2.9**	3.5	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.6**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	41	61	9.5	8.6	9.1	10	11	12	13	16	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1.2**	**2.0**	**2.7**	3.4	3.8	4.4	4.9	6.0	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.2**	**1.4**	**2.3**	**3.0**	3.5	4.0	4.5	5.1	6.0	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	3.1	7.9	12	13	16	18	20	24	CMA+DE-MOS
NEWUOA	**1**	3.6	**1.1**	**1.1**	**1.3**	**1.5**	**1.7**	**1.9**	**1.9**	**2.0**	NEWUOA
Basic RCGA	**1**	**1.1**	3.3	17	31	52	75	102	133	189	Basic RCGA
SPSA	40	64	35	117	246	255	301	325	368	6241	SPSA

Table 62: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	5.1	10	15	19	22	24	27	30	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.4**	4.0	4.0	4.3	4.6	5.1	5.9	6.2	7.1	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.4**	**1.7**	**2.3**	**2.4**	**3.0**	3.2	3.5	3.9	4.5	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**2.4**	**1.8**	**2.3**	**2.7**	**2.8**	3.1	3.3	3.5	4.1	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**2.3**	**1.8**	3.6	4.4	4.6	5.3	5.6	6.0	6.9	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.4**	**1.7**	**2.0**	**2.1**	**2.4**	**2.7**	**3.0**	3.5	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.7**	**1.0**	**1.6**	**1.9**	**1.9**	**2.3**	**2.5**	**2.6**	**3.0**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.2**	**1.4**	**1.7**	**1.8**	**2.0**	**2.0**	**2.4**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.6**	**1.2**	**1.4**	**1.6**	**1.9**	**2.1**	**2.2**	**2.3**	**2.9**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	45	79	9.1	10	10	10	10	11	12	13	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.4**	**1.5**	**2.3**	**2.6**	3.1	3.3	3.8	3.9	4.6	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.5**	**1.5**	**2.2**	**2.8**	**3.0**	3.3	3.9	4.2	4.8	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**2.5**	8.7	11	12	14	15	16	18	CMA+DE-MOS
NEWUOA	**1**	3.9	**2.7**	4.1	4.8	11	13	18	21	27	NEWUOA
Basic RCGA	**1**	**1.2**	4.5	20	27	40	58	80	99	138	Basic RCGA
SPSA	41	60	863	3390	6811	6831	6080	7162	15738	*31e-3/1e5*	SPSA

Table 63: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	4.7	8.7	21	29	38	48	57	79	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.5**	**2.9**	4.2	**2.6**	**2.8**	**3.0**	**2.9**	3.1	3.0	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**2.5**	**1.6**	**2.4**	**1.6**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.8**	**2.3**	**1.6**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**2.1**	3.8	4.4	**2.8**	**2.6**	**2.6**	**2.7**	**2.7**	**2.7**	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.6**	**1**	**1.9**	**1.3**	**1.3**	**1.4**	**1.4**	**1.5**	**1.5**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.3**	**1.2**	**1.8**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.2**	**1.1**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.6**	**1.4**	**1.8**	**1.4**	**1.4**	**1.3**	**1.3**	**1.3**	**1.2**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.5**	**1.2**	**1**	**1.0**	**1.1**	**2.1**	3.4	5.1	10	avg NEWUOA
CMA-EGS (IPOP,r1)	32	57	9.1	10	5.7	5.5	5.0	4.9	5.2	5.9	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.3**	**2.6**	**1.8**	**1.8**	**1.8**	**1.8**	**1.9**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**1.7**	**2.5**	**1.9**	**1.9**	**2.0**	**2.1**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	3.5	8.4	7.9	7.7	7.8	8.0	8.8	8.8	CMA+DE-MOS
NEWUOA	**1**	3.5	**1.1**	**1.2**	**1.6**	**1.9**	10	11	22	32	NEWUOA
Basic RCGA	**1**	**1.3**	3.3	17	17	27	38	47	53	65	Basic RCGA
SPSA	51	202	70	76	48	52	68	698	11449	*42e-6/1e5*	SPSA

Table 64: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.2	24	36	308	437	513	556	585	605	643	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	6.5	3.5	3.8	6.6	32	136	*98e-3/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**2.7**	3.8	3.2	**2.1**	7.6	8.7	8.2	8.3	8.1	7.7	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.9**	**1.3**	**1.6**	4.7	8.5	15	15	14	14	13	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	3.7	3.7	3.5	6.4	30	60	261	*69e-3/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.8**	**1.7**	**1.5**	**2.1**	**2.9**	**2.6**	4.2	4.0	3.9	3.7	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.2**	**1.6**	**1.4**	**2.5**	**2.0**	**2.4**	**2.3**	**2.2**	**2.1**	**2.0**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.0**	**1.4**	**1.3**	**2.1**	**2.9**	**2.6**	**2.4**	**2.3**	**2.3**	**2.1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.5**	**1.2**	**1.3**	4.5	8.3	11	10	10	9.4	8.9	(1,4s)-CMA-ES
avg NEWUOA	**1.2**	**1.3**	**1**	**2.5**	3.4	6.1	9.2	9.0	8.7	11	avg NEWUOA
CMA-EGS (IPOP,r1)	20	5.9	5.4	292	264	225	208	198	191	180	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**3.0**	**1.3**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.9**	**1**	**1.3**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	IPOP-CMA-ES
CMA+DE-MOS	5.5	3.9	5.0	**2.0**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.1**	CMA+DE-MOS
NEWUOA	**1**	**1.3**	**1.2**	**1.7**	3.5	8.4	15	66	*14e-4/5e3*	.	NEWUOA
Basic RCGA	6.5	3.6	10	191	254	663	613	1245	*12e-1/5e4*	.	Basic RCGA
SPSA	173	68	*36e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 65: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.3	18	34	680	1331	1414	1463	1499	1525	1576	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	9.1	3.4	3.0	3.3	15	49	100	97	*18e-2/1e4*	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.9	**2.6**	**2.0**	**2.5**	7.6	14	29	*88e-3/1e4*	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	3.8	3.0	**2.1**	**1.5**	3.9	33	*38e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	7.2	**2.4**	4.8	4.3	15	*14e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	3.9	4.1	**2.7**	5.2	11	23	49	100	*14e-2/1e4*	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.7**	4.1	**2.6**	**2.5**	9.2	30	48	47	95	92	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.6**	**1.3**	**1**	**1.8**	6.8	32	98	96	94	91	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.9**	**1**	**1.6**	**2.8**	12	32	99	97	*12e-2/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	**1.4**	**2.5**	**1.7**	**1**	**1.5**	6.2	21	66	65	*45e-4/7e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	22	8.2	5.6	418	1054	992	959	936	920	890	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.0**	3.6	**2.7**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.5**	**1.8**	**1.6**	**1.6**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	6.9	4.7	4.7	**2.5**	**1.7**	**1.9**	**2.2**	**2.2**	**2.2**	**2.3**	CMA+DE-MOS
NEWUOA	**1**	**1.9**	**1.6**	**1.1**	**2.6**	7.1	*38e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	9.2	7.4	13	45	94	259	251	*51e-2/5e4*	.	.	Basic RCGA
SPSA	550	172	*36e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 66: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.8	10	16	161	296	339	361	378	393	415	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	5.0	9.5	8.3	8.6	6.1	6.0	6.0	5.9	5.8	5.7	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.1	5.1	4.7	**2.0**	**1.8**	**1.9**	**1.9**	**2.0**	**2.0**	**2.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.0**	3.3	3.8	**2.1**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	**1.8**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	6.6	9.0	9.3	5.6	4.8	4.9	5.0	5.0	5.0	5.0	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.2**	3.2	3.1	**2.3**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.6**	**1.8**	**2.3**	**1.9**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.5**	**1.3**	**1.5**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.2**	**1.6**	**2.5**	**1.2**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	(1,4s)-CMA-ES
avg NEWUOA	**1.8**	**1.2**	**1**	**1**	**1.7**	6.0	13	45	293	*21e-5/8e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	15	11	10	4.9	3.5	23	22	21	21	21	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.9**	**2.3**	**2.8**	**1.2**	**1.1**	**1.2**	**1.3**	**1.3**	**1.3**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.9**	**2.8**	3.6	**1.7**	**1.6**	**1.8**	**1.8**	**1.9**	**1.9**	**1.9**	IPOP-CMA-ES
CMA+DE-MOS	5.5	6.3	10	3.5	**2.9**	**2.9**	3.0	3.1	3.2	3.5	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.1**	**1.5**	3.5	28	87	*79e-4/7e3*	.	.	NEWUOA
Basic RCGA	7.1	10	25	238	339	512	977	*44e-2/5e4*	.	.	Basic RCGA
SPSA	568	1872	2419	*26e-1/1e5*	.	.	.	.	.	.	SPSA

Table 67: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	13	45	99	174	251	281	331	414	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	11	44	302	*18e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**2.3**	7.9	6.1	23	57	262	*91e-5/1e4*	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	3.8	7.8	19	35	106	243	438	*17e-4/1e4*	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	7.5	45	414	*23e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.9**	8.2	9.1	12	19	43	91	*62e-5/1e4*	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	3.3	3.9	7.1	4.8	**5.7**	10	**12**	23	351	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	3.1	4.9	4.8	6.7	**8.8**	22	58	351	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.1**	8.5	10	24	64	92	504	*66e-4/1e4*	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.7**	41	323	*14e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	52	72	**2.8**	**2.5**	**4.5**	9.0	38	103	226	972	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1.2**	**2.8**	**1.8**	**1.3**	**1.1**	**1.1**	**1.1**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.0**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1.9**	24	19	13	14	16	16	16	CMA+DE-MOS
NEWUOA	**1**	**2.7**	37	197	*17e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.5**	**1**	11	9.5	9.1	9.4	12	**14**	**16**	Basic RCGA
SPSA	50	82	5176	*88e-1/1e5*	.	.	.	.	.	.	SPSA

Table 68: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.20	1e+02 0.20	1e+01 14	1e+00 703	1e-01 1855	1e-02 3138	1e-03 3952	1e-04 5735	1e-05 7305	1e-07 11152	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.7**	55	*23e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**2.7**	34	33	*18e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	40	64	*19e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**2.8**	114	101	*22e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.7**	**7.5**	23	80	*11e-1/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.4**	31	**11**	*84e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	3.7	20	19	*94e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.7**	31	100	*15e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.0	195	64	*27e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	5825	9728	366	20	**12**	**11**	**14**	**15**	**21**	**67**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	12	13	**1**	**1**	**1.0**	**1**	**1.1**	**1.1**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.7**	11	**1.2**	**1.1**	**1**	**1.2**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**3.1**	139	195	247	418	288	227	*89e-2/1e5*	CMA+DE-MOS
NEWUOA	**1**	48	97	93	*41e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	19	47	111	*16e-2/5e4*	.	.	.	Basic RCGA
SPSA	436	1305	112	14	378	*15e-2/1e5*	.	.	.	.	SPSA

Table 69: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	4.2	13	24	39	57	74	91	127	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**2.7**	**2.9**	**2.4**	3.2	3.7	3.9	4.8	4.7	5.1	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	3.3	**2.2**	**2.2**	**2.2**	**2.0**	**2.1**	**2.0**	**1.9**	**2.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.3**	**1.8**	**1.9**	**1.8**	**1.6**	**1.6**	**1.7**	**1.7**	**1.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	3.1	3.1	3.6	3.8	4.5	4.6	4.6	5.1	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.1**	**1.8**	**2.0**	**1.8**	**1.9**	**2.0**	**2.1**	**2.2**	**2.1**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.5**	**1.2**	**1.4**	**1.6**	**1.6**	**1.7**	**1.8**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.2**	**1.6**	**1.2**	**1.4**	**1.4**	**1.4**	**1.3**	**1.3**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.5**	**2.2**	3.1	46	90	*67e-4/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	41	62	11	7.3	5.5	210	4881	*17e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**1.6**	**1.7**	**1.9**	**2.0**	**1.9**	**2.0**	**2.2**	**2.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.5**	**1.9**	**2.0**	**2.1**	**2.1**	**2.2**	**2.2**	**2.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	3.2	7.7	8.6	9.3	9.4	10	10	11	CMA+DE-MOS
NEWUOA	**1**	**1.7**	**2.6**	11	148	1690	*41e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1.3**	4.7	18	22	27	32	38	48	80	Basic RCGA
SPSA	50	101	73	839	6210	*13e-2/1e5*	.	.	.	.	SPSA

Table 70: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	7.9	31	103	4452	24292	68291	85486	86710	87738	89816	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	22	12	59	*69e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	3.8	6.0	6.2	3.5	**2.8**	**1**	*10e-1/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	7.6	4.8	3.9	**2.3**	**2.8**	**2.1**	*67e-2/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	32	32	84	*92e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	10	7.7	5.5	**2.0**	5.9	**2.1**	*74e-2/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	5.5	5.5	**2.8**	**1**	**1.0**	**2.1**	*37e-2/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.0**	**3.0**	**3.0**	**1.6**	**1**	**2.2**	*28e-2/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.6	3.6	6.7	**2.5**	**2.7**	*79e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	25	52	443	*27e+0/6e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	76	56	23	*33e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1.7**	**1**	6.6	3.2	**1.4**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.3**	13	3.4	**1.2**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	3.8	7.1	19	55	65	23	**18**	**18**	**18**	**18**	CMA+DE-MOS
NEWUOA	21	35	216	16	*13e+0/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**2.8**	4.8	8.9	52	30	11	*18e-1/5e4*	.	.	.	Basic RCGA
SPSA	113	440	13632	*31e+0/1e5*	.	.	.	.	.	.	SPSA

