Comparison tables: BBOB 2009 noisy testbed in 10-D

The BBOBies

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Abstract

This document provides tabular results of the workshop for Black-Box Optimization Benchmarking at GECCO 2009, see `http://coco.gforge.inria.fr/doku.php?id=bbob-2009`. 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 [13, 8]. The experimental set-up is described in [12].

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 [12] for details on how ERT is obtained. All numbers are computed with no more than two digits of precision.

Table 1: 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	0.1	0.1	2.6	4	18	18.5	19.4	20	21	22.6	$\mathrm{ERT}_{\mathrm{best}}$/D
ALPS	**1**	4.5	70	130	51	72	89	110	120	160	ALPS [15]
AMaLGaM IDEA	**1**	6.4	17	30	11	15	19	22	24	28	AMaLGaM IDEA [4]
avg NEWUOA	**1**	20	**2.9**	**3.4**	**1**	**1.2**	**1.2**	**1.3**	**1.3**	**1.4**	avg NEWUOA [23]
BayEDAcG	**1**	7.1	53	81	45	86	110	130	130	140	BayEDAcG [9]
BFGS	**1**	840	*36e+0/3e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	13	5.4	7.8	**2.5**	3.3	4	4.6	5.1	6.1	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	6.9	3	4.2	**1.4**	**1.8**	**2.2**	**2.6**	**2.9**	3.5	(1+1)-CMA-ES [2]
DASA	**1**	180	30	34	10	13	14	16	18	21	DASA [18]
DEPSO	**1**	5.8	16	27	11	16	21	26	31	41	DEPSO [11]
EDA-PSO	**1**	6.1	25	380	180	280	360	440	510	640	EDA-PSO [5]
full NEWUOA	**1**	45	4	4.1	**1**	**1**	**1**	**1**	**1**	**1**	full NEWUOA [23]
GLOBAL	**1**	**3.9**	13	11	3	3.3	3.7	3.9	4.1	5	GLOBAL [20]
iAMaLGaM IDEA	**1**	5.7	8.1	13	5.1	6.9	8.3	9.9	11	14	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.5	11	19	8.3	11	13	15	16	18	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	20	870	*28e-3/4e3*	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	15	**2.1**	**3**	**1.1**	**1.6**	**1.9**	**2.1**	**2.3**	**2.9**	NEWUOA [23]
(1+1)-ES	**1**	15	3.1	3.7	**1.2**	**1.5**	**1.8**	**2.2**	**2.4**	**2.9**	(1+1)-ES [1]
PSO	**1**	5.3	8.9	25	12	18	25	31	35	45	PSO [6]
PSO_Bounds	**1**	5.5	13	140	96	150	220	250	280	480	PSO_Bounds [7]
Monte Carlo	**1**	**3.1**	2200	*36e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	11	5.1	6.5	**2.2**	**2.8**	3.3	3.9	4.3	5.1	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	10	4.6	3.9	**1**	**1.1**	**1.3**	**1.4**	**1.6**	**1.9**	SNOBFIT [17]
VNS (Garcia)	**1**	12	12	11	3.3	4	4.5	5.3	5.7	6.7	VNS (Garcia) [10]

Table 2: 10-D, running time excess ERT/ERT$_{\text{best}}$ 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 ERT$_{\text{best}}$/D	1e+03 0.1	1e+02 0.1	1e+01 2.57	1e+00 4.08	1e-01 17.6	1e-02 20.8	1e-03 22.6	1e-04 23.9	1e-05 26.5	1e-07 30.4	Δftarget ERT$_{\text{best}}$/D
ALPS	**1**	**3.7**	69	130	52	64	78	91	100	120	ALPS [15]
AMaLGaM IDEA	**1**	6.8	17	30	11	13	15	17	17	20	AMaLGaM IDEA [4]
avg NEWUOA	**1**	31	**2.9**	**3.2**	**1**	**1.1**	**1.2**	**1.3**	**1.4**	**1.7**	avg NEWUOA [23]
BayEDAcG	**1**	5.8	51	73	27	37	41	52	61	63	BayEDAcG [9]
BFGS	**1**	640	*34e+0/3e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	8.5	4.9	7.1	**2.6**	**2.9**	3.2	3.8	4	4.5	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	11	3.1	4	**1.3**	**1.6**	**1.9**	**2.2**	**2.3**	**2.6**	(1+1)-CMA-ES [2]
DASA	**1**	190	31	34	12	13	15	17	18	22	DASA [18]
DEPSO	**1**	5.7	18	26	11	14	18	22	24	29	DEPSO [11]
EDA-PSO	**1**	4.8	45	390	200	250	310	370	400	470	EDA-PSO [5]
full NEWUOA	**1**	40	4.3	4.2	**1.1**	**1**	**1**	**1**	**1**	**1**	full NEWUOA [23]
GLOBAL	**1**	4.9	13	10	3.3	3.8	4.3	4.9	7.2	26	GLOBAL [20]
iAMaLGaM IDEA	**1**	**4.4**	7.2	13	5.1	6.1	7.3	8.3	8.9	10	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.1	11	21	9.2	11	12	13	13	14	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	460	*13e-2/4e3*	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	18	3.5	7.9	9	30	48	81	150	550	NEWUOA [23]
(1+1)-ES	**1**	15	**3**	**4**	**1.3**	**1.5**	**1.7**	**2.1**	**2.7**	4.5	(1+1)-ES [1]
PSO	**1**	4.7	9.1	1800	420	360	340	320	300	270	PSO [6]
PSO_Bounds	**1**	7.1	13	98	99	140	190	210	220	440	PSO_Bounds [7]
Monte Carlo	**1**	6.2	3100	*33e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	9	4.1	6.1	**2.1**	**2.3**	**2.7**	3	3.2	3.6	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	6.3	6.1	7.6	**2**	**2.1**	**2.1**	**2.6**	3.6	5.3	SNOBFIT [17]
VNS (Garcia)	**1**	12	12	11	3.4	3.7	4.1	4.5	4.6	5	VNS (Garcia) [10]