Table 71: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	35	230	738	3.40e5	1.57e6	4.55e6	4.56e6	4.57e6	4.60e6	4.63e6	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	19	107	*12e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	11	24	*71e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	18	33	*72e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	25	75	*10e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	9.0	10	101	*20e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.9	7.6	40	*18e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	4.7	10	55	*22e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	9.3	20	194	*42e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	56	56	*20e+1/6e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	48	36	40	4.2	*36e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.4**	**1.5**	**1**	**2.6**	**8.9**	*88e-2/1e6*	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.4**	**1.9**	**1.4**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**2.6**	31	30	**1**	**1**	*20e-1/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	31	90	*36e+1/5e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.1**	**2.4**	**4.5**	**2.2**	*26e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	31	56	1976	*20e+0/1e5*	.	.	.	.	.	.	SPSA

Table 72: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.3	10	38	387	555	633	683	714	738	779	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	5.1	13	4.5	8.1	8.6	10	10	10	10	10	(1,2)-CMA-ES
(1,2m)-CMA-ES	**3.0**	**3.0**	**1.3**	**2.3**	**2.5**	**2.6**	**2.8**	**2.7**	**2.7**	**2.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	3.8	4.2	**1.5**	**1.5**	**1.7**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	10	9.2	3.6	7.5	13	15	19	18	18	17	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.6**	**2.5**	**1**	**2.1**	**2.2**	**2.2**	**2.3**	**2.3**	**2.3**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.8**	**2.6**	**1.1**	**1.0**	**1.3**	**1.4**	**1.4**	**1.4**	**1.4**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.1**	3.2	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.7**	**2.5**	**1.0**	**1.3**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	(1,4s)-CMA-ES
avg NEWUOA	**1.5**	**2.5**	**1.7**	4.2	29	145	*14e-2/7e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	23	11	4.0	720	1185	*20e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.1	**2.8**	**1.3**	**1.1**	**1.3**	**1.5**	**1.5**	**1.5**	**1.6**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	3.1	**2.8**	**1.2**	**1.2**	**1.7**	**1.9**	**2.0**	**2.0**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	6.7	6.9	4.1	**2.3**	**2.7**	3.0	3.1	3.3	3.4	3.9	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.1**	6.7	130	*44e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	8.2	11	14	113	214	1130	*70e-2/5e4*	.	.	.	Basic RCGA
SPSA	354	512	604	*45e-1/1e5*	.	.	.	.	.	.	SPSA

Table 73: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	3.4	97	293	1238	1313	1535	1535	1535	1557	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	4.4	14	5.4	65	*11e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.9**	8.3	**1.9**	4.0	16	112	*12e-2/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.1**	3.5	**1.7**	4.4	34	109	*18e-2/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.1**	9.3	5.7	48	*91e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.4**	3.5	**2.4**	4.2	14	51	92	92	92	*19e-2/1e4*	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.3**	**2.6**	**1.2**	**3.6**	**6.4**	52	44	44	44	45	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.8**	**1.1**	**1.8**	5.2	11	51	44	44	44	43	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	9.2	**1.6**	8.3	13	56	48	48	48	48	(1,4s)-CMA-ES
avg NEWUOA	**1.7**	13	3.9	40	72	*13e-1/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	67	7.3	5.3	169	328	*58e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.9**	**2.6**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.4**	**1.1**	**1**	**1.8**	**1.9**	**2.2**	**2.1**	**2.1**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.5**	**1**	7.0	15	10	**13**	**13**	**13**	**13**	**13**	CMA+DE-MOS
NEWUOA	**2.1**	8.1	3.6	57	*18e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1.7**	**1.1**	**2.7**	28	27	49	74	74	74	97	Basic RCGA
SPSA	72	13	516	*56e-1/1e5*	.	.	.	.	.	.	SPSA

Table 74: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	2.9	490	1317	5378	9801	10047	10047	10047	10293	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.3**	116	32	*11e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.5**	70	7.9	*63e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1.3**	112	17	*79e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	38	45	18	*73e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.3**	44	5.7	*46e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.3**	**14**	4.3	*30e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	53	21	5.9	112	*21e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.4**	18	6.6	*53e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1.3**	91	23	*11e+0/6e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1787	581	47	135	*19e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	28	**1.0**	**1.4**	**1.0**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	33	**1**	**1**	**1**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1.5**	**2.0**	19	290	71	**52**	**79**	**79**	**79**	**78**	CMA+DE-MOS
NEWUOA	**1**	121	14	*89e-1/5e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.2**	**1**	**3.7**	**35**	**65**	*41e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	1025	428	57	548	*29e-1/1e5*	.	.	.	.	.	SPSA

Table 75: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.23	2.3	14	79	415	495	702	702	702	896	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.9**	3.3	4.9	7.0	58	*13e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.5**	**2.2**	**1.7**	**3.0**	5.8	50	99	99	99	159	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.6**	**2.6**	**2.1**	**1.9**	6.6	41	64	64	64	164	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1.2**	**2.6**	4.4	13	44	*17e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.7**	**1.5**	**1.6**	**2.1**	4.9	21	97	97	97	79	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.4**	**1.2**	**1.1**	**1.7**	**2.2**	**12**	19	19	19	46	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.5**	**1.2**	**2.7**	**2.0**	4.1	23	35	35	35	37	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.5**	**1.4**	**1.8**	**2.2**	6.1	41	65	65	65	*11e-3/1e4*	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	**1**	5.2	24	*10e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	55	11	7.9	521	1588	2865	2019	2019	2019	*31e-2/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**1.7**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.1**	**1**	**1.5**	**2.9**	**2.4**	**2.7**	**2.2**	**2.2**	**2.2**	**1.8**	IPOP-CMA-ES
CMA+DE-MOS	**1.4**	**2.1**	4.9	23	28	23	**17**	**17**	**17**	**13**	CMA+DE-MOS
NEWUOA	**1.9**	**1.1**	**2.7**	17	37	*34e-2/4e3*	.	.	.	.	NEWUOA
Basic RCGA	**1.2**	**1.5**	68	84	96	707	511	511	511	400	Basic RCGA
SPSA	51	55	204	2021	3406	*12e-1/1e5*	.	.	.	.	SPSA

Table 76: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	48	293	1012	1794	2524	3093	3918	4024	4139	4325	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	14	20	*42e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	3.9	4.6	9.0	26	*37e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.9	7.6	30	81	*17e+0/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	19	33	142	*72e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	3.4	4.8	7.4	24	*57e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.4**	**2.6**	**4.4**	18	*33e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.9**	3.9	4.6	**10**	57	46	37	*28e-1/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.4	5.1	11	*86e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	14	32	*95e+0/6e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	270	4821	*33e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.8**	3.5	**3.5**	**3.8**	**3.3**	**3.0**	**2.5**	**2.5**	**2.5**	**2.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	9.4	10	**8.6**	**9.0**	**7.1**	**7.0**	**6.8**	**6.6**	CMA+DE-MOS
NEWUOA	13	18	*74e+0/5e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.1**	19	33	88	285	*22e-1/5e4*	.	.	.	.	Basic RCGA
SPSA	957	4910	*74e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 77: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	61	1297	3481	7328	9644	11204	12787	13732	14995	17590	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	52	54	*32e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	16	33	*19e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	25	113	*31e+1/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	58	111	*31e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	6.3	19	*13e+1/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	7.5	**6.6**	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	6.5	23	*13e+1/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	12	16	*14e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	21	67	*30e+1/6e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	406	206	206	*14e+1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.6	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**3.7**	**1**	**1.6**	**2.0**	**1.8**	**1.6**	**1.6**	**1.6**	**1.5**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	18	24	**18**	**20**	**17**	**15**	**14**	**15**	**13**	CMA+DE-MOS
NEWUOA	23	*41e+1/5e3*	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.8**	6.8	**19**	100	*45e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	354	151	*13e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 78: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	5.3	11	98	173	241	277	302	323	339	382	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	7.6	16	8.0	9.1	8.2	9.3	10	11	12	13	(1,2)-CMA-ES
(1,2m)-CMA-ES	7.7	11	4.0	3.4	**2.9**	**2.9**	**2.9**	**2.8**	**2.8**	**2.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	6.3	7.4	**2.3**	**2.3**	**2.4**	**2.3**	**2.3**	**2.2**	**2.2**	**2.1**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	8.2	17	16	14	20	21	26	33	56	68	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.3	7.2	**2.0**	**2.0**	**1.7**	**1.8**	**1.8**	**1.8**	**1.8**	**1.9**	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.2	5.9	**1.7**	**1.7**	**1.4**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.6**	**4.3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.6	7.3	**1.7**	**1.4**	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1.2**	**1**	**1.6**	12	83	*18e-2/7e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	34	708	295	874	1149	5059	*21e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.1	6.3	**1.5**	**1.2**	**1.2**	**1.2**	**1.2**	**1.3**	**1.3**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	3.7	9.2	**2.8**	**2.8**	**2.5**	**2.6**	**2.6**	**2.6**	**2.7**	**2.6**	IPOP-CMA-ES
CMA+DE-MOS	10	17	3.2	**2.5**	**2.2**	**2.3**	**2.8**	3.2	3.6	4.2	CMA+DE-MOS
NEWUOA	**1**	**1.3**	3.8	15	151	*30e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	6.8	534	432	2000	*45e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	57	262	2263	*18e+0/1e5*	.	.	.	.	.	.	SPSA

Table 79: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.7	46	131	356	1131	3165	3431	6022	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	13	22	150	*12e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**2.5**	5.6	7.1	11	92	*16e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**2.6**	4.4	7.7	26	88	*18e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	11	30	30	1087	*20e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.1**	8.4	6.4	18	39	*62e-4/1e4*	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.9**	13	**3.1**	**6.4**	**10**	40	45	*42e-4/1e4*	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.1**	7.7	5.5	10	17	125	*55e-4/1e4*	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	5.2	12	20	117	*23e-3/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.4	16	67	*42e-2/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	62	92	13	27	45	172	181	*23e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.4**	**1.3**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1**	**1.2**	**1.0**	**1.5**	**1.5**	**2.1**	**2.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	**2.2**	143	58	29	12	**6.4**	**6.9**	**4.1**	CMA+DE-MOS
NEWUOA	**1**	**1.7**	23	100	*90e-2/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.2**	**1.2**	18	19	11	**11**	40	*20e-5/5e4*	.	Basic RCGA
SPSA	51	67	2680	*32e-1/1e5*	.	.	.	.	.	.	SPSA

Table 80: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.21	2.8	443	2447	5038	9959	16295	28976	72546	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.4**	89	43	*14e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	32	53	104	61	*11e-1/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.6**	40	34	*10e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	59	59	44	*14e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	10	41	21	*77e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**2.7**	15	**8.6**	*66e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	52	74	13	*69e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.8**	44	20	*83e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	40	109	64	*15e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1223	2046	778	111	51	33	72	*13e-3/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.1**	21	**1**	**1**	**1.1**	**1.2**	**1.2**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**7.0**	**2.1**	**1.0**	**1**	**1**	**1**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**2.9**	83	199	97	**49**	**47**	**55**	**22**	CMA+DE-MOS
NEWUOA	**1**	31	150	72	*24e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.2**	**1**	22	**18**	**32**	*50e-3/5e4*	.	.	.	Basic RCGA
SPSA	194	1014	318	217	*84e-2/1e5*	.	.	.	.	.	SPSA

Table 81: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.23	3.0	16	31	75	162	306	467	698	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	**2.6**	4.0	3.3	4.7	5.7	6.6	7.5	16	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.4**	**1.4**	**1.6**	**1.6**	**1.7**	**2.1**	**2.9**	3.2	5.0	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.5**	**1.5**	**1.5**	**1.2**	**1.7**	**1.7**	**1.9**	**2.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	3.9	3.1	4.1	3.9	4.0	11	9.4	16	48	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.8**	**1**	**1.7**	**1.6**	**1.6**	**1.9**	**1.9**	**2.0**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.5**	**2.0**	**1.6**	**1.5**	**1.5**	**1.8**	**1.6**	**1.7**	**2.1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.1**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.7**	**1.5**	**1.4**	**1.3**	**1.2**	**1.2**	**1.2**	**1.3**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.9**	**2.5**	4.6	78	1122	*38e-3/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	46	55	9.4	6.0	5.1	686	8809	*55e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.9**	**1.8**	**1.6**	**1.8**	**1.6**	**1.5**	**1.4**	**1.4**	**1.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**1.1**	**1.6**	**1.8**	**1.6**	**2.1**	**2.9**	3.5	4.1	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**2.0**	6.8	7.1	5.7	4.4	4.1	3.8	4.4	CMA+DE-MOS
NEWUOA	**1**	3.5	**2.8**	21	132	*86e-3/4e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.2**	**1.2**	16	20	16	59	2413	*22e-5/5e4*	.	Basic RCGA
SPSA	42	66	69	9513	*11e-1/1e5*	.	.	.	.	.	SPSA

Table 82: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	3.7	326	808	2202	2907	3456	7093	13010	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.2**	5.8	32	*80e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.1**	3.3	**5.0**	*34e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.4**	3.8	6.6	*57e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.1**	21	42	*96e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.1**	4.7	11	*53e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.9**	5.5	*38e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.7**	5.1	*35e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	11	12	*57e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.5**	3.3	36	*11e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	33	46	7.1	7.5	64	158	*62e-3/3e4*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**1.6**	**1.4**	**1.6**	**1.0**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.3**	**2.6**	**1**	**1**	**1**	**1.2**	**1.3**	**1.0**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	117	148	68	54	46	**23**	**17**	CMA+DE-MOS
NEWUOA	**1**	**1.9**	7.4	97	*18e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	**1.3**	8.5	**8.5**	**11**	**21**	**44**	*72e-5/5e4*	.	Basic RCGA
SPSA	53	87	64	*46e-1/1e5*	.	.	.	.	.	.	SPSA

Table 83: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	3.7	1994	8536	20823	44694	56322	75790	1.99e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	45	*28e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	37	71	*22e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	45	*29e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	33	52	*26e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.2**	24	72	*15e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	9.1	24	**34**	*15e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	23	75	*18e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	42	75	*14e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.5**	48	*26e-1/6e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1886	2342	870	70	*14e-1/4e4*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	17	**1.5**	**1.3**	**1.0**	**1**	**1**	**1**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**14**	**1**	**1**	**1**	**1.1**	**1.3**	**1.2**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	**1**	115	**183**	*18e-1/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1.3**	39	*37e-1/5e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	**1.2**	48	*11e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	77217	77493	7333	*71e-1/1e5*	.	.	.	.	.	.	SPSA

Table 84: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.21	3.3	50	443	1531	3792	4933	8445	11261	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	6.5	103	328	*52e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.1**	**2.0**	**2.2**	14	97	*65e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.2**	**2.5**	4.5	10	*60e-3/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1.7**	57	225	*88e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**2.9**	**1.7**	17	56	*13e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1.4**	**2.1**	7.1	46	*41e-3/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.2**	**1.1**	6.1	8.4	93	*46e-3/1e4*	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.6**	10	16	34	*10e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.9**	3.6	72	*63e-2/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	54	71	11	4.6	38	*44e-3/6e4*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1.0**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.7**	**1.6**	**1.0**	**1.9**	**1.2**	**1.3**	**1.2**	**1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1**	4.8	**6.8**	**4.0**	**2.6**	**2.3**	**3.6**	**3.2**	CMA+DE-MOS
NEWUOA	**1**	**1.1**	**1.8**	129	*11e-1/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.4**	52	19	11	11	71	*55e-5/5e4*	.	Basic RCGA
SPSA	59	90	306	13461	*39e-1/1e5*	.	.	.	.	.	SPSA

Table 85: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	0.20	3.1	162	18741	25208	27184	27488	28028	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	7.8	73	*92e-3/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.3**	4.5	18	*69e-3/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**2.4**	41	*81e-3/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	16	128	*11e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.3**	16	*58e-3/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.5**	16	*58e-3/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.3**	15	*54e-3/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	3.1	29	*82e-3/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.0**	5.3	12	*36e-3/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	49	65	70	10	4.2	7.6	*10e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.7**	3.9	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.7**	**3.2**	**1.1**	**1.5**	**2.2**	**2.2**	**2.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.2**	**2.2**	**1**	6.6	**31**	**28**	**28**	**28**	CMA+DE-MOS
NEWUOA	**1**	**1**	3.9	**1**	7.5	3.7	*40e-3/5e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1.7**	**1.9**	**1.8**	*82e-4/5e4*	.	.	.	Basic RCGA
SPSA	41	60	35786	2327	65	75	*51e-3/1e5*	.	.	.	SPSA

Table 86: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.20	1e+02 0.20	1e+01 0.20	1e+00 6.5	1e-01 114	1e-02 1.04e5	1e-03 2.42e6	1e-04 3.74e6	1e-05 3.76e6	1e-07 3.78e6	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.1**	62	1304	*25e-2/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	19	*22e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	22	*20e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	32	18	1262	*26e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	16	*15e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	11	410	*12e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**2.5**	202	*12e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.2**	8.6	629	*18e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	22	50	800	*26e-2/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	1548	1777	5228	242	176	14	*23e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.9**	**14**	**2.4**	*51e-4/4e5*	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.9**	18	**2.0**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.2**	**1.0**	**1**	*23e-3/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.2**	32	611	*26e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1**	**2.5**	**1**	*11e-3/5e4*	.	.	.	Basic RCGA
SPSA	1.00e6	2.00e6	3.25e6	99552	12626	*16e+2/1e5*	.	.	.	.	SPSA

Table 87: 05-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	0.20	2.9	131	16697	33988	34990	35477	36152	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	5.9	21	8.9	*55e-3/1e4*	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	**2.2**	7.9	4.2	*44e-3/1e4*	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	**1.8**	6.9	8.9	*29e-3/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1.3**	4.1	57	*64e-3/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**1.2**	12	*32e-3/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.2**	6.1	8.6	*24e-3/1e4*	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1.7**	12	*42e-3/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	**1.2**	15	8.7	*29e-3/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**2.0**	**1.3**	8.0	*53e-3/6e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	44	62	77	13	3.0	5.5	*92e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.1**	**2.1**	4.7	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.0**	**2.4**	**1.1**	**1.2**	**1.4**	**1.4**	**1.4**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.2**	**2.4**	**1**	**1.5**	**9.3**	**43**	**43**	**42**	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.5**	**1**	11	*62e-3/4e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**2.8**	**1.5**	**2.8**	*95e-4/5e4*	.	.	.	Basic RCGA
SPSA	45	56	122	1499	5186	*15e-2/1e5*	.	.	.	.	SPSA

Table 88: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	15	1446	2483	3968	4430	4659	5193	6634	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	6.9	3.5	6.0	8.6	16	15	*80e-3/1e4*	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	3.0	**1**	**1.3**	**1.0**	**1.0**	**2.0**	**2.1**	**1.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	3.2	**1.1**	**1.3**	**1.2**	**1.2**	**1.2**	**1.4**	**2.3**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	14	**2.8**	13	37	33	*31e-2/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	4.5	**1.6**	**1.8**	**1.3**	**2.0**	**2.5**	3.1	4.7	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.7**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	5.0	**1.1**	**1.3**	**1.2**	**1.2**	**1.2**	**1.2**	**1.3**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	6.2	**1.8**	**2.6**	3.1	3.3	3.3	8.3	10	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	16	5.4	4.7	22	*31e-2/6e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	37	52	3.6	49	84	102	92	87	78	99	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	3.8	**1.0**	**2.9**	**2.1**	**1.9**	**1.8**	**1.6**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.5**	8.3	19	15	14	13	12	9.3	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**2.5**	7.8	10	6.4	5.8	5.7	5.1	4.1	CMA+DE-MOS
NEWUOA	**1**	**1**	18	10	27	*19e-1/5e3*	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	7.7	10	8.7	12	12	11	11	Basic RCGA
SPSA	27	55	5241	*89e-1/1e5*	.	.	.	.	.	.	SPSA

Table 89: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	35	18178	1.21e5	1.45e5	1.63e5	1.64e5	1.65e5	1.66e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	61	*33e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	40	*34e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	44	**2.5**	*23e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	70	8.2	*56e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	12	**1.4**	**1.2**	*20e-1/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	10	**2.5**	*17e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	12	**1.9**	*19e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	14	**1.7**	**1.2**	**1**	*20e-1/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	25	**2.4**	*30e-1/6e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	2252	4483	850	14	12	10	8.7	8.7	8.7	8.6	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	3.8	**1.2**	**1**	**1.1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**3.1**	**1.5**	**1.0**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.4**	8.0	4.2	5.3	4.7	4.6	4.6	4.6	CMA+DE-MOS
NEWUOA	**1**	**1**	45	**1.8**	*61e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1**	**1.3**	**2.4**	**2.1**	**4.5**	**4.5**	**4.5**	Basic RCGA
SPSA	626	2123	411	*58e-1/1e5*	.	.	.	.	.	.	SPSA

Table 90: 05-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	11	689	2109	2125	2140	2154	2163	2188	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	14	11	6.5	7.7	8.9	8.9	8.9	11	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	7.2	4.0	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	5.2	3.3	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	37	14	12	12	12	12	12	12	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	5.3	5.9	3.5	3.5	3.5	3.5	3.8	3.8	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	3.6	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	6.8	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	3.3	3.3	4.3	4.2	4.2	4.2	4.2	4.2	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1.3**	**1.5**	**1.7**	4.6	9.2	41	*14e-3/6e3*	.	avg NEWUOA
CMA-EGS (IPOP,r1)	35	57	5.1	48	42	96	320	319	*31e-3/1e5*	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.4**	34	45	45	45	45	45	45	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.2**	14	41	44	44	44	44	44	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**2.4**	54	40	53	53	53	53	52	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.2**	**2.6**	**2.9**	15	*62e-3/4e3*	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**2.5**	16	7.3	8.7	9.0	11	11	14	Basic RCGA
SPSA	40	62	141	460	*19e-1/1e5*	.	.	.	.	.	SPSA

Table 91: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.59	5.5	12	18	22	24	26	28	31	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	8.4	6.4	4.8	4.3	4.4	4.8	5.1	5.5	6.4	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**2.4**	3.4	**2.6**	**2.4**	**2.7**	3.0	3.2	3.4	4.0	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	4.9	**2.7**	**2.0**	**1.9**	**2.1**	**2.4**	**2.6**	**2.8**	3.3	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	9.1	6.5	4.4	4.2	4.4	4.9	5.3	5.8	6.7	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.6**	**2.4**	**2.0**	**2.0**	**2.2**	**2.4**	**2.7**	**2.8**	3.4	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.8**	**1.9**	**1.7**	**1.6**	**1.9**	**2.1**	**2.3**	**2.4**	**2.9**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.1**	**1.5**	**1.3**	**1.3**	**1.4**	**1.6**	**1.8**	**1.9**	**2.3**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.4**	**2.2**	**1.8**	**1.7**	**1.8**	**2.1**	**2.3**	**2.5**	**2.9**	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.3	**1.4**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	153	43	16	11	8.5	8.3	8.5	8.9	9.1	10	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**2.4**	**2.4**	**2.4**	**2.7**	3.1	3.4	3.7	4.4	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.9**	**2.7**	**2.5**	**2.5**	**2.9**	3.2	3.6	3.8	4.4	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	7.9	11	8.9	10	12	12	13	16	CMA+DE-MOS
NEWUOA	**1**	**2.5**	**1**	**1**	**1.1**	**1.4**	**1.5**	**1.6**	**1.7**	**2.1**	NEWUOA
Basic RCGA	**1**	**1.2**	13	21	28	40	97	175	214	274	Basic RCGA
SPSA	104	30	2098	1945	2334	3543	4564	4869	5882	*34e-5/1e5*	SPSA

Table 92: 10-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.41	7.5	13	18	23	27	32	37	52	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	12	5.0	4.6	4.9	4.7	4.8	4.8	4.9	4.6	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	6.0	**2.5**	**2.4**	**2.6**	**2.6**	**2.6**	**2.7**	**2.7**	**2.4**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	5.8	**1.7**	**2.0**	**2.1**	**2.1**	**2.2**	**2.2**	**2.2**	**2.0**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	6.3	7.7	6.5	6.5	6.0	6.2	6.0	6.2	6.9	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	5.3	**2.0**	**2.0**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.2**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.9**	**1.6**	**1.6**	**1.7**	**1.8**	**1.9**	**1.9**	**2.0**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	3.5	**1.2**	**1.4**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.4**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	4.1	**1.6**	**1.5**	**1.7**	**1.8**	**1.8**	**1.9**	**1.9**	**1.8**	(1,4s)-CMA-ES
avg NEWUOA	**1**	7.5	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	147	60	12	10	10	8.9	8.4	8.0	7.7	6.6	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.4**	**1.7**	**2.2**	**2.5**	**2.6**	**2.7**	**2.8**	**2.9**	**2.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.5**	**1.8**	**2.3**	**2.6**	**2.6**	**2.7**	**2.8**	**2.9**	**2.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.5**	6.7	10	9.3	10	11	10	11	9.4	CMA+DE-MOS
NEWUOA	**1**	4.4	**1.2**	**2.5**	9.0	27	40	60	105	317	NEWUOA
Basic RCGA	**1**	**1**	9.1	18	29	38	85	143	168	165	Basic RCGA
SPSA	124	45	53809	1.08e5	*21e+0/1e5*	.	.	.	.	.	SPSA

Table 93: 10-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.53	6.2	13	22	31	41	49	58	76	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	6.5	6.0	4.3	3.6	3.4	3.2	3.2	3.2	3.3	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.1	**2.9**	**2.2**	**1.9**	**1.8**	**1.8**	**1.8**	**1.9**	**1.8**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	3.1	**2.6**	**2.1**	**1.7**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	4.9	5.1	3.8	3.1	**2.8**	**2.7**	**2.8**	**2.9**	**2.9**	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**3.0**	**2.5**	**2.0**	**1.7**	**1.6**	**1.6**	**1.6**	**1.6**	**1.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**2.5**	**2.0**	**1.6**	**1.5**	**1.4**	**1.3**	**1.4**	**1.4**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.7**	**1.5**	**1.2**	**1.1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.2	**2.0**	**1.5**	**1.4**	**1.3**	**1.2**	**1.3**	**1.3**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1**	5.9	**1.3**	**1**	**1**	3.1	22	74	948	*39e-6/8e3*	avg NEWUOA
CMA-EGS (IPOP,r1)	121	42	14	8.9	6.7	5.5	4.8	4.8	4.8	4.8	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.5**	**2.1**	**2.1**	**2.0**	**1.9**	**1.8**	**1.9**	**1.9**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.0**	**2.1**	**2.1**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	6.8	10	7.2	7.5	7.3	8.2	8.1	8.6	CMA+DE-MOS
NEWUOA	**1**	**2.8**	**1**	**1.2**	**2.9**	13	83	179	656	*15e-5/6e3*	NEWUOA
Basic RCGA	**1**	**1**	14	19	25	34	73	115	125	121	Basic RCGA
SPSA	105	138	48	38	32	40	930	3126	*18e-5/1e5*	.	SPSA