Table 3: 10-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
$\mathrm{ERT}_{\mathrm{best}}/D$	0.1	0.1	2.62	4.7	12.6	14.1	36	36.3	36.3	36.4	$\mathrm{ERT}_{\mathrm{best}}/D$
ALPS	**1**	4.9	67	110	75	96	2.5e4	*10e-4/5e5*	.	.	ALPS [15]
AMaLGaM IDEA	**1**	4.4	17	27	16	19	30	100	230	380	AMaLGaM IDEA [4]
avg NEWUOA	**1**	31	**3**	**2.9**	**1.8**	6.8	25	100	1500	*39e-6/8e3*	avg NEWUOA [23]
BayEDAcG	**1**	5.6	44	66	62	80	49	53	58	67	BayEDAcG [9]
BFGS	**1**	230	12	6.5	**2.9**	**2.5**	**1**	**1**	**1**	**1**	BFGS [22]
BIPOP-CMA-ES	**1**	9.3	5.5	6.1	3.6	4.2	**2.2**	**2.6**	3.1	4.2	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	9.7	3.4	3.6	**2.5**	6	23	92	710	*18e-6/1e4*	(1+1)-CMA-ES [2]
DASA	**1**	57	21	22	39	1100	2.4e5	*16e-4/6e5*	.	.	DASA [18]
DEPSO	**1**	14	17	21	17	72	150	*25e-4/2e3*	.	.	DEPSO [11]
EDA-PSO	**1**	4.6	37	350	280	1500	*71e-4/1e5*	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	45	3.8	3.4	**1.4**	**1.9**	**1.4**	**2.8**	7.5	20	full NEWUOA [23]
GLOBAL	**1**	6.3	25	17	7.1	6.9	**2.7**	**2.7**	**2.7**	**2.7**	GLOBAL [20]
iAMaLGaM IDEA	**1**	4.4	7.5	12	7.4	9.3	7.4	39	200	1e3	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	7.3	10	18	12	15	8.6	11	17	30	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	14	14	13	25	50	170	MCS (Neum) [16]
NEWUOA	**1**	15	**2.3**	3.6	5.2	29	95	240	1100	*15e-5/6e3*	NEWUOA [23]
(1+1)-ES	**1**	12	3.4	3.6	**1.9**	7.8	46	600	7800	4.1e5	(1+1)-ES [1]
PSO	**1**	5.5	9.1	1500	580	2300	1.9e4	*56e-4/1e5*	.	.	PSO [6]
PSO_Bounds	**1**	**3.4**	11	110	1500	4.6e4	*40e-3/1e5*	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	5.3	1600	*36e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	10	4.8	5.6	3	3.6	**1.9**	**2.3**	**2.7**	**3.5**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**3.8**	3.9	**2.5**	**1**	**1**	**1.4**	**2.7**	5.5	7.7	SNOBFIT [17]
VNS (Garcia)	**1**	12	11	9.4	4.7	5.3	**2.6**	3.1	3.8	5	VNS (Garcia) [10]

Table 4: 10-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	4.81	23.4	45.3	999	1660	1840	1940	2020	2080	2200	$\mathrm{ERT}_{\mathrm{best}}$/D
ALPS	49	26	32	14	14	16	21	33	51	110	ALPS [15]
AMaLGaM IDEA	10	4.2	5.8	**1.4**	**1**	**1**	**1**	**1**	**1**	**1**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	**1**	7.1	22	*67e-2/8e3*	.	.	.	.	avg NEWUOA [23]
BayEDAcG	24	13	47	*97e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*12e+3/1e3*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	3.5	3	3.6	**1.8**	**1.3**	**1.3**	**1.3**	**1.2**	**1.2**	**1.2**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**2.2**	**2.1**	**2.8**	5.5	19	80	*46e-2/1e4*	.	.	.	(1+1)-CMA-ES [2]
DASA	17	11	15	**2.1**	7.2	23	78	180	1900	*28e-6/9e5*	DASA [18]
DEPSO	11	5.8	11	30	*70e-1/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	72	74	97	18	17	22	28	34	40	*67e-8/1e5*	EDA-PSO [5]
full NEWUOA	**2**	**1.6**	**1.6**	**1.6**	**2.6**	**2.5**	6.4	6.1	11	14	full NEWUOA [23]
GLOBAL	6.9	**1.9**	**1.8**	**1**	**1.4**	**2.8**	*39e-1/300*	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	5.7	**2.6**	**2.9**	**2.5**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	iAMaLGaM IDEA [4]
MA-LS-Chain	7.5	3.9	5.7	34	21	20	19	18	18	17	MA-LS-Chain [19]
MCS (Neum)	3.8	36	*61e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**2.1**	7.2	4.6	47	*55e-2/5e3*	.	.	.	.	NEWUOA [23]
(1+1)-ES	**2.5**	**2**	**1.8**	5.2	9.9	32	66	390	1200	*21e-6/1e6*	(1+1)-ES [1]
PSO	7.8	5.8	9.4	400	430	*59e-1/1e5*	.	.	.	.	PSO [6]
PSO_Bounds	21	26	71	660	400	770	730	700	*63e-1/1e5*	.	PSO_Bounds [7]
Monte Carlo	6700	*26e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	3.1	**1.3**	**1.3**	5.7	3.6	3.3	3.2	3	**3**	**2.8**	IPOP-SEP-CMA-ES [21]
SNOBFIT	6.1	5.4	18	7.3	*13e+0/500*	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	7.9	3.3	22	54	51	46	45	44	42	40	VNS (Garcia) [10]

Table 5: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	3.11	32.8	95	2150	7010	7260	7420	7730	7820	7970	ERT_{best}/D
ALPS	74	17	16	10	5.3	6.9	12	14	19	42	ALPS [15]
AMaLGaM IDEA	13	**2.6**	**2.3**	3.9	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	AMaLGaM IDEA [4]
avg NEWUOA	**1.9**	**1.7**	**2.5**	5.1	3.7	16	*88e-2/8e3*	.	.	.	avg NEWUOA [23]
BayEDAcG	42	8.8	18	*83e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*20e+3/1e3*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	4.8	**1.1**	**1**	**2.9**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	3.7	**2.4**	**1.8**	4.5	4.4	20	*55e-2/1e4*	.	.	.	(1+1)-CMA-ES [2]
DASA	33	11	18	**3.1**	**2.6**	17	54	250	1400	*24e-5/8e5*	DASA [18]
DEPSO	18	3.5	3.4	*76e-1/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	120	54	45	*52e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**2.9**	**1.3**	**1.2**	4.4	6.4	*32e-2/1e4*	.	.	.	.	full NEWUOA [23]
GLOBAL	11	**1.5**	**1.6**	**1**	*70e-1/300*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	9	**1.8**	**1.2**	9.5	**3**	**2.9**	**2.9**	**2.8**	**2.8**	**2.8**	iAMaLGaM IDEA [4]
MA-LS-Chain	12	3	5.2	160	*52e-1/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	7	25	*70e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1.2**	11	10	*52e-1/5e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	3.6	**1**	**1.7**	8.7	10	45	170	300	1800	*71e-5/1e6*	(1+1)-ES [1]
PSO	15	220	80	300	*65e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	27	16	98	320	200	*75e-1/1e5*	.	.	.	.	PSO_Bounds [7]
Monte Carlo	7500	*32e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	5.4	**1.4**	**1**	32	20	*72e-1/1e4*	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	14	4.6	11	*16e+0/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	11	29	18	310	300	650	730	800	1200	4900	VNS (Garcia) [10]

Table 6: 10-D, running time excess ERT/$\mathrm{ERT_{best}}$ 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
$\mathrm{ERT_{best}}$/D	3.44	12.8	28.8	342	771	819	850	874	897	937	$\mathrm{ERT_{best}}$/D
ALPS	72	47	47	140	140	1500	*12e-3/5e5*	.	.	.	ALPS [15]
AMaLGaM IDEA	13	7.6	8.6	35	45	86	210	340	430	620	AMaLGaM IDEA [4]
avg NEWUOA	**1.5**	**1**	**1.3**	5.4	19	160	*13e-2/9e3*	.	.	.	avg NEWUOA [23]
BayEDAcG	36	25	100	*11e+0/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	71	210	*44e+0/4e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	5.3	3.8	**2.9**	**1.7**	**1**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	3.5	3.1	3.5	24	40	170	*51e-2/1e4*	.	.	.	(1+1)-CMA-ES [2]
DASA	21	13	11	6.6	29	4e3	*16e-3/1e6*	.	.	.	DASA [18]
DEPSO	16	10	17	85	*67e-1/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	140	140	160	*43e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**2.6**	**1.5**	**1**	**1**	8.1	89	*48e-3/1e4*	.	.	.	full NEWUOA [23]
GLOBAL	9.8	3.3	**2.6**	5.4	*42e-1/300*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	7.1	4.5	4.4	21	17	46	90	210	340	810	iAMaLGaM IDEA [4]
MA-LS-Chain	11	7.3	8.3	5.7	4.9	6.5	8.2	11	14	32	MA-LS-Chain [19]
MCS (Neum)	5.3	24	*61e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1.3**	**1.6**	7.5	14	26	*11e-2/7e3*	.	.	.	NEWUOA [23]
(1+1)-ES	**2.7**	**2.3**	**2.4**	18	61	370	1.7e4	*57e-4/1e6*	.	.	(1+1)-ES [1]
PSO	9.8	11	13	1900	1800	*62e-1/1e5*	.	.	.	.	PSO [6]
PSO_Bounds	27	37	320	*65e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	1e4	*32e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	4.8	**2.3**	**2.1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	8.8	9.3	14	*70e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	11	5.3	4.6	11	**4.8**	**4.6**	**4.5**	**4.4**	**4.3**	**4.2**	VNS (Garcia) [10]

Table 7: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	94.5	225	387	521	735	960	1130	1430	ERT_{best}/D
ALPS	**1**	5.1	3.2	**6**	8	**11**	14	19	26	86	ALPS [15]
AMaLGaM IDEA	**1**	**3.5**	5.8	13	15	14	12	10	9.7	**9.4**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	32	230	*15e+0/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	4.2	**3**	**4**	**4.5**	29	*32e-3/2e3*	.	.	.	BayEDAcG [9]
BFGS	**1**	600	*33e+0/1e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	17	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	180	230	*11e+0/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	3e3	1.1e4	*11e+0/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	4.1	**2.7**	13	*97e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**3.5**	9.2	44	30	37	40	32	28	24	EDA-PSO [5]
full NEWUOA	**1**	130	230	*13e+0/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	5.1	77	*17e+0/500*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	7	3.9	26	42	53	45	35	30	27	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	6.1	**2.2**	6.1	**6.9**	**7.8**	**7.7**	**6.9**	**6.3**	**5.8**	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	28	*87e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	15	130	*23e+0/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	200	240	6.3e4	*19e-1/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	4.9	460	260	270	240	260	210	310	1e3	PSO [6]
PSO_Bounds	**1**	4.4	84	240	560	1300	*59e-2/1e5*	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	4.2	38	*30e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	17	12	16	16	14	**12**	**9.5**	**8.2**	13	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	7.9	11	*13e+0/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	12	28	27	36	42	65	110	200	960	VNS (Garcia) [10]

Table 8: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	1e3	3140	4760	7750	10900	13600	17900	30800	ERT_{best}/D
ALPS	**1**	**2.6**	**1.2**	460	*12e-1/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	5.2	19	**33**	**77**	**85**	**320**	***28e-4/1e6***	.	.	AMaLGaM IDEA [4]
avg NEWUOA	**1**	1400	*27e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	5.7	*21e+0/2e3*	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	240	*40e+0/800*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	180	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	380	30	*13e+0/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	4600	640	*10e+0/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	28	29	*18e+0/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	4.4	94	450	*99e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	3300	140	*29e+0/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	3.9	*19e+0/500*	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	5.9	18	**61**	**97**	**160**	**1300**	**1100**	***62e-4/1e6***	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.5	**1.1**	240	*24e-1/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	27	*18e+0/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	590	*28e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	270	95	*54e-1/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**2.7**	190	*17e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	4.7	120	*11e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	6	4.1	*34e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	47	45	*15e+0/1e4*	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	5.1	*21e+0/500*	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	12	48	4300	*13e-1/5e6*	.	.	.	.	.	VNS (Garcia) [10]