Table 94: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.8	23	45	1566	1825	1956	2034	2089	2127	2187	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.9	4.6	5.1	28	*24e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.7	3.5	**2.8**	7.0	38	74	71	69	*72e-2/1e4*	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	3.9	**2.6**	**2.0**	10	24	72	69	67	*16e-1/1e4*	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	14	6.3	4.4	16	*15e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	3.6	3.2	**2.8**	4.7	79	*56e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.9**	**1.3**	**1.7**	20	37	72	69	67	66	64	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.1**	**2.3**	**1.6**	8.2	39	*92e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	3.1	**2.4**	**1.9**	5.2	24	73	*40e-2/1e4*	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1**	4.5	20	*67e-2/8e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	20	6.1	4.8	24	21	19	19	18	18	18	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.7	**1.6**	**1.6**	**1.3**	**1.2**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	3.7	**2.5**	**2.9**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	12	5.7	5.3	**2.2**	**2.3**	**2.4**	**2.6**	**2.7**	**2.7**	**2.7**	CMA+DE-MOS
NEWUOA	**1.0**	**2.1**	7.2	**2.9**	43	*55e-2/5e3*	.	.	.	.	NEWUOA
Basic RCGA	16	15	99	*73e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	81	31	*70e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 95: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.1	38	97	4218	4463	4596	4682	4743	4797	4894	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	16	4.4	4.5	7.6	32	*21e-1/1e4*	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	7.8	**1.6**	**1.6**	5.2	*19e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	5.6	**2.3**	**1.7**	3.8	10	32	*14e-1/1e4*	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	16	5.2	5.5	16	33	*35e-1/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	5.9	**1.7**	**1.3**	3.8	15	*15e-1/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	4.7	**1.6**	**1.1**	6.0	16	*20e-1/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**3.6**	**1.7**	**1.4**	3.4	16	*59e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.6	**1.3**	**1.1**	3.1	6.0	15	31	*38e-2/1e4*	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1.9**	**1.5**	**2.4**	**2.6**	5.9	26	*88e-2/8e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	31	4.3	**2.4**	155	147	142	140	138	137	287	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	5.1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	6.2	**1.2**	**2.2**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	22	3.4	**2.3**	4.8	**4.6**	**4.5**	**4.4**	**4.3**	**4.3**	**4.2**	CMA+DE-MOS
NEWUOA	**1**	**1.0**	11	5.2	*52e-1/5e3*	.	.	.	.	.	NEWUOA
Basic RCGA	28	8.8	44	167	*61e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	84	18	*70e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 96: 10-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.4	13	36	289	370	409	433	449	463	487	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	15	10	6.6	5.4	5.2	5.2	5.1	5.1	5.1	5.1	(1,2)-CMA-ES
(1,2m)-CMA-ES	6.4	3.7	**2.5**	**2.7**	**2.6**	**2.6**	**2.5**	**2.5**	**2.5**	**2.4**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	6.3	4.8	**2.5**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.7**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	12	12	6.4	9.4	8.6	8.2	8.0	7.9	7.8	7.6	(1,2s)-CMA-ES
(1,4)-CMA-ES	5.1	3.5	**2.0**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	(1,4)-CMA-ES
(1,4m)-CMA-ES	4.7	3.2	**1.8**	**1.7**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**3.0**	**1.6**	**1.4**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	5.0	3.5	**2.0**	**1.9**	**1.8**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,4s)-CMA-ES
avg NEWUOA	**1.5**	**1**	**1**	6.4	40	325	*13e-2/9e3*	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	24	10	5.2	3.6	3.4	3.4	3.4	3.5	3.6	4.0	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.9	**2.8**	**1.9**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	IPOP-aCMA-ES
IPOP-CMA-ES	4.8	3.5	**2.3**	**2.4**	**2.5**	**2.5**	**2.5**	**2.6**	**2.6**	**2.5**	IPOP-CMA-ES
CMA+DE-MOS	19	10	6.3	4.0	3.7	3.7	3.7	3.8	3.8	4.0	CMA+DE-MOS
NEWUOA	**1**	**1.3**	**1.3**	8.9	29	52	*11e-2/7e3*	.	.	.	NEWUOA
Basic RCGA	20	22	110	549	923	1778	*66e-1/5e4*	.	.	.	Basic RCGA
SPSA	431	1779	18171	*16e+0/1e5*	.	.	.	.	.	.	SPSA

Table 97: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.10	0.24	80	194	360	560	738	854	1016	1179	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	**1**	213	233	*11e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	9.0	18	734	*35e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	22	26	750	*54e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	173	824	*14e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	53	42	*54e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	12	15	162	*21e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	71	11	*34e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	8.2	42	347	*54e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	13	267	*15e+0/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	113	81	**1.5**	**1.6**	**2.3**	**3.2**	**3.3**	**5.9**	**6.6**	21	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.5**	**1.1**	**1.3**	**1.5**	**1.2**	**1.0**	**1**	**1.1**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	4.1	**1**	**1**	**1**	**1**	**1**	**1.1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**2.5**	18	75	48	33	30	26	24	21	CMA+DE-MOS
NEWUOA	**1**	6.4	153	*23e+0/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	3.9	3.9	3.2	3.2	4.6	6.5	7.1	**7.8**	Basic RCGA
SPSA	82	60	17402	*28e+0/1e5*	.	.	.	.	.	.	SPSA

Table 98: 10-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.10	1e+02 0.51	1e+01 785	1e+00 1992	1e-01 3283	1e-02 5974	1e-03 7657	1e-04 11196	1e-05 13940	1e-07 23700	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	198	*28e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	309	*26e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	180	*29e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	148	*27e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	180	85	*18e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	188	190	*17e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	138	42	*16e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	175	*22e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	279	*27e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	11234	4430	**5.8**	**5.5**	**6.2**	**5.7**	**6.6**	**6.0**	**10**	**15**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	73	**1.3**	**1**	**1.4**	**1.1**	**1.4**	**1.2**	**1.4**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**12**	**1**	**1.0**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.2**	58	756	*74e-1/1e5*	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	116	*28e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	5.9	356	*21e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	3022	1591	7.2	35	*78e-2/1e5*	.	.	.	.	.	SPSA

Table 99: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.44	9.4	20	33	45	60	77	93	127	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	13	4.4	3.5	4.2	4.1	4.2	4.2	4.5	4.8	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	7.1	**1.8**	**1.7**	**1.7**	**2.0**	**1.9**	**1.9**	**2.0**	**2.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	6.5	**1.7**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	12	4.1	3.7	3.6	3.5	3.5	3.5	3.8	4.0	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.6	**1.6**	**1.6**	**1.6**	**1.9**	**2.0**	**2.1**	**2.2**	**2.3**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	3.0	**1.2**	**1.2**	**1.3**	**1.5**	**1.6**	**1.6**	**1.6**	**1.7**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.7**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	4.4	**1.3**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	(1,4s)-CMA-ES
avg NEWUOA	**1**	4.5	3.3	55	1014	*31e-2/7e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	125	46	9.1	6.8	5.4	884	*49e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.3**	**1.3**	**1.7**	**1.8**	**2.0**	**2.1**	**2.2**	**2.3**	**2.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**1.3**	**1.5**	**1.7**	**1.9**	**2.0**	**2.0**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	4.6	6.7	7.3	8.2	9.4	10	10	11	CMA+DE-MOS
NEWUOA	**1**	3.7	3.6	112	*57e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	8.3	15	18	42	90	92	89	78	Basic RCGA
SPSA	101	167	147	532	19908	*36e-2/1e5*	.	.	.	.	SPSA

Table 100: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	33	198	1028	1.55e6	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	*50e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	43	113	*16e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	130	725	*44e+1/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*65e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	38	163	*11e+1/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	8.4	21	*64e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	15	25	*79e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	52	337	*21e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	658	*16e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	15	8.5	6.2	*76e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.2**	**1.8**	**1.0**	*55e-1/1e6*	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	*57e-1/1e6*	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	9.0	6.4	14	**1**	*74e-1/1e5*	.	.	.	.	.	CMA+DE-MOS
NEWUOA	106	*83e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**4.0**	**3.7**	**3.0**	*85e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	71	632	*10e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 101: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	242	924	5957	∞	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	604	*68e+2/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	590	*45e+2/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*76e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*65e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*46e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	192	*21e+2/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	191	*43e+2/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	617	*46e+2/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	418	*10e+3/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	17	11	**11**	*93e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1**	**1**	*70e-1/9e5*	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.2**	**1.2**	*70e-1/1e6*	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	27	36	21	*89e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	*74e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.5**	**1.2**	35	*10e+0/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	15	74	*87e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 102: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.7	15	68	652	813	888	924	958	986	1039	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	14	7.7	**2.6**	11	11	12	14	14	17	19	(1,2)-CMA-ES
(1,2m)-CMA-ES	5.5	3.7	**1.9**	**2.9**	**2.9**	**2.9**	**3.0**	**3.0**	**3.0**	**3.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.4	**2.9**	**2.4**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	10	6.5	13	15	19	24	29	29	28	46	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.3	3.9	**1.9**	3.7	3.4	3.4	3.4	3.4	3.4	3.6	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.7	**2.7**	**1.5**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.8**	**2.4**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.4	3.1	**1.1**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	(1,4s)-CMA-ES
avg NEWUOA	**1.5**	**2.2**	14	175	140	*42e-1/8e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	24	8.6	**2.9**	*77e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.4	**2.4**	**1.1**	**1.7**	**1.8**	**1.9**	**1.9**	**2.0**	**2.0**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	4.2	**2.3**	**1**	**2.0**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**	IPOP-CMA-ES
CMA+DE-MOS	17	8.9	3.6	3.4	3.9	4.7	5.9	5.9	5.9	5.9	CMA+DE-MOS
NEWUOA	**1**	**1**	36	*81e-1/5e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	21	24	68	1148	*77e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	341	1212	20969	*29e+0/1e5*	.	.	.	.	.	.	SPSA

Table 103: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.26	20	343	1692	3158	3562	3586	3586	3586	3648	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	27	76	*37e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	3.8	13	38	*97e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	58	12	437	*16e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.0	157	*50e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.1**	14	91	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.2**	7.1	23	*77e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	12	10	15	*77e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	13	16	204	*19e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1.9**	45	*40e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	118	3.9	15	103	*11e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.3	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.2**	**2.4**	**1.4**	**1.2**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	3.8	30	21	**19**	**17**	**17**	**17**	**17**	**17**	CMA+DE-MOS
NEWUOA	12	36	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.0**	**2.1**	**3.9**	**7.4**	70	*53e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	72	6.0	*32e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 104: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.26	195	2191	5606	14972	16693	17094	17094	17094	17363	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	198	60	*98e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	94	63	*97e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	95	46	*83e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	199	85	*11e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	88	45	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	104	14	*58e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	261	25	*79e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	153	59	*88e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	40	38	*82e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	10944	63	27	**127**	*41e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	52	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.4**	**1**	**1.1**	**1.5**	**1.3**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	IPOP-CMA-ES
CMA+DE-MOS	**1**	6.0	*21e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	12	18	*88e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.2**	**1.5**	**6.7**	*57e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	4275	42	77	*14e+0/1e5*	.	.	.	.	.	.	SPSA

Table 105: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.26	6.7	36	390	1304	1794	1826	1826	1826	1862	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.4	3.8	12	188	*23e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1.1**	**2.4**	**2.7**	12	115	*69e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.2	**1.8**	**2.2**	10	*65e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**2.9**	5.3	16	*27e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1.6**	**1.4**	3.4	11	114	*75e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.7**	**1**	**1.3**	11	51	*61e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.0**	**1.1**	**1.7**	**7.7**	**33**	*39e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.7**	**1.4**	**2.9**	13	108	*69e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**2.7**	**1.5**	4.7	287	*24e-1/7e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	71	7.2	4.4	708	*13e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**1.1**	**1.2**	**2.7**	**3.5**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	IPOP-CMA-ES
CMA+DE-MOS	**1**	4.6	3.7	39	62	**84**	**83**	**83**	**83**	**81**	CMA+DE-MOS
NEWUOA	4.1	**1.4**	21	*41e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	3.5	41	34	178	398	391	391	391	383	Basic RCGA
SPSA	68	23	38	*31e-1/1e5*	.	.	.	.	.	.	SPSA

Table 106: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	304	1440	2445	3980	4537	4776	5016	5228	5443	5856	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	488	*59e+2/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	236	*24e+2/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*28e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*55e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	45	*99e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	13	*36e+1/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	42	*90e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	76	*13e+2/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	336	*35e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	272	489	*70e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.5**	**2.2**	**2.9**	**2.5**	**2.4**	**2.5**	**2.5**	**2.5**	**2.4**	**2.4**	IPOP-CMA-ES
CMA+DE-MOS	8.4	16	**18**	**14**	**12**	**12**	**11**	**11**	**10**	**10**	CMA+DE-MOS
NEWUOA	*28e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.3**	**13**	95	*23e+0/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	1498	*29e+2/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 107: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1301	5096	8105	13110	20449	22450	24596	26799	28946	37059	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	*44e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	*55e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*51e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*76e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*32e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	*33e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	*32e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	*39e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	*46e+2/7e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	196	*13e+2/1e5*	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.5**	**1.4**	**2.1**	**2.2**	**1.7**	**1.7**	**1.7**	**1.7**	**1.6**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	34	99	**197**	*21e+1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	47	*51e+2/4e3*	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.0**	**20**	*12e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	1139	*24e+2/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 108: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	11	73	171	282	368	429	458	487	509	552	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	12	4.5	5.8	10	11	12	14	18	19	33	(1,2)-CMA-ES
(1,2m)-CMA-ES	6.1	**2.2**	**2.3**	3.1	**2.8**	**2.7**	**2.7**	**2.6**	**2.7**	**2.7**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.9	**1.8**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	11	5.3	12	14	20	28	33	55	53	63	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.6	**1.8**	**1.9**	**2.3**	**2.3**	**2.3**	**2.4**	**2.6**	**2.7**	**2.8**	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.8	**1.2**	**1.6**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.9**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**3.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.1	**1.6**	**1.6**	**1.7**	**1.5**	**1.5**	**1.5**	**1.5**	**1.6**	**1.6**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.4**	13	*37e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	18	5.7	297	1423	3807	*60e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.0	**1.5**	**1.1**	**1.0**	**1.0**	**1.1**	**1.2**	**1.2**	**1.2**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	4.7	**2.2**	**2.3**	**2.6**	**2.6**	**2.6**	**2.6**	**2.7**	**2.7**	**2.7**	IPOP-CMA-ES
CMA+DE-MOS	12	3.7	**2.6**	**2.1**	**2.1**	**2.3**	**2.6**	**2.8**	3.1	3.5	CMA+DE-MOS
NEWUOA	**1.1**	**1.7**	45	*99e-1/5e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	30	185	947	*22e+0/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	25	57	8679	*29e+0/1e5*	.	.	.	.	.	.	SPSA