Table 9: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	2.79	28.6	49.9	82.4	116	146	179	242	ERT_{best}/D
ALPS	**1**	**2.3**	68	57	1.4e5	*20e-2/5e5*	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	4.9	16	4.1	12	43	53	58	91	160	AMaLGaM IDEA [4]
avg NEWUOA	**1**	20	11	38	670	*31e-2/7e3*	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**2.9**	43	11	11	17	21	19	17	*35e-7/2e3*	BayEDAcG [9]
BFGS	**1**	440	270	49	28	17	12	9.7	9.9	7.3	BFGS [22]
BIPOP-CMA-ES	**1**	13	**4.7**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.2**	**1.2**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	13	8.9	53	1400	*30e-2/1e4*	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	150	1600	*26e-1/5e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	6.1	17	7.5	46	*87e-3/2e3*	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	4.1	39	1.1e4	*13e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	33	27	24	2900	*34e-2/1e4*	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	7.3	13	6.3	*35e-2/300*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	5.1	8.3	**2.1**	10	54	130	190	270	450	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.3	10	4.5	9.5	180	3200	*28e-4/5e4*	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	19	73	200	230	180	320	240	MCS (Neum) [16]
NEWUOA	**1**	16	12	77	*57e-2/4e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	12	5.9	7.7	1900	*42e-3/1e6*	.	.	.	.	(1+1)-ES [1]
PSO	**1**	5.1	160	4100	*10e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	5	2600	*31e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	5.9	2400	*29e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	9	**4.8**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	4.8	6.5	18	140	*85e-2/500*	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	12	11	**1.6**	**1.5**	**1.4**	**1.3**	**1.3**	**1.3**	**1.3**	VNS (Garcia) [10]

Table 10: 10-D, running time excess ERT/ERT_{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 ERT_{best}/D	1e+03 35.2	1e+02 141	1e+01 1120	1e+00 3.32e6	1e-01 7.03e6	1e-02 1.64e7	1e-03 nan	1e-04 nan	1e-05 nan	1e-07 nan	Δftarget ERT_{best}/D
ALPS	8.2	6.1	15	**1**	**1**	***27e-1/5e5***	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1.6**	**1.1**	**6.5**	*70e-1/1e6*	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	620	*16e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	4.8	3.9	**4.3**	*11e+0/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*19e+3/700*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1.3**	**1**	**1**	**4.9**	**2.3**	**1**	***56e-1/1e6***	.	.	.	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	220	*69e+1/1e4*	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1.3e4	*79e+1/4e5*	.	.	.	.	.	.	.	.	DASA [18]
DEPSO	**2.8**	5.7	*28e+0/2e3*	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	15	12	83	*87e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	1300	*27e+2/1e4*	.	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	*41e+2/400*	.	.	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	4.3	20	*61e-1/1e6*	.	.	.	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	3.2	**3**	7.4	*75e-1/5e4*	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	29	*45e+1/4e3*	.	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	100	*83e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	570	*14e+1/1e6*	.	.	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**3**	17	610	*14e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	210	370	370	*27e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	1600	*26e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1.1**	7.6	13	*95e-1/1e4*	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	12	*43e+1/500*	.	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1.9**	26	39	**3.6**	***16e-1/6e6***	.	.	.	.	.	VNS (Garcia) [10]

Table 11: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	384	1950	8290	nan	nan	nan	nan	nan	nan	nan	ERT_{best}/D
ALPS	**1.8**	**3.8**	*21e+0/5e5*	.	.	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	6	**3.7**	**16**	***80e-1/1e6***	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	260	*10e+3/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1.5**	15	*39e+1/2e3*	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*14e+3/500*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1.1**	**1**	**1**	***70e-1/1e6***	.	.	.	.	.	.	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	*25e+2/1e4*	.	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	*19e+2/4e5*	.	.	.	.	.	.	.	.	.	DASA [18]
DEPSO	24	*21e+2/2e3*	.	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	45	120	*17e+1/1e5*	.	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	*94e+2/1e4*	.	.	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	*56e+2/400*	.	.	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	4.6	11	**35**	***86e-1/1e6***	.	.	.	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.6	*42e+0/5e4*	.	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	33	*20e+2/4e3*	.	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	*74e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	340	*54e+1/1e6*	.	.	.	.	.	.	.	.	(1+1)-ES [1]
PSO	250	730	*76e+1/1e5*	.	.	.	.	.	.	.	PSO [6]
PSO_Bounds	180	*85e+1/1e5*	.	.	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	59	*30e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	13	9.2	*11e+1/1e4*	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	*28e+2/500*	.	.	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	34	130	*23e+0/6e6*	.	.	.	.	.	.	.	VNS (Garcia) [10]

Table 12: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	3.71	14.9	88.4	1160	1610	1740	1820	1890	1950	2040	ERT_{best}/D
ALPS	56	37	30	1500	*17e-1/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	11	5.9	6.6	300	250	240	230	230	220	210	AMaLGaM IDEA [4]
avg NEWUOA	**1.5**	**2.2**	10	98	71	*42e-1/8e3*	.	.	.	.	avg NEWUOA [23]
BayEDAcG	31	20	23	*85e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	2900	*24e+2/2e3*	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	4.6	5	**1.2**	**1**	**1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	3.6	4.5	8.1	*48e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	23	61	320	*31e-1/6e5*	.	.	.	.	.	.	DASA [18]
DEPSO	15	8.4	15	*88e-1/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	120	120	300	*93e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**2.7**	3	4.6	*32e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	8.9	3.7	**2.5**	*78e-1/300*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	6.4	4.1	**2.2**	390	340	320	310	330	320	310	iAMaLGaM IDEA [4]
MA-LS-Chain	9.7	6.1	**2.9**	280	*56e-1/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	4.3	37	*66e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	27	*81e-1/5e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	3.7	**2.7**	7.4	760	*70e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	11	530	1400	*10e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	31	51	1.6e4	*16e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	8100	*33e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	4.4	**2.6**	**1**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	7.8	8.9	40	*21e+0/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	10	4.3	**1.2**	**4.9**	**3.7**	**3.6**	**3.4**	**3.3**	**3.3**	**3.2**	VNS (Garcia) [10]