Table 109: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.19	17	376	606	1010	2457	5473	8198	11037	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	23	40	*38e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	4.1	12	119	*17e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	10	11	380	*17e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	19	51	*45e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**2.9**	18	185	*18e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	11	12	124	*14e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	6.5	11	39	*10e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.3	14	387	*21e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	13	146	*65e-1/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	144	118	3.9	5.1	4.9	36	*32e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.7**	**2.7**	**1**	**1.3**	**1.4**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.9**	**1**	**1.0**	**1**	**1**	**1.6**	**2.1**	**2.3**	**2.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.6**	48	51	57	35	**17**	**10**	**6.6**	**5.5**	CMA+DE-MOS
NEWUOA	**1**	6.0	90	*60e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**2.5**	**2.5**	**2.6**	**2.9**	288	*22e-4/5e4*	.	.	Basic RCGA
SPSA	80	63	6677	*10e+0/1e5*	.	.	.	.	.	.	SPSA

Table 110: 10-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.23	291	2404	4229	11615	23539	40778	72104	1.36e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	135	145	*12e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	175	51	*11e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	204	41	*97e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	311	45	*95e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**10**	18	*67e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	103	9.3	*57e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	74	9.2	*65e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	36	21	*69e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	194	25	*97e-1/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	5333	5878	32	**17**	**22**	**10**	*34e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	49	**1**	**1.1**	**1.2**	**1.0**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	18	**1.1**	**1**	**1**	**1**	**1.2**	**1.4**	**1.1**	**1.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	6.1	313	*44e-1/1e5*	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	79	25	*11e+0/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	21	*80e-2/5e4*	.	.	.	.	.	Basic RCGA
SPSA	2288	4227	49	*55e-1/1e5*	.	.	.	.	.	.	SPSA

Table 111: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.19	8.0	23	38	71	161	319	514	1031	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	11	5.3	4.7	5.0	5.7	5.2	5.9	7.8	140	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.3	**2.2**	**1.8**	**1.9**	**2.1**	**2.2**	**2.4**	**2.7**	3.5	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**2.8**	**1.5**	**1.3**	**1.5**	**1.5**	**1.5**	**1.5**	**1.7**	**2.3**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	9.4	4.0	4.1	4.0	4.4	6.0	8.9	11	144	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	4.9	**1.4**	**1.7**	**2.1**	**2.2**	**2.4**	**2.3**	**2.9**	**2.5**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	6.8	**1.2**	**1.3**	**1.5**	**1.8**	**1.8**	**1.8**	**2.0**	**1.9**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	5.2	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	5.7	**1.0**	**1.4**	**1.5**	**1.6**	**1.5**	**1.3**	**1.4**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	8.3	**1.9**	216	2743	*76e-2/7e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	142	107	7.7	7.0	6.8	19806	*20e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	3.8	**1.3**	**1.5**	**1.8**	**2.0**	**1.8**	**1.5**	**1.4**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.3**	**1.1**	**1.6**	**1.9**	**2.2**	**2.7**	3.2	3.3	3.5	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.6**	3.7	5.6	6.9	7.8	6.7	5.5	5.1	4.0	CMA+DE-MOS
NEWUOA	**1**	4.2	3.1	303	*11e-1/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**2.9**	16	20	49	964	*22e-4/5e4*	.	.	Basic RCGA
SPSA	100	110	213	28929	*46e-1/1e5*	.	.	.	.	.	SPSA

Table 112: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.10	0.10	8.1	701	2889	4897	8620	10993	21803	58803	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	**1**	**1.1**	40	*41e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.6**	8.9	*28e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.8**	12	*27e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	17	36	*45e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	4.1	13	*33e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.2**	14	*26e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	4.1	8.0	*30e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.1**	15	*32e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.7	19	*42e-1/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	118	217	7.7	4.7	*10e-1/2e3*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.5**	**1**	**1.4**	**1**	**1**	**1**	**1.2**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.1**	**1**	**1.0**	**1.3**	**1.1**	**1**	**1.2**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.4**	**2.5**	69	32	29	**20**	**16**	**10**	**4.5**	CMA+DE-MOS
NEWUOA	**1**	**2.5**	30	*47e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.5**	**1.4**	**2.8**	**7.9**	**17**	24	*56e-3/5e4*	.	.	Basic RCGA
SPSA	1.54e5	1.54e5	4506	*76e-1/1e5*	.	.	.	.	.	.	SPSA

Table 113: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.10	1e+02 0.10	1e+01 15	1e+00 6209	1e-01 24694	1e-02 47823	1e-03 79121	1e-04 1.48e5	1e-05 2.64e5	1e-07 7.01e5	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	447	*82e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	85	158	*67e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.2**	180	*65e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	292	*71e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	38	*56e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	32	57	*46e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1.3**	42	*52e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.1**	63	*61e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.3**	48	*68e-1/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	9772	12675	189	*63e-1/5e3*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**7.3**	**1**	**1.0**	**1.1**	**1.3**	**1.1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.0**	**5.9**	**1.0**	**1**	**1**	**1**	**1**	**1.0**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.4**	54	*42e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	31	51	*64e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.3**	**1**	*23e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	1.14e6	1.15e6	93722	*66e+2/1e5*	.	.	.	.	.	.	SPSA

Table 114: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	6.2	71	1122	3653	5485	8188	11405	17037	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	27	*45e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1.3**	**2.9**	165	*77e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1.1**	**2.6**	131	*85e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	218	*47e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	4.1	**1.6**	260	*12e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1.6**	**1.4**	96	*65e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	3.1	**1**	64	*55e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.1	15	957	*15e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.5	7.0	*24e-1/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	112	177	8.3	**3.0**	31	*13e-2/5e3*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.1**	**1.0**	**1**	**1.0**	**1**	**1.1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	3.9	**1.1**	**1**	**1.4**	**1**	**1.2**	**1**	**1.5**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.4**	**1.9**	221	14	**6.7**	**5.2**	**4.2**	**3.6**	**3.0**	CMA+DE-MOS
NEWUOA	**1**	5.0	6.5	*34e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.2**	**2.1**	11	**13**	10	14	*10e-4/5e4*	.	.	Basic RCGA
SPSA	71512	71549	2956	*76e-1/1e5*	.	.	.	.	.	.	SPSA

Table 115: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	0.10	3.9	22979	69545	1.68e5	2.58e5	2.59e5	2.63e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	69	*50e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	31	*39e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	12	*41e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	122	*54e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	24	*38e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	10	*37e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	13	*34e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	33	*40e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	5.9	**1**	*19e-2/7e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	129	163	186	9.4	**1**	**4.8**	*14e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**2.9**	**1.2**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**2.4**	**1.2**	**1.2**	**1.2**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	11	**1.4**	23	*26e-3/1e5*	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	3.8	**2.1**	*22e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	4.5	**2.0**	*88e-3/5e4*	.	.	.	.	Basic RCGA
SPSA	71510	71522	71531	1817	12	*12e-2/1e5*	.	.	.	.	SPSA

Table 116: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	0.10	15	1.11e5	1.92e6	6.27e6	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	345	*88e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	209	*74e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	385	*84e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	364	*86e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	72	*59e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	60	*56e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**2.9**	55	*57e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	62	*72e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	9.4	335	*89e-2/7e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	2497	3030	3915	95	4.1	*12e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**2.1**	**2.8**	**1**	**1**	*80e-3/3e5*	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	3.8	**3.2**	*86e-3/3e5*	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**3.3**	6.4	*17e-2/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	29	80	*66e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1**	**1**	*12e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	1.40e7	*89e+2/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 117: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	0.10	4.0	3514	32104	76636	1.01e5	1.03e5	1.05e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	10	*30e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	3.4	14	*18e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	3.2	41	*22e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	13	*34e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	**2.9**	6.0	*15e-2/1e4*	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	**1.9**	4.5	*11e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	**2.4**	4.2	*12e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	3.0	13	*15e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1**	**1**	*20e-2/7e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	115	148	159	10	13	*72e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.9**	**2.1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.6**	**3.1**	**1.6**	**1.4**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	6.8	**1**	**2.5**	*66e-4/1e5*	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	**2.4**	**2.0**	*25e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.2**	5.1	6.4	*25e-3/5e4*	.	.	.	.	Basic RCGA
SPSA	112	144	652	3311	403	*59e-2/1e5*	.	.	.	.	SPSA

Table 118: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	429	9758	10136	10203	10257	10320	10366	10450	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	330	*15e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	18	7.0	14	*80e-1/1e4*	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	32	*78e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	165	*20e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	24	*81e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	7.8	4.5	*46e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	14	**3.1**	*53e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	21	*82e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	69	*21e+0/7e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	124	170	**4.5**	10	9.5	13	15	28	28	64	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.4**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	110	73	70	149	148	147	147	145	CMA+DE-MOS
NEWUOA	**1**	**1**	*24e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	7.0	6.9	**7.1**	**7.2**	**7.3**	**11**	**11**	**21**	Basic RCGA
SPSA	79	101	*64e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 119: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	3382	1.35e5	1.60e5	1.65e5	1.68e5	1.72e5	1.74e5	1.79e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	*44e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	*34e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	43	*32e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	44	*38e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	21	*21e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	*24e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	*23e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	*28e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	*39e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	5487	16432	21	5.3	**9.1**	**8.9**	**8.7**	**8.6**	**8.5**	**8.4**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.1**	**1**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	41	*11e+0/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**7.1**	**2.7**	*65e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	1935	9633	*41e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 120: 10-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	92	1340	2887	2897	2907	2919	2930	2951	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	6.3	18	11	11	11	10	10	10	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	5.2	**2.8**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**2.3**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	5.9	3.5	3.4	4.0	4.5	5.6	8.1	8.1	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**2.7**	**2.6**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.0**	**2.4**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**2.6**	**2.5**	**2.2**	**2.2**	**2.2**	**2.2**	**2.1**	**2.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1**	**2.6**	11	*41e-2/7e3*	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	108	153	**1.3**	53	53	97	482	*15e-2/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.2**	3.8	**1.8**	**1.8**	**1.8**	**1.9**	**1.9**	**2.0**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.9**	**2.0**	**1.8**	**1.8**	**1.8**	**1.8**	**1.9**	**1.9**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	170	166	105	105	104	104	103	103	CMA+DE-MOS
NEWUOA	**1**	**1**	**1.4**	4.9	10	21	21	*14e-1/4e3*	.	.	NEWUOA
Basic RCGA	**1**	**1**	28	24	14	14	15	15	23	57	Basic RCGA
SPSA	121	152	582	*73e-1/1e5*	.	.	.	.	.	.	SPSA

Table 121: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	2.5	9.3	18	24	30	33	36	38	42	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	12	5.5	4.0	3.9	4.0	4.3	4.5	4.8	5.4	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.8	**2.9**	**2.2**	**2.1**	**2.1**	**2.3**	**2.4**	**2.6**	**2.9**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	5.1	**2.4**	**1.8**	**1.7**	**1.8**	**1.9**	**2.0**	**2.2**	**2.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	11	5.2	3.7	3.4	3.5	3.7	4.0	4.4	4.9	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	4.3	**2.3**	**1.8**	**1.8**	**1.9**	**2.0**	**2.2**	**2.4**	**2.7**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	3.2	**1.9**	**1.5**	**1.5**	**1.5**	**1.7**	**1.8**	**1.9**	**2.2**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**3.0**	**1.6**	**1.2**	**1.2**	**1.2**	**1.3**	**1.4**	**1.5**	**1.7**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.6	**1.9**	**1.4**	**1.4**	**1.5**	**1.6**	**1.7**	**1.9**	**2.1**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.1**	**1.1**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	avg NEWUOA
CMA-EGS (IPOP,r1)	319	16	13	8.8	7.5	6.8	6.7	6.7	6.8	7.1	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.7**	**2.0**	**1.8**	**1.8**	**2.0**	**2.2**	**2.4**	**2.6**	3.0	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.8**	**1.9**	**1.7**	**1.8**	**1.9**	**2.2**	**2.3**	**2.6**	**3.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	5.0	9.1	7.0	6.1	7.1	8.2	8.1	8.6	10	CMA+DE-MOS
NEWUOA	**1**	**1**	**1**	**1**	**1.1**	**1.1**	**1.2**	**1.2**	**1.4**	**1.5**	NEWUOA
Basic RCGA	**1**	3.7	12	16	67	188	256	281	304	323	Basic RCGA
SPSA	172	15	26638	*25e+0/1e5*	.	.	.	.	.	.	SPSA