Table 13: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	15.3	447	2760	10300	10900	10900	10900	10900	11200	ERT_{best}/D
ALPS	**2.6**	3.3	**2.4**	5.9	7.3	43	72	72	72	83	ALPS [15]
AMaLGaM IDEA	**1.7**	**1**	**1.8**	**2.9**	**1.2**	**1.4**	**1.6**	**1.6**	**1.6**	**1.6**	AMaLGaM IDEA [4]
avg NEWUOA	4.9	59	*40e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1.9**	**3**	**2.3**	*40e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	110	360	*14e+1/1e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	4	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	5.8	55	320	*32e+0/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	760	560	1.4e4	*25e+0/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1.7**	3.1	6.3	*10e+0/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**2.6**	24	58	73	*21e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	9.8	100	*50e+0/1e4*	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1.9**	3.5	*34e+0/600*	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1.8**	**1.1**	3.1	**4.7**	**3.4**	**4.1**	**4.1**	**4.1**	**4.1**	**3.9**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1.9**	**2**	**2.2**	7	16	67	67	67	67	65	MA-LS-Chain [19]
MCS (Neum)	**1**	12	130	*23e+0/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	32	47	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	22	37	1200	*87e-1/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**1.8**	**2.8**	150	510	*70e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1.8**	**2.1**	1500	*23e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**2.5**	3.4	4200	*10e+0/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	3.2	16	7.4	17	*23e-1/1e4*	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**2.2**	4.2	*29e+0/500*	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1.4**	**2.3**	14	64	360	7100	7100	7100	7100	6900	VNS (Garcia) [10]

Table 14: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	30.7	3660	12800	33100	38600	39000	39000	39000	40600	ERT_{best}/D
ALPS	**2.7**	**2.3**	**9.7**	*47e-1/5e5*	.	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**2.6**	**2.2**	**5.7**	**11**	**30**	**120**	**120**	**120**	**120**	**180**	AMaLGaM IDEA [4]
avg NEWUOA	100	240	*82e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1.7**	18	*66e+0/2e3*	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	49	83	*15e+1/800*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	4.1	6.1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	110	68	*40e+0/1e4*	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	96	370	1800	*28e+0/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**2.3**	38	*79e+0/2e3*	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**2**	820	180	*55e+0/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	180	140	*77e+0/1e4*	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**2.3**	**2.3**	*68e+0/400*	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1.8**	31	12	**20**	**29**	**180**	**180**	**180**	**180**	**170**	iAMaLGaM IDEA [4]
MA-LS-Chain	**2.7**	**1.4**	10	*67e-1/5e4*	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	20	*39e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	32	110	*88e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	110	61	2e3	*16e+0/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**1.7**	510	*70e+0/1e5*	.	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**2.1**	500	*49e+0/1e5*	.	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**2.5**	**1**	520	*11e+0/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**2.1**	120	*39e+0/1e4*	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**2.4**	**2.8**	*51e+0/500*	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1.4**	170	190	*42e-1/5e6*	.	.	.	.	.	.	VNS (Garcia) [10]

Table 15: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	3.81	39.8	290	859	1230	1260	1260	1260	1280	ERT_{best}/D
ALPS	**2.1**	14	11	490	*61e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**2**	4.3	**1.8**	**3.9**	**3.6**	**4.3**	**4.3**	**4.3**	**4.3**	**4.2**	AMaLGaM IDEA [4]
avg NEWUOA	7	**2.6**	4.2	390	*24e-1/7e3*	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1.9**	9.6	11	*40e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	150	1400	*11e+1/2e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	4.5	**2**	**1**	4.5	6.9	**5.5**	**5.4**	**5.4**	**5.4**	**5.6**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	4	7.7	12	*21e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	35	140	8300	*77e-1/5e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1.9**	6.5	7	16	*12e-1/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**2**	5.2	27	4800	*19e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	16	**2**	3.7	140	*13e-1/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**2.4**	6.1	4.1	*56e-1/500*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1.9**	**2.8**	**1.4**	**1.5**	**4.4**	13	14	14	14	14	iAMaLGaM IDEA [4]
MA-LS-Chain	**1.9**	3.8	3.7	42	260	*59e-2/5e4*	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	300	*12e+0/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	11	**2.4**	19	*41e-1/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	7.3	**1.6**	17	2900	*88e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1.7**	**2.6**	640	*32e-1/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1.9**	3	1400	*64e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1.9**	13	6.6e4	*11e+0/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	3.2	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**2.3**	4.8	89	*16e+0/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1.4**	6.5	**1.9**	13	38	56	64	64	64	65	VNS (Garcia) [10]

Table 16: 10-D, running time excess ERT/ERT_{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 ERT_{best}/D	1e+03 105	1e+02 1650	1e+01 7140	1e+00 10600	1e-01 10900	1e-02 11300	1e-03 11600	1e-04 11900	1e-05 12300	1e-07 16700	Δftarget ERT_{best}/D
ALPS	**4.8**	5	15	160	*15e-1/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	AMaLGaM IDEA [4]
avg NEWUOA	970	*35e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	16	18	*68e+1/2e3*	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*10e+3/800*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	5.1	**2.2**	**1.3**	**1.3**	**1.6**	**1.7**	**1.7**	**1.7**	**1.7**	**1.3**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	130	*86e+1/1e4*	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	6200	*10e+2/4e5*	.	.	.	.	.	.	.	.	DASA [18]
DEPSO	13	18	*63e+1/2e3*	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	150	390	200	*46e+1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	1400	*25e+2/1e4*	.	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	*31e+2/500*	.	.	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1.7**	**2.5**	**2.8**	**2.7**	**3**	**3.4**	**3.5**	**3.5**	**3.7**	**2.8**	iAMaLGaM IDEA [4]
MA-LS-Chain	5.2	15	33	*30e+0/5e4*	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	45	*99e+1/4e3*	.	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	*28e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	330	*28e+1/1e6*	.	.	.	.	.	.	.	.	(1+1)-ES [1]
PSO	530	890	*59e+1/1e5*	.	.	.	.	.	.	.	PSO [6]
PSO_Bounds	240	850	*46e+1/1e5*	.	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	530	*40e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	46	16	*17e+1/1e4*	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	9.3	*18e+2/500*	.	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	87	54	1400	*12e+0/5e6*	.	.	.	.	.	.	VNS (Garcia) [10]

Table 17: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	2240	10100	22800	39900	48900	62600	65400	68700	71700	79400	ERT_{best}/D
ALPS	**1.2**	160	*12e+1/5e5*	.	.	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**2.3**	**4.2**	**7**	**6.5**	**13**	**30**	**100**	***31e-3/1e6***	.	.	AMaLGaM IDEA [4]
avg NEWUOA	*46e+2/7e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	*28e+2/2e3*	.	.	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*14e+3/500*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	65	*25e+2/1e4*	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1400	*15e+2/4e5*	.	.	.	.	.	.	.	.	DASA [18]
DEPSO	*39e+2/2e3*	.	.	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	53	*97e+1/1e5*	.	.	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	64	*62e+2/1e4*	.	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	*38e+2/400*	.	.	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	4	**11**	**9.5**	**14**	**24**	**51**	**110**	***33e-3/1e6***	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1.1**	*36e+1/5e4*	.	.	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	5.5	*20e+2/4e3*	.	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	27	*51e+2/4e3*	.	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	96	*61e+1/1e6*	.	.	.	.	.	.	.	.	(1+1)-ES [1]
PSO	130	*18e+2/1e5*	.	.	.	.	.	.	.	.	PSO [6]
PSO_Bounds	180	*19e+2/1e5*	.	.	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	13	*35e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	21	*15e+2/1e4*	.	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	*33e+2/500*	.	.	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	28	1600	*16e+1/5e6*	.	.	.	.	.	.	.	VNS (Garcia) [10]

Table 18: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	10.6	31.2	135	324	434	530	610	651	707	806	ERT_{best}/D
ALPS	34	40	260	2.2e4	*30e-1/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	4.8	3.6	**1.3**	**2.9**	4.4	9.6	12	12	20	34	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**3.2**	17	*37e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	98	*59e+1/2e3*	.	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	*71e+2/2e3*	.	.	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	6.2	5.6	3.2	**2.2**	**2.2**	**2.1**	**2**	**2**	**1.9**	**1.8**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**2.7**	18	350	*13e+0/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	110	4900	*58e+0/7e5*	.	.	.	.	.	.	.	DASA [18]
DEPSO	14	61	*72e+0/2e3*	.	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	52	72	*29e+0/1e5*	.	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	14	430	*48e-1/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	3.8	5.3	50	*16e+0/1e3*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	3.7	**2.8**	**1**	**2.2**	5.1	18	30	54	59	140	iAMaLGaM IDEA [4]
MA-LS-Chain	6.7	12	16	130	780	*64e-2/5e4*	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	140	*65e+1/4e3*	.	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1.2**	3.9	57	*99e-1/5e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	4.9	150	5e4	*16e+0/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	6.7	2300	1e4	*54e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	18	1700	*63e+0/1e5*	.	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	2200	*34e+1/1e6*	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	5.6	7.8	3.4	**2.1**	**1.8**	**1.7**	**1.5**	**1.5**	**1.5**	**1.4**	IPOP-SEP-CMA-ES [21]
SNOBFIT	16	*40e+1/500*	.	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	7.1	4.3	**1.7**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	VNS (Garcia) [10]

Table 19: 10-D, running time excess ERT/ERT$_{\text{best}}$ 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 different powers Gauss

Δftarget ERT$_{\text{best}}$/D	1e+03 0.1	1e+02 0.1	1e+01 12.8	1e+00 312	1e-01 497	1e-02 1120	1e-03 3650	1e-04 17900	1e-05 30100	1e-07 4e4	Δftarget ERT$_{\text{best}}$/D
ALPS	**1**	**2.9**	3.4	4.1	**8**	11	44	*43e-5/5e5*	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**2.7**	**2.1**	8.5	14	**8.3**	**3.9**	**1.3**	**1.2**	**1.1**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	25	200	*65e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**2.5**	6.6	**2.6**	**4.1**	*67e-3/2e3*	.	.	.	.	BayEDAcG [9]
BFGS	**1.7**	270	*13e+0/2e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	7.5	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	66	87	*31e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	750	1100	*33e-1/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1.1**	**2.5**	5.9	6.6	*80e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**2.7**	4.6	83	110	83	180	*64e-4/1e5*	.	.	EDA-PSO [5]
full NEWUOA	**1**	120	160	*55e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	3.4	8.7	*54e-1/600*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	3.1	**1.4**	10	38	24	13	**3.5**	**2.4**	**2.2**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	4	**1.7**	**3.2**	8.8	9.3	**9.1**	*49e-5/5e4*	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	18	*56e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	11	120	*60e-1/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1.5**	170	44	4.6e4	*13e-1/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	3.3	**1.4**	230	330	380	*38e-2/1e5*	.	.	.	PSO [6]
PSO_Bounds	**1.1**	3.1	560	890	2800	*28e-1/1e5*	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	3.1	7.5	4.7e4	*14e-1/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	7.1	34	11	13	**7.1**	20	*54e-4/1e4*	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	4.3	7.6	*52e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	3	**2.6**	18	41	180	2900	*10e-4/7e6*	.	.	VNS (Garcia) [10]

Table 20: 10-D, running time excess ERT/ERT_{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 different powers 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	0.1	0.1	47.1	3990	7460	15700	43900	93000	1.27e5	2.5e5	ERT_{best}/D
ALPS	**1**	**2.8**	**1.7**	48	*62e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1.9**	6.4	**16**	**39**	**130**	***32e-3/1e6***	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	**1**	440	160	*97e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**2.8**	13	*77e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	110	260	*15e+0/800*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	17	4.1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	220	64	*63e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	43	460	*46e-1/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**2.5**	21	*63e-1/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**2.8**	330	160	*47e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	440	310	*99e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**2.3**	**2.3**	*79e-1/500*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**2.8**	15	29	**98**	**290**	***47e-3/1e6***	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	5.1	**1**	**18**	*10e-1/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	59	*81e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	180	150	*11e+0/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	220	46	3700	*23e-1/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	3.2	330	350	*48e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**2.6**	770	*61e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**2.7**	**2**	*15e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	2100	98	*52e-1/1e4*	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	3.1	4.1	*69e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	3	97	380	*63e-2/6e6*	.	.	.	.	.	VNS (Garcia) [10]

Table 21: 10-D, running time excess ERT/ERT_{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 different powers Cauchy