Table 122: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	2.8	11	21	27	34	40	49	60	79	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	11	5.5	3.9	4.0	4.1	4.6	5.1	5.1	8.7	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.5	**2.7**	**2.0**	**2.0**	**1.9**	**1.9**	**1.8**	**1.7**	**1.6**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	4.5	**2.1**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	**1.3**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	15	6.5	4.5	4.7	6.1	8.4	13	18	44	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.5	**2.2**	**1.7**	**1.8**	**1.7**	**1.8**	**1.7**	**1.6**	**1.6**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**2.9**	**1.7**	**1.3**	**1.4**	**1.4**	**1.4**	**1.4**	**1.3**	**1.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.0**	**1.3**	**1**	**1.1**	**1.1**	**1.1**	**1.1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**2.9**	**1.6**	**1.3**	**1.4**	**1.4**	**1.5**	**1.4**	**1.4**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.0**	**1**	**1.0**	**1**	**1**	**1**	**1**	**1.1**	**1.1**	avg NEWUOA
CMA-EGS (IPOP,r1)	291	13	11	7.4	6.6	5.8	5.4	4.9	4.4	3.9	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**1.6**	**1.5**	**1.7**	**1.7**	**1.8**	**1.7**	**1.7**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.5**	**1.8**	**1.6**	**1.7**	**1.7**	**1.8**	**1.8**	**1.7**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	4.8	10	6.1	5.5	6.1	6.6	5.9	5.4	5.4	CMA+DE-MOS
NEWUOA	**1**	**1**	3.1	5.9	6.8	24	52	509	*31e-5/5e3*	.	NEWUOA
Basic RCGA	**1**	3.1	12	14	61	168	202	205	193	173	Basic RCGA
SPSA	218	22	*43e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 123: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	2.7	7.6	20	29	36	44	53	61	77	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	13	7.6	3.9	3.4	3.3	3.3	3.2	3.2	3.2	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.4	3.3	**1.8**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	4.1	**2.8**	**1.6**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	11	6.3	3.3	**2.9**	**3.0**	3.1	3.0	3.0	**3.0**	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.9	**2.7**	**1.6**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**2.9**	**2.2**	**1.3**	**1.3**	**1.3**	**1.4**	**1.4**	**1.4**	**1.4**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.4**	**1.8**	**1.0**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.3	**2.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.0**	**1.3**	**1**	**2.2**	29	977	*14e-4/1e4*	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	305	15	16	7.8	6.1	5.4	4.9	4.7	4.7	4.8	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.5**	**2.3**	**1.6**	**1.6**	**1.7**	**1.7**	**1.8**	**1.8**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.4**	**2.4**	**1.6**	**1.6**	**1.6**	**1.7**	**1.8**	**1.8**	**1.8**	IPOP-CMA-ES
CMA+DE-MOS	**1**	3.5	10	6.3	5.1	5.7	6.2	6.5	6.6	6.9	CMA+DE-MOS
NEWUOA	**1**	**1**	**1**	**1.1**	6.4	63	1836	*48e-4/5e3*	.	.	NEWUOA
Basic RCGA	**1**	**2.7**	14	14	78	329	316	295	276	241	Basic RCGA
SPSA	352	65	54	32	33	48	125	26503	*37e-5/1e5*	.	SPSA

Table 124: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	5.1	40	2089	6734	7032	7207	7310	7389	7451	7567	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	12	7.3	36	*14e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	5.8	**1.4**	16	22	*12e+0/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.8	**2.8**	7.2	*12e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	11	6.1	67	*14e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	5.0	**2.3**	9.4	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.7	**1**	6.9	*97e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**3.3**	**1.2**	5.5	22	21	*91e-1/1e4*	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	3.7	**1.4**	12	*12e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1.8**	**1.7**	6.5	*98e-1/1e4*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	20	3.8	**1**	**2.9**	**2.8**	**2.8**	**2.7**	**2.7**	**2.7**	**2.7**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.5	**1.1**	**2.8**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	4.7	**1.2**	**4.2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	20	3.6	20	6.2	6.0	5.9	5.8	5.7	5.7	5.6	CMA+DE-MOS
NEWUOA	**1**	**1.9**	39	*17e+0/6e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	24	12	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	71	*14e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 125: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	10	79	11367	13185	13727	14025	14234	14400	14561	14883	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	5.5	**3.0**	13	11	*17e+0/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**3.0**	**1.3**	**2.2**	*12e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.4**	**1.4**	5.8	*13e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	7.3	5.0	13	*16e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.6**	**1.2**	6.2	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**2.1**	**2.2**	5.8	*13e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.7**	**1**	**2.2**	*13e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.9**	**2.0**	4.1	*15e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.2**	6.1	*12e+0/1e4*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	10	**1.8**	59	*13e+0/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.2**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.1**	**1.9**	**1.6**	**1.8**	**1.8**	**1.8**	**1.7**	**1.7**	**1.7**	**1.7**	IPOP-CMA-ES
CMA+DE-MOS	10	**1.6**	7.7	**6.8**	**6.6**	**6.4**	**6.4**	**6.3**	**6.2**	**6.1**	CMA+DE-MOS
NEWUOA	**1.5**	5.4	*24e+0/5e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	13	7.3	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	55	*14e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 126: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	6.0	25	314	639	722	767	786	804	818	844	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	10	6.2	4.2	6.6	6.4	6.7	6.7	6.7	6.6	6.6	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.8	**2.0**	**1.6**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.0**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	4.2	**2.0**	**1.3**	**2.0**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.8**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	8.9	4.2	4.0	6.6	6.4	6.3	6.2	6.2	6.2	6.2	(1,2s)-CMA-ES
(1,4)-CMA-ES	4.0	3.3	**1.8**	**2.6**	**2.5**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.6	**2.0**	**1.2**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.6**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	3.3	**2.0**	**1.2**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	(1,4s)-CMA-ES
avg NEWUOA	**1.6**	**1.6**	15	*74e-1/1e4*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	17	5.8	3.9	4.2	4.1	4.0	4.1	4.1	4.2	23	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.6	**1.7**	**1.4**	**1.3**	**1.4**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	IPOP-aCMA-ES
IPOP-CMA-ES	3.8	**1.8**	**1.9**	**2.4**	**2.4**	**2.4**	**2.5**	**2.5**	**2.5**	**2.5**	IPOP-CMA-ES
CMA+DE-MOS	18	6.0	3.6	15	14	14	13	13	13	13	CMA+DE-MOS
NEWUOA	**1**	**1**	13	53	*49e-1/8e3*	.	.	.	.	.	NEWUOA
Basic RCGA	21	21	*17e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	305	2006	*52e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 127: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	11	295	554	876	1131	1310	1573	1795	2120	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	337	*83e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	118	*67e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	167	*61e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	776	*87e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	160	*67e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	96	*54e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	115	*56e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	201	*70e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	84	*64e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	327	**4.1**	**1**	**1**	**1.3**	**1.8**	**2.2**	**3.0**	**3.1**	**4.0**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	6.7	**1.2**	**1.2**	**1.2**	**1.3**	**1.6**	**1.9**	**1.9**	**1.8**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**3.3**	**1.6**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	20	158	196	130	102	91	76	67	57	CMA+DE-MOS
NEWUOA	**1**	75	*57e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**2.5**	**2.3**	4.4	6.5	7.1	7.0	6.9	6.7	Basic RCGA
SPSA	213	632	*65e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 128: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.05	1e+02 8.1	1e+01 2080	1e+00 4253	1e-01 6653	1e-02 11323	1e-03 17250	1e-04 22700	1e-05 29520	1e-07 45791	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	1646	*11e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	1932	*10e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	1428	*98e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	1383	*94e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	1669	*93e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	1446	*96e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	1588	*95e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	1707	*10e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	1677	*11e+1/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	18344	275	**3.4**	**3.4**	**3.6**	**2.9**	**2.8**	**4.2**	**6.5**	*13e-6/1e5*	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**34**	**1.0**	**1.1**	**1.5**	**1.5**	**1.4**	**1.8**	**1.6**	**1.4**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	36	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**11**	*43e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	624	*91e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	*22e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	9320	217	16	*59e-1/1e5*	.	.	.	.	.	.	SPSA

Table 129: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	2.8	15	26	38	52	65	79	94	123	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	11	3.9	4.3	4.1	4.3	4.3	4.3	4.3	4.5	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	5.7	**1.9**	**1.8**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**1.9**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	3.6	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	11	3.7	3.5	3.5	3.4	3.5	3.6	3.5	3.6	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	3.5	**1.4**	**1.7**	**1.9**	**2.0**	**2.0**	**2.1**	**2.2**	**2.4**	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**2.0**	**1.2**	**1.3**	**1.5**	**1.6**	**1.7**	**1.7**	**1.7**	**1.8**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**2.6**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	3.3	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.4**	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1.9**	19	*25e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	325	14	7.8	6.7	5.5	27060	*19e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	**1.2**	**1.5**	**1.7**	**1.9**	**2.0**	**2.1**	**2.1**	**2.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	**1.2**	**1.5**	**1.6**	**1.8**	**1.9**	**2.0**	**2.0**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	5.1	6.7	5.1	6.5	7.0	7.3	7.7	7.9	8.1	CMA+DE-MOS
NEWUOA	**1**	**1**	19	*33e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	3.5	8.1	13	176	206	195	183	167	140	Basic RCGA
SPSA	311	56	59	2870	7702	*30e-2/1e5*	.	.	.	.	SPSA

Table 130: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	156	771	∞	∞	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	*62e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	*72e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*56e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*65e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*63e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	*35e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	*55e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	*53e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	*55e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	3.1	**1.4**	*18e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.5**	**1**	*17e+0/1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.8**	*17e+0/1e6*	.	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	58	32	*19e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	*19e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1.6**	**1.0**	*20e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	176	*42e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 131: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	749	3022	∞	∞	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	*77e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	*84e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*70e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*77e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*79e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	*71e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	*70e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	*63e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	*94e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	3.3	**3.0**	*20e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.0**	**1**	*18e+0/9e5*	.	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1.0**	**1.1**	*18e+0/9e5*	.	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	58	236	*28e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	*63e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**2.7**	*49e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	40	*48e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 132: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	6.6	41	444	1550	1727	1799	1843	1879	1911	1966	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.6	5.3	8.8	17	41	40	80	79	78	76	(1,2)-CMA-ES
(1,2m)-CMA-ES	4.1	**1.3**	**2.8**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	3.8	**2.4**	**1.7**	**1.4**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	9.1	4.2	11	23	86	*38e-1/1e4*	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	3.7	**2.6**	4.2	3.4	4.2	4.6	4.6	4.5	4.5	4.5	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.6	**2.4**	**2.2**	**2.6**	**2.5**	**2.5**	**2.5**	**2.5**	**2.6**	**2.5**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**2.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**2.7**	**2.9**	**1.7**	**1.3**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.5**	(1,4s)-CMA-ES
avg NEWUOA	**1.3**	3.1	*20e+0/1e4*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	17	4.0	*18e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	3.1	**1.3**	**2.4**	**1.7**	**1.8**	**1.8**	**1.9**	**1.9**	**1.9**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	3.6	**2.0**	**2.7**	**2.0**	**2.0**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	16	3.3	5.6	7.8	7.6	8.0	8.0	7.9	7.9	7.8	CMA+DE-MOS
NEWUOA	**1**	**2.8**	*29e+0/5e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	18	12	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	163	1405	*53e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 133: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.1	199	1493	4836	7431	8440	8440	8440	8440	8519	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	1080	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	141	*26e+1/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	302	*31e+1/1e4*	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	1086	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	247	*25e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	119	240	*14e+1/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	55	*18e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	144	*29e+1/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	233	*29e+1/9e3*	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	40	**1**	**2.7**	305	*21e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	7.9	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**5.9**	**1.0**	**1.7**	**2.0**	**2.2**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	3.9	45	**35**	**38**	**34**	**34**	**34**	**34**	**43**	CMA+DE-MOS
NEWUOA	160	*24e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.8**	**1.3**	*23e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	31	472	*98e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 134: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.0	1325	6093	19469	38632	48301	48321	48321	48321	49566	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	1308	*67e+1/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	1445	*55e+1/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	1797	*58e+1/1e4*	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	1095	*53e+1/1e4*	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	1291	*56e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	1206	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	636	*53e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	705	*52e+1/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	406	*44e+1/9e3*	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	3792	12	**22**	*74e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**41**	**1.0**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	94	**1**	**1**	**1.9**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES
CMA+DE-MOS	**1.4**	134	*15e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	214	*47e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**10**	*46e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	2955	46	*71e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 135: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.99	10	130	1771	2494	2874	2877	2877	2877	2931	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	14	10	1114	*16e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	8.0	**2.7**	6.5	*50e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	5.7	**2.2**	11	*52e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	16	10	*21e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	3.5	**2.3**	17	*61e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	3.4	**1.8**	5.5	*40e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	3.2	**1.5**	6.4	*45e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	4.0	**2.3**	24	*65e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	3.8	**1.5**	100	*93e-1/1e4*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	24	7.5	**1.1**	368	*14e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.7**	**1.8**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	**1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	IPOP-CMA-ES
CMA+DE-MOS	**1.6**	10	**1.2**	163	583	*17e-1/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1.8**	**1**	219	*18e+0/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.2**	8.2	13	**89**	**141**	*11e-1/5e4*	.	.	.	.	Basic RCGA
SPSA	24	17	896	*12e+0/1e5*	.	.	.	.	.	.	SPSA

Table 136: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	1573	5510	8949	9831	10385	10929	11446	11923	12447	13421	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	*33e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*34e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*27e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	*24e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	*23e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	*28e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	*20e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	27	129	*26e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.7**	**2.3**	**3.2**	**3.8**	**4.3**	**4.2**	**4.1**	**4.1**	**4.0**	**3.9**	IPOP-CMA-ES
CMA+DE-MOS	15	**19**	**15**	**14**	**13**	**13**	**12**	**12**	**11**	**12**	CMA+DE-MOS
NEWUOA	*22e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**2.1**	60	*22e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	*11e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA

Table 137: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 4001	1e+02 16080	1e+01 32666	1e+00 42568	1e-01 52736	1e-02 60110	1e-03 64804	1e-04 70428	1e-05 76496	1e-07 1.02e5	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	*28e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	*32e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	*31e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	*24e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	*75e+2/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.7**	**1.6**	**1.5**	**1.7**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	373	*22e+2/1e5*	.	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	*26e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**27**	*14e+2/5e4*	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	*13e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA