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	0.1	0.1	7.24	31.7	63.1	148	368	694	999	1820	ERT_{best}/D
ALPS	**1.1**	3.3	9.6	81	*25e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**2.1**	3.2	11	30	44	32	39	46	43	AMaLGaM IDEA [4]
avg NEWUOA	**1**	15	**2.1**	150	1700	*76e-2/7e3*	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1.7**	8.6	22	30	64	*41e-3/2e3*	.	.	.	BayEDAcG [9]
BFGS	**1**	400	570	*10e+0/2e3*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	5.4	**1.1**	**1**	**1.1**	**1.1**	**1.1**	**1.4**	**1.9**	**2.1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	4.7	4	41	*49e-2/1e4*	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	45	580	*26e-1/5e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**2.2**	4.6	8.8	140	*17e-2/2e3*	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**2.9**	**2.3**	9400	*14e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	32	10	140	*55e-2/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1.9**	3.8	18	*11e-1/300*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**2.9**	**1.6**	3.4	21	72	94	87	130	120	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**2.7**	**2.5**	4.8	43	*28e-3/5e4*	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	7.1	*22e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	7.9	3.4	220	*11e-1/4e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	11	3.3	54	2.8e4	*10e-2/1e6*	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**2.9**	**1.7**	7400	*13e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**2.9**	4.9	*20e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	3	9.6	*15e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	4.1	**1**	**1**	**1**	**1**	**1.2**	**1.1**	**1.1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	3.5	4.4	*26e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	3	3.5	**1.6**	**1.4**	**1.1**	**1**	**1**	**1**	**1**	VNS (Garcia) [10]

Table 22: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	5.53	1160	3320	9790	14100	17600	43900	81700	ERT_{best}/D
ALPS	**1**	**1.3**	**1.9**	17	690	*12e-2/5e5*	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1.3**	**1.7**	**4.2**	**10**	**6.2**	**5**	**4.2**	**2.3**	**5.4**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	3.7	28	*42e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1.2**	**1.4**	**2.4**	*85e-2/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	11	140	*82e-1/2e3*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1.7**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1.5**	24	*40e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	350	*38e-1/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1.1**	3.8	*27e-1/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1.1**	3.4	200	*16e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	10	65	*49e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1.1**	**2.4**	*50e-1/600*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1.1**	**1**	11	**27**	**11**	**8.6**	**7.7**	**3.4**	**7**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1.3**	**1.2**	17	*56e-2/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	3.3	*37e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**2.5**	45	*47e-1/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	20	*19e-1/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1.1**	**1.7**	610	*25e-1/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	4.1	580	*24e-1/1e5*	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1.2**	**2.8**	*20e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1.1**	39	18	*14e-1/1e4*	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	4.2	*49e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	3.7	150	2.9e4	*24e-2/7e6*	.	.	.	.	VNS (Garcia) [10]

Table 23: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	3.99	9440	38900	66500	1.29e5	1.99e5	3.33e5	1.03e6	ERT_{best}/D
ALPS	**1**	**1.1**	**2.4**	*15e-1/5e5*	.	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1.9**	3	**34**	***68e-2/1e6***	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1.3**	180	*68e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1.1**	9.3	*57e-1/2e3*	.	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	11	150	*87e-1/900*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**2.2**	18	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1.2**	140	*48e-1/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**2.7**	290	*37e-1/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1.2**	64	*50e-1/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1.3**	3.7	*48e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	91	350	*60e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	5	*53e-1/400*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1.3**	5.9	**79**	***85e-2/1e6***	.	.	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1.3**	**1**	*19e-1/5e4*	.	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	37	*47e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	31	190	*64e-1/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	17	76	*25e-1/1e6*	.	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1.3**	**2.8**	*43e-1/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1.1**	6.1	*56e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1.1**	3.1	*20e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1.6**	160	*44e-1/1e4*	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1.1**	5.4	*53e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	350	*15e-1/6e6*	.	.	.	.	.	.	VNS (Garcia) [10]

Table 24: 10-D, running time excess ERT/ERT$_{\text{best}}$ 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
ERT$_{\text{best}}$/D	0.1	0.1	3.73	61.4	1050	3430	5290	7380	13700	33100	ERT$_{\text{best}}$/D
ALPS	**1**	**1.2**	**2.8**	7200	*99e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1.3**	**2.5**	6.7	4.9	**4.6**	**7.6**	**10**	**7.9**	**7.4**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	3.5	12	*24e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1.3**	**2.8**	10	**2.7**	8.7	*74e-3/2e3*	.	.	.	BayEDAcG [9]
BFGS	**1**	6.9	460	*89e-1/2e3*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**2.1**	**1.8**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	3.3	9	2400	*19e-1/1e4*	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	210	*31e-1/5e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1.4**	3.6	50	*97e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1.1**	**1.2**	**2.3**	*31e-1/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	9.2	*23e-1/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1.3**	3.2	*33e-1/500*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1.1**	**1.5**	12	16	17	26	27	17	**8.6**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1.3**	**1.7**	130	*62e-2/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	*25e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	5	11	*34e-1/4e3*	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	9.8	6.8	1.2e4	*93e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1.4**	**1.3**	*27e-1/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	**2.4**	*34e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1.3**	**2.5**	*22e-1/1e6*	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1.3**	**1.8**	**5.5**	**2.3**	**1.5**	**1.5**	**2.2**	**5.3**	*86e-6/1e4*	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1.5**	**2**	*28e-1/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	4.1	**1.5**	8.6	46	520	*64e-5/6e6*	.	.	VNS (Garcia) [10]

Table 25: 10-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	0.1	0.1	0.1	0.1	0.1	1.05e5	2.97e5	6.38e5	6.4e5	6.44e5	ERT_{best}/D
ALPS	**1**	**1**	**1.1**	490	3.4e7	***12e-2/5e5***	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	**1.1**	160	1.1e6	***42e-3/1e6***	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	5.9	**39**	*19e-2/7e3*	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	**1.1**	220	*24e-2/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	**1.7**	4.1e4	*97e-2/3e3*	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	110	**5e5**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	**1**	3e3	*40e-2/1e4*	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	**2.9**	8.9e4	*40e-2/4e5*	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	**1.1**	290	*41e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1**	**1**	310	7e6	***12e-2/1e5***	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	9.8	240	*20e-2/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	**1.3**	1200	*69e-2/500*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	**1.2**	110	1.9e6	**130**	***37e-3/1e6***	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	**1.1**	170	8.5e5	***10e-2/5e4***	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	**1**	***25e-3/4e3***	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	3.8	**84**	*22e-2/4e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	**1**	3e3	*25e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	**1.1**	250	*21e-2/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	**1.2**	320	1.5e7	***17e-2/1e5***	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	**1**	1400	*28e-2/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	**1**	89	**7.3e5**	***22e-2/1e4***	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	**1.1**	380	*58e-2/500*	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	**1.4**	300	2.2e7	***76e-3/8e6***	.	.	.	.	VNS (Garcia) [10]