Table 138: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	33	130	283	462	623	731	834	887	921	977	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	5.2	4.6	5.6	13	29	64	87	166	160	*11e-2/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**2.6**	**1.9**	**2.0**	**2.2**	**2.1**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**2.5**	**1.4**	**1.5**	**1.7**	**1.6**	**1.7**	**1.8**	**1.8**	**1.8**	**1.7**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	4.6	4.2	6.2	18	19	26	88	*13e-3/1e4*	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**2.4**	**1.5**	**2.1**	**2.5**	**3.0**	3.2	3.0	3.1	3.2	3.4	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1.9**	**1.3**	**1.5**	**1.5**	**1.7**	**1.9**	**1.9**	**2.0**	**2.0**	**2.0**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1.6**	**1**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1.9**	**1.4**	**1.4**	**1.5**	**1.6**	**1.8**	**1.8**	**1.9**	**1.9**	**1.9**	(1,4s)-CMA-ES
avg NEWUOA	**1.0**	11	*43e+0/1e4*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	6.6	3.5	3.7	1409	*21e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.2**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1.0**	**1.0**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	3.2	**2.5**	**2.4**	**2.3**	**2.3**	**2.4**	**2.3**	**2.4**	**2.4**	**2.5**	IPOP-CMA-ES
CMA+DE-MOS	4.9	**2.9**	**2.3**	**2.7**	**2.7**	**2.8**	**2.7**	**2.8**	**2.9**	**3.0**	CMA+DE-MOS
NEWUOA	**1**	11	*62e+0/6e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	37	513	*10e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	16	260	*63e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 139: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.26	177	848	1234	2527	8644	13755	17218	26577	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	432	*21e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	62	404	*13e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	80	397	*14e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	163	*20e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	101	*15e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	13	247	*13e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	40	*13e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	141	394	*15e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	59	*15e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	352	106	**1**	**2.3**	**2.2**	**4.9**	167	*19e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**3.5**	**1.2**	**1.1**	**1.2**	**1.2**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	6.0	**1.5**	**1**	**1**	**1**	**1.4**	**2.0**	**2.4**	**3.5**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	7.4	38	41	26	**14**	**11**	**11**	**19**	CMA+DE-MOS
NEWUOA	**1**	6.5	311	*18e+0/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.0**	**1.4**	**2.8**	3.5	8.7	*57e-4/5e4*	.	.	.	Basic RCGA
SPSA	282	70	*19e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 140: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.05	1e+02 0.18	1e+01 1115	1e+00 5339	1e-01 10424	1e-02 24158	1e-03 53265	1e-04 1.15e5	1e-05 1.47e5	1e-07 2.73e5	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	974	*29e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	1216	*34e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	943	*33e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	1353	*28e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	1273	*29e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	515	*30e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	792	*35e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	1144	*32e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	214	*29e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	12827	5698	**7.6**	**9.3**	**6.9**	**8.0**	*16e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	104	**1**	**1.1**	**1.1**	**1.5**	**1.2**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**68**	**1.1**	**1**	**1**	**1**	**1**	**1.2**	**1.6**	**1.7**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.5**	73	*92e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	168	*30e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	7.7	*61e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	10758	8824	373	*12e+0/1e5*	.	.	.	.	.	.	SPSA

Table 141: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.26	14	31	50	90	190	379	669	1513	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	42	4.2	4.3	4.2	4.3	4.6	5.3	10	*35e-7/1e4*	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	32	**1.9**	**1.7**	**1.7**	**1.8**	**2.0**	**2.0**	**2.1**	12	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	26	**1.7**	**1.5**	**1.5**	**1.4**	**1.4**	**1.5**	**1.5**	10	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	42	3.9	3.6	3.8	3.7	3.8	4.5	10	*44e-7/1e4*	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	12	**1.6**	**1.9**	**2.0**	**2.1**	**2.1**	**2.3**	**2.6**	3.9	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	5.1	**1.2**	**1.4**	**1.5**	**1.7**	**1.8**	**1.8**	**1.9**	**2.3**	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	8.4	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	4.6	**1.3**	**1.3**	**1.3**	**1.3**	**1.4**	**1.3**	**1.5**	**1.9**	(1,4s)-CMA-ES
avg NEWUOA	**1**	16	43	*40e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	301	93	7.1	6.8	7.7	*46e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	3.9	**1.1**	**1.3**	**1.6**	**1.9**	**1.9**	**1.7**	**1.5**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**3.4**	**1.1**	**1.3**	**1.6**	**2.1**	**2.8**	3.3	3.5	3.7	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	5.8	4.2	5.3	6.5	6.2	6.7	5.7	4.2	CMA+DE-MOS
NEWUOA	**1**	5.6	27	*52e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.0**	4.4	13	51	145	*41e-4/5e4*	.	.	.	Basic RCGA
SPSA	210	171	10888	*10e+0/1e5*	.	.	.	.	.	.	SPSA

Table 142: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.05	0.05	56	2099	5147	10376	22158	35019	65608	1.87e5	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	**1**	25	61	*87e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	7.9	28	*67e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	6.0	18	*78e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	78	*88e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	9.2	48	*69e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	7.4	21	*68e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	8.5	27	*75e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	7.3	20	*77e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**2.3**	77	*77e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
IPOP-aCMA-ES	**1**	6.0	**1.4**	**1**	**1.3**	**1.2**	**1**	**1**	**1**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.0**	**1.2**	**1.1**	**1**	**1**	**1.1**	**1.0**	**1.4**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	3.0	104	97	*14e-1/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	6.8	50	*80e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.1**	**1**	**8.3**	**10**	**11**	*98e-3/5e4*	.	.	.	Basic RCGA
SPSA	1.00e6	1.00e6	3583	*11e+0/1e5*	.	.	.	.	.	.	SPSA

Table 143: 20-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	340	18974	45008	1.12e5	2.13e5	3.46e5	6.75e5	1.47e7	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	148	204	*12e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	*12e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	215	210	*12e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	245	98	*13e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	103	102	*11e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	43	*10e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	113	77	*11e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	120	126	*12e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	128	63	*11e+0/9e3*	.	.	.	.	.	.	avg NEWUOA
IPOP-aCMA-ES	**1**	**1.3**	**1**	**1.0**	**1.5**	**1.1**	**1.2**	**1.2**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.7**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1.3**	*28e-7/1e6*	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	11	*68e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	53	27	*10e+0/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.4**	**1.1**	*48e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	1.76e6	2.41e6	*20e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 144: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	10	97	926	3166	5746	9469	14794	24797	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	377	*86e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	6.7	3.4	*33e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	4.6	3.2	1544	*36e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	33	654	*84e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1.2**	133	*46e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	7.0	**2.3**	*23e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	47	*40e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1.5**	21	*50e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	3.3	88	*59e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
IPOP-aCMA-ES	**1**	3.4	**1**	**4.0**	**2.3**	**1.0**	**1**	**1.1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.0**	**1**	**1.7**	**1**	**1.1**	**1**	**1.1**	**1.3**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.1**	4.0	**2.6**	**1**	**1.4**	**2.3**	**2.4**	**2.1**	**3.0**	CMA+DE-MOS
NEWUOA	**1**	10	84	*66e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1.2**	**2.1**	8.2	8.0	6.1	6.8	23	*39e-5/5e4*	.	Basic RCGA
SPSA	1.00e6	1.00e6	29207	*13e+0/1e5*	.	.	.	.	.	.	SPSA

Table 145: 20-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.05	1e+02 0.05	1e+01 0.05	1e+00 16	1e-01 1.17e5	1e-02 2.96e5	1e-03 8.26e5	1e-04 1.38e6	1e-05 4.09e6	1e-07 4.10e6	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	2812	*12e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	453	*94e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	379	*96e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	*13e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	501	*95e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	253	*88e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	254	*95e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	733	*10e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	**1**	**1.5**	*45e-2/9e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	283	321	364	**2.3**	4.0	*23e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**2.6**	**1.6**	**1**	**1.1**	**1.2**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**3.0**	3.0	**1.5**	**1**	**1**	**1.2**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	4.7	**2.9**	*18e-2/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	**1**	**1.3**	*49e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1**	**1**	*33e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	1.00e6	1.00e6	1.00e6	3109	**1.5**	*12e-2/1e5*	.	.	.	.	SPSA

Table 146: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	0.05	17	2.09e5	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	*14e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	*14e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	*13e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	8707	*13e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	8532	*13e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	122	7763	*16e-1/9e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	2514	3109	3338	39	*33e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	19	*30e-2/2e5*	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**17**	*28e-2/2e5*	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**4.6**	*39e-2/1e5*	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	4.2	392	*12e-1/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1.1**	**1**	**1**	*32e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	2.80e7	2.80e7	2.80e7	83636	*45e+3/1e5*	.	.	.	.	.	SPSA

Table 147: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	0.05	10	11182	59822	1.80e5	3.02e5	3.07e5	3.16e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	39	*70e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1**	3.1	*52e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1**	4.4	*48e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**1**	38	*67e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1**	5.9	*44e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**1**	3.9	13	*39e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1**	3.4	*23e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1**	6.0	*53e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	7.7	**1.1**	*43e-2/9e3*	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	292	335	353	3.9	*28e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1.3**	**1**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1.4**	**4.3**	**1.4**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	7.9	**1**	*44e-3/1e5*	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	3.7	**1.3**	*45e-2/4e3*	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	**1**	**1.6**	4.8	*59e-3/5e4*	.	.	.	.	Basic RCGA
SPSA	226	276	960	11890	36	*10e-1/1e5*	.	.	.	.	SPSA

Table 148: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.05	0.05	3560	15866	20644	20902	21121	21361	21554	21972	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,2)-CMA-ES	**1**	**1**	*71e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	*65e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	*66e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	*70e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	*66e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	*64e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	*65e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	*68e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	*69e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	284	367	**3.5**	5.2	5.1	5.1	5.1	6.5	6.5	6.8	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**3.2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	189	*50e+0/1e5*	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	*70e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	9.3	**4.2**	**4.1**	**4.1**	**4.1**	**5.3**	**5.4**	**5.3**	Basic RCGA
SPSA	309	350	*73e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 149: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	42959	1.28e5	1.75e5	1.78e5	1.81e5	1.84e5	1.87e5	1.95e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	*73e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	*74e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	*73e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	*70e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	*74e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	3132	3641	**3.9**	**5.6**	**4.2**	**8.3**	**8.2**	**8.0**	**7.9**	**7.7**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.7**	**1.5**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	*59e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
NEWUOA	**1**	**1**	*73e+0/4e3*	.	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	17	*34e+0/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	2290	9084	*69e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 150: 20-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	163	678	1422	1485	1562	1645	1712	1874	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	3.2	12	8.6	8.2	7.9	7.5	7.2	6.7	(1,2)-CMA-ES
(1,2m)-CMA-ES	**1**	**1**	**1.5**	4.2	5.4	5.2	4.9	4.7	4.5	4.2	(1,2m)-CMA-ES
(1,2ms)-CMA-ES	**1**	**1**	**1.4**	4.3	3.0	**2.9**	**2.8**	**2.7**	**2.6**	**2.4**	(1,2ms)-CMA-ES
(1,2s)-CMA-ES	**1**	**1**	**2.9**	22	30	29	27	26	25	23	(1,2s)-CMA-ES
(1,4)-CMA-ES	**1**	**1**	**1.5**	6.7	5.6	5.4	5.1	4.9	4.7	4.3	(1,4)-CMA-ES
(1,4m)-CMA-ES	**1**	**1**	**2.7**	5.7	5.2	5.0	4.8	4.6	4.4	4.0	(1,4m)-CMA-ES
(1,4ms)-CMA-ES	**1**	**1**	**1.3**	**2.6**	**2.7**	**2.6**	**2.5**	**2.4**	**2.3**	**2.1**	(1,4ms)-CMA-ES
(1,4s)-CMA-ES	**1**	**1**	**1.8**	6.5	8.4	8.0	7.7	7.3	7.0	6.4	(1,4s)-CMA-ES
avg NEWUOA	**1**	**1**	10	*45e-1/9e3*	.	.	.	.	.	.	avg NEWUOA
CMA-EGS (IPOP,r1)	295	351	45	101	106	135	*76e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.3**	**2.5**	**2.1**	**2.0**	**1.9**	**1.9**	**1.9**	**1.8**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	7.4	8.1	6.3	6.2	6.1	6.1	6.1	5.9	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	CMA+DE-MOS
NEWUOA	**1**	**1**	14	*77e-1/4e3*	.	.	.	.	.	.	NEWUOA
Basic RCGA	**1**	**1**	24	60	45	44	53	55	54	62	Basic RCGA
SPSA	292	365	8603	*73e+0/1e5*	.	.	.	.	.	.	SPSA

Table 151: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	8.8	18	26	32	39	47	54	61	76	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1.3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	736	11	10	8.7	7.5	6.7	6.0	5.6	5.3	4.8	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1.3**	**1.4**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.1**	**1.3**	**1.4**	**1.5**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	4.5	5.8	4.7	4.2	4.2	5.1	4.9	4.6	4.7	CMA+DE-MOS
Basic RCGA	**1**	3.0	8.5	86	261	306	310	306	297	270	Basic RCGA
SPSA	536	35	*52e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 152: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	8.8	21	30	38	48	58	68	82	111	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	686	11	8.4	7.4	6.4	5.5	5.0	4.6	4.1	3.5	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1.1**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.2**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.0**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	5.8	5.0	4.1	3.6	3.4	4.2	3.8	3.4	3.4	CMA+DE-MOS
Basic RCGA	**1**	**2.8**	7.2	74	226	251	252	243	221	184	Basic RCGA
SPSA	488	882	*78e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 153: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	9.0	19	26	34	41	49	56	64	80	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1.4**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	739	10	9.4	9.0	7.7	6.7	6.1	5.8	5.8	5.9	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.0**	**1.1**	**1.4**	**1.4**	**1.5**	**1.6**	**1.7**	**1.7**	**1.8**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.2**	**1.4**	**1.4**	**1.5**	**1.6**	**1.7**	**1.7**	**1.7**	IPOP-CMA-ES
CMA+DE-MOS	**1**	4.2	5.4	4.6	4.1	4.4	5.2	4.9	5.2	5.3	CMA+DE-MOS
Basic RCGA	**1**	**2.8**	7.5	97	534	500	466	432	398	343	Basic RCGA
SPSA	864	24	23	28	31	82	322	*52e-5/1e5*	.	.	SPSA

Table 154: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	20	101	25643	27893	28622	29029	29287	29518	29735	30167	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1.2**	*32e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	5.9	**1.9**	*25e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1.0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**1**	**2.9**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	IPOP-CMA-ES
CMA+DE-MOS	5.3	72	*38e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	8.7	51	*38e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	22	*27e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 155: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	21	84	69232	74593	76229	77140	77843	78534	79214	80631	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	3.7	*40e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	5.9	**2.7**	*34e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**1.9**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	5.0	**1.6**	*38e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	8.5	69	*38e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	26	*27e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 156: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	20	48	938	1484	1569	1603	1634	1654	1672	1705	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	5.6	4.0	22	37	36	35	42	75	125	167	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1.4**	**1.5**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.2**	**1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.1**	**2.1**	**2.0**	IPOP-CMA-ES
CMA+DE-MOS	5.3	3.1	7.3	6.9	7.2	7.4	7.5	7.6	7.6	7.7	CMA+DE-MOS
Basic RCGA	9.4	112	*37e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	72	5868	*25e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 157: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	254	1095	1387	1723	2048	2323	2653	2957	3632	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	*24e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	738	**1**	**1.3**	**2.0**	**2.5**	**2.9**	**3.3**	**3.3**	**3.7**	**4.3**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**2.0**	**1.1**	**1.3**	**1.3**	**1.7**	**2.2**	**2.2**	**2.9**	**2.6**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	214	1354	1070	*57e+0/1e5*	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**2.0**	14	13	14	16	15	14	18	18	Basic RCGA
SPSA	476	2597	*14e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 158: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	1667	4706	10659	17859	24926	34943	45832	58275	92191	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	*25e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	29020	**2.8**	**3.2**	**3.2**	**3.8**	**4.7**	**21**	*78e-4/1e5*	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.3**	**1.3**	**1.7**	**1.6**	**1.7**	**2.1**	**2.3**	**2.2**	**1.9**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	402	*15e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	22	*92e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	27994	**2.8**	*20e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 159: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	8.3	20	31	42	56	69	82	94	121	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1.4**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	689	11	9.0	7.4	6.4	*38e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.1**	**1.2**	**1.3**	**1.6**	**1.8**	**1.9**	**2.0**	**2.1**	**2.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.1**	**1.3**	**1.6**	**1.8**	**1.9**	**2.0**	**2.1**	**2.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	4.8	5.3	4.1	5.7	5.2	5.9	6.2	6.1	6.4	CMA+DE-MOS
Basic RCGA	**1**	3.2	8.7	297	346	319	288	265	242	204	Basic RCGA
SPSA	683	28	396	1849	33291	*82e-2/1e5*	.	.	.	.	SPSA

Table 160: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	337	2177	∞	∞	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	*32e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	344	186	*12e+2/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.5**	**1**	*37e+0/1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1.7**	**1.0**	*37e+0/9e5*	.	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	174	340	*47e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**5.0**	*51e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	830	*17e+2/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 161: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	2264	10316	∞	∞	∞	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	*29e+4 /1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	*97e+3 /1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	*38e+0 /1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1.0**	**1**	*38e+0 /1e6*	.	.	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	*39e+3 /1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**10**	*63e+1 /5e4*	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	31	*77e+1 /1e5*	.	.	.	.	.	.	.	.	SPSA

Table 162: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	22	43	1815	3253	3424	3514	3566	3610	3652	3728	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	5.8	4.5	*38e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.1**	**1.4**	**2.3**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.1**	**1**	**2.4**	**2.1**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	IPOP-CMA-ES
CMA+DE-MOS	4.8	3.4	5.6	4.1	4.2	4.1	4.1	4.1	4.1	4.0	CMA+DE-MOS
Basic RCGA	8.2	136	*37e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	51	3186	*10e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 163: 40-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	53	1014	5897	15017	17513	19075	19075	19075	19075	19155	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	*17e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	**2.2**	**1.2**	8.1	*52e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**2.1**	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.5**	**1**	**1.4**	**2.6**	**2.8**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	IPOP-CMA-ES
CMA+DE-MOS	7.6	238	*11e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**2.2**	**5.8**	*70e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	3.0	*21e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 164: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	191	5188	21852	67746	87251	1.31e5	1.31e5	1.31e5	1.31e5	1.32e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	*16e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	23	**4.3**	**66**	*25e+0/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**3.5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**3.7**	**1.0**	**1.1**	**1.8**	**1.9**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	IPOP-CMA-ES
CMA+DE-MOS	145	*74e+1/1e5*	.	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	*32e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	22	*28e+1/1e5*	.	.	.	.	.	.	.	.	SPSA

Table 165: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.7	26	213	4094	5334	5887	5887	5887	5887	5932	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1.6**	**1.8**	*24e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	11	4.2	**1**	*30e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.3**	**1.2**	**2.0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**3.7**	**4.4**	**4.4**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	IPOP-CMA-ES
CMA+DE-MOS	4.6	4.1	117	*58e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**2.6**	6.6	52	*45e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	5.5	7.5	*21e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 166: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	5083	15799	23313	27069	28619	30108	32081	34946	36455	39385	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	*13e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	*12e+4/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**2.5**	**2.6**	**3.5**	**3.5**	**3.6**	**4.0**	**4.1**	**3.8**	**3.8**	**3.7**	IPOP-CMA-ES
CMA+DE-MOS	*47e+2/1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**5.2**	*70e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	*40e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA

Table 167: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	11888	43288	66394	91504	1.28e5	1.40e5	1.52e5	1.66e5	1.84e5	2.72e5	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	*12e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	*31e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.9**	**1.7**	**2.1**	**2.4**	**1.9**	**2.1**	**2.2**	**2.1**	**2.1**	**1.6**	IPOP-CMA-ES
CMA+DE-MOS	*47e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	*95e+2/5e4*	.	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	*42e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA

Table 168: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	70	181	365	608	829	1081	1362	1550	1699	1866	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	4.7	3.8	3.1	1074	*20e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1.5**	**1.4**	**1.4**	**1.3**	**1.3**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.9**	**2.4**	**2.8**	**2.8**	**2.7**	**2.6**	**2.4**	**2.4**	**2.4**	**2.5**	IPOP-CMA-ES
CMA+DE-MOS	3.5	3.5	3.7	3.5	3.4	3.1	**2.8**	**2.7**	**2.6**	**2.7**	CMA+DE-MOS
Basic RCGA	150	*30e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA
SPSA	15	7903	*18e+1/1e5*	.	.	.	.	.	.	.	SPSA

Table 169: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	2.4	687	2003	2589	6878	27847	41084	48350	68515	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	136	*50e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	1209	18	**2.0**	**7.1**	**6.3**	**5.0**	*27e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	4.3	**2.0**	**1.2**	**1.1**	**1.4**	**1.3**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1.3**	**3.4**	**1**	**1**	**1**	**1**	**1.6**	**2.5**	**4.5**	**4.2**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	5.2	175	741	573	*88e-1/1e5*	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	6.2	28	29	104	*25e-2/5e4*	.	.	.	Basic RCGA
SPSA	437	7.5	*34e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 170: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	3.0	3323	12814	31056	69445	1.81e5	2.83e5	3.23e5	1.11e6	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	1513	*81e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	17083	516	**8.3**	**18**	**12**	*24e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	41	**1**	**1.4**	**1.8**	**1.4**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**35**	**1.0**	**1**	**1**	**1**	**1.3**	**1.6**	**2.5**	**12**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**6.4**	*28e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	*19e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	34780	556	*23e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 171: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	2.2	21	38	56	101	219	459	864	2518	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	3.7	**1.1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	673	13	8.5	11	914	*89e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1.2**	**1**	**1.2**	**1.7**	**1.9**	**2.2**	**1.9**	**1.7**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1.1**	**1.0**	**1.2**	**1.7**	**2.1**	**3.1**	**3.9**	**4.5**	**4.0**	IPOP-CMA-ES
CMA+DE-MOS	**1.1**	**1.5**	4.5	3.4	4.7	5.8	6.8	6.7	6.3	4.2	CMA+DE-MOS
Basic RCGA	**1**	**1**	5.1	25	167	166	*38e-4/5e4*	.	.	.	Basic RCGA
SPSA	517	42	31062	*18e+0/1e5*	.	.	.	.	.	.	SPSA

Table 172: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	131	4579	12383	24252	37209	71118	1.37e5	5.80e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	13	1067	*12e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
IPOP-aCMA-ES	**1**	**1**	**3.3**	**1**	**1.1**	**1.3**	**1.5**	**1.0**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	6.4	**2.9**	**1.2**	**1**	**1**	**1**	**1**	**1.1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	13	*64e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1.5**	**1**	**73**	*30e-1/5e4*	.	.	.	.	.	Basic RCGA
SPSA	6.00e6	6.01e6	10675	*68e+3/1e5*	.	.	.	.	.	.	SPSA

Table 173: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	881	52295	1.85e5	3.75e5	5.15e5	1.23e6	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1**	*17e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
IPOP-aCMA-ES	**1**	**1**	**1.3**	**1**	**1**	**1.1**	**2.7**	**4.1**	*13e-4/6e5*	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	14	**1.1**	**1.0**	**1.2**	**1**	**1**	**1**	*25e-6/1e6*	.	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1.3**	93	*97e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1.2**	**1**	*75e-1/5e4*	.	.	.	.	.	.	Basic RCGA
SPSA	1.60e7	1.60e7	*10e+4/1e5*	.	.	.	.	.	.	.	SPSA

Table 174: 40-D, running time excess ERT/$\mathrm{ERT}_{\mathrm{best}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	14	628	2840	4719	7403	10258	17969	35937	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	14	31	*58e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
IPOP-aCMA-ES	**1**	**2.4**	**1.1**	5.2	**3.3**	**2.5**	**1.9**	**1.9**	**1.4**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**2.6**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1.1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	6.4	**2.4**	**1.3**	**1.3**	**1.4**	**1.7**	**1.4**	**1.3**	CMA+DE-MOS
Basic RCGA	**1**	**1**	**1.6**	**1.8**	4.5	4.5	6.1	22	*21e-5/5e4*	.	Basic RCGA
SPSA	1.60e7	1.26e7	*94e+3/1e5*	.	.	.	.	.	.	.	SPSA

Table 175: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	0.03	0.03	11	2.20e5	1.08e6	5.44e6	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1**	**1**	*16e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	717	916	1032	**3.7**	*45e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	30	**2.5**	**1**	**1**	*95e-4/1e6*	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	33	**6.6**	**1.9**	*48e-2/3e5*	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**6.7**	*51e-2/1e5*	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	**1.1**	**1**	**1**	*52e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	*11e+4/1e5*	.	.	.	.	.	.	.	.	.	SPSA

Table 176: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	0.03	13	3.41e5	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1**	**1**	*17e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	3014	3562	3755	**22**	*52e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	66	*51e-2/2e5*	.	.	.	.	.	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	57	*50e-2/2e5*	.	.	.	.	.	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	**6.0**	*54e-2/1e5*	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	**1.1**	**1**	**1**	*55e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	2.60e7	2.60e7	2.60e7	51513	*93e+3/1e5*	.	.	.	.	.	SPSA

Table 177: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	0.03	10	47116	1.02e5	2.77e5	3.69e5	4.89e5	5.41e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1**	**1**	18	*78e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	711	818	968	4.1	*47e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1.8**	**1**	**1**	**1.2**	**1.6**	**1.3**	**1.2**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1**	**2.0**	3.4	**2.4**	**1**	**1**	**1**	**1**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	**1.1**	7.6	**2.5**	*10e-2/1e5*	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	**1**	**1**	**3.0**	*16e-2/5e4*	.	.	.	.	Basic RCGA
SPSA	431	527	4104	11818	30	*19e-1/1e5*	.	.	.	.	SPSA

Table 178: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	0.03	16799	1.12e5	2.91e5	2.93e5	2.94e5	2.96e5	2.97e5	3.00e5	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1**	*81e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	673	930	**6.6**	**3.9**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.5**	**2.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	*77e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	*69e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	560	629	*80e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 179: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher unif

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	0.03	1.53e5	2.88e5	2.98e5	3.09e5	3.18e5	3.30e5	3.40e5	3.57e5	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1**	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	1358	1503	*69e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**1.6**	**1.8**	**4.1**	**4.0**	**3.9**	**3.8**	**3.7**	**3.6**	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	*76e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS
Basic RCGA	**1**	**1**	*69e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA
SPSA	3993	8599	*78e+0/1e5*	.	.	.	.	.	.	.	SPSA

Table 180: 40-D, running time excess $\mathrm{ERT}/\mathrm{ERT}_{\mathrm{best}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$	0.03	0.03	165	2864	8052	8064	8074	8088	8100	8125	$\mathrm{ERT}_{\mathrm{best}}/\mathrm{D}$
(1,4ms)-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	(1,4ms)-CMA-ES
CMA-EGS (IPOP,r1)	658	840	48	96	34	35	*20e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1)
IPOP-aCMA-ES	**1**	**1**	**2.1**	**7.4**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	IPOP-aCMA-ES
IPOP-CMA-ES	**1**	**1**	**3.5**	133	163	163	162	162	162	161	IPOP-CMA-ES
CMA+DE-MOS	**1**	**1**	94	96	50	50	50	50	50	49	CMA+DE-MOS
Basic RCGA	**1**	**1**	55	**23**	**14**	**15**	**15**	**16**	**16**	**16**	Basic RCGA
SPSA	606	755	*84e+0/1e5*	.	.	.	.	.	.	.	SPSA

References

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