Table 26: 10-D, running time excess ERT/ERT$_{\text{best}}$ 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$_{\text{best}}$/D	0.1	0.1	0.1	0.1	0.1	nan	nan	nan	nan	nan	ERT$_{\text{best}}$/D
ALPS	**1**	**1**	**1**	510	*21e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	**1.3**	220	4.9e7	***11e-2/1e6***	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	9.4	4.9e4	*89e-2/7e3*	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	**1.1**	310	*59e-2/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	6.1	1.6e4	*11e-1/1e3*	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	870	**3.9e6**	***84e-3/7e5***	.	.	.	.	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	**1**	4500	*53e-2/1e4*	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	**1.2**	1.1e5	*47e-2/4e5*	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	**1.1**	1e3	*77e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1**	**1**	2600	**1.5e7**	***41e-2/1e5***	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	28	7.1e4	*75e-2/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	**1.1**	1500	*78e-2/500*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	**1.3**	**200**	3.3e7	***13e-2/1e6***	.	.	.	.	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	**1.1**	**190**	*22e-2/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	**1**	***25e-3/4e3***	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	29	1.2e4	*66e-2/4e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	**1**	6800	*30e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	**1.3**	950	*34e-2/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	**1**	1.5e5	*61e-2/1e5*	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	**1.1**	980	*31e-2/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	**1.1**	1.3e4	*41e-2/1e4*	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	**1.2**	670	*73e-2/500*	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	**1.4**	1.8e4	*16e-2/7e6*	.	.	.	.	.	VNS (Garcia) [10]

Table 27: 10-D, running time excess ERT/ERT_{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 ERT_{best}/D	1e+03 0.1	1e+02 0.1	1e+01 0.1	1e+00 0.1	1e-01 0.1	1e-02 79900	1e-03 1.35e5	1e-04 2.06e5	1e-05 2.08e5	1e-07 2.11e5	Δftarget ERT_{best}/D
ALPS	**1**	**1**	**1**	370	*17e-2/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	**1**	150	1.3e5	**5.5**	**25**	**34**	**34**	**34**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	**1**	**40**	*20e-2/7e3*	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	**1.2**	240	*21e-2/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	60	5.8e4	*11e-1/2e3*	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	54	**8.5e4**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	**1**	790	*39e-2/1e4*	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	10	5.8e4	*46e-2/4e5*	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	**1.1**	280	*33e-2/2e3*	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1**	**1.1**	92	*29e-2/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	**1**	69	*23e-2/1e4*	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	**1.1**	880	*68e-2/500*	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	**1**	90	4e5	15	**23**	**22**	**21**	**21**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	**1.1**	130	*19e-2/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	**1**	**1**	**1**	*25e-3/4e3*	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	**2.4**	79	*25e-2/4e3*	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	**2.5**	850	*19e-2/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	**1.1**	570	*32e-2/1e5*	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	**1**	530	*40e-2/1e5*	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	**1.1**	1200	*33e-2/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	**1**	**47**	**3.7e4**	**1.8**	*34e-3/1e4*	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	**1**	250	*65e-2/500*	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	**1.4**	220	3.8e5	93	*96e-4/7e6*	.	.	.	VNS (Garcia) [10]

Table 28: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	915	13800	14000	14400	29200	29300	38300	52900	ERT_{best}/D
ALPS	**1**	**1**	**3.8**	**1.7**	**1.9**	**2**	**1.1**	**1.2**	**1**	**1**	ALPS [15]
AMaLGaM IDEA	**1**	**1**	5	5.1	5.4	5.4	**2.8**	**2.8**	**2.1**	**1.6**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	32	*21e+0/7e3*	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	**2.6**	**2.2**	*93e-1/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	*57e+0/2e3*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	6.4	6.6	6.4	3.2	3.2	**2.4**	**1.8**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	25	*15e+0/1e4*	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	400	*91e-1/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	5.2	**1**	**1**	**1**	**1**	**1**	*15e+0/2e3*	.	DEPSO [11]
EDA-PSO	**1**	**1**	310	100	100	97	48	48	37	27	EDA-PSO [5]
full NEWUOA	**1**	**1**	77	*23e+0/1e4*	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	8.6	*22e+0/500*	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	14	6	11	11	5.7	5.8	4.4	3.3	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	4.1	**2.9**	**3**	**3.1**	**1.6**	**1.6**	**1.2**	**1**	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	14	4.1	*13e+0/4e3*	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	*24e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	36	120	*16e-1/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	230	*16e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	220	*19e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	11	1100	*20e-1/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	11	3.2	4.9	10	5	5	3.8	**2.8**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	4	*22e+0/500*	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	31	9	9.1	11	7	10	13	14	VNS (Garcia) [10]

Table 29: 10-D, running time excess ERT/ERT$_{\text{best}}$ 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
ERT$_{\text{best}}$/D	0.1	0.1	5400	1.36e5	1.41e5	1.42e5	1.43e5	1.44e5	1.45e5	1.47e5	ERT$_{\text{best}}$/D
ALPS	**1**	**1**	**2**	26	*23e-1/5e5*	.	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	12	**6.1**	**14**	**23**	**23**	**23**	**31**	**100**	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	*39e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	*30e+0/2e3*	.	.	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	*46e+0/900*	.	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	*18e+0/1e4*	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	360	*13e+0/4e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	5.5	*24e+0/2e3*	.	.	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1**	260	*20e+0/1e5*	.	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	*41e+0/1e4*	.	.	.	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	*28e+0/400*	.	.	.	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	12	18	**47**	**100**	**99**	**99**	**98**	**97**	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	**1.7**	**5.3**	*48e-1/5e4*	.	.	.	.	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	*21e+0/4e3*	.	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	21	110	*56e-1/1e6*	.	.	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	260	*18e+0/1e5*	.	.	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	260	*26e+0/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	**1.3**	32	*20e-1/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	13	*22e+0/1e4*	.	.	.	.	.	.	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	*27e+0/500*	.	.	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	42	69	*72e-2/7e6*	.	.	.	.	.	VNS (Garcia) [10]

Table 30: 10-D, running time excess ERT/ERT_{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
ERT_{best}/D	0.1	0.1	48.1	588	3750	7050	7090	7150	7220	7330	ERT_{best}/D
ALPS	**1**	**1**	6.7	9	67	*62e-3/5e5*	.	.	.	.	ALPS [15]
AMaLGaM IDEA	**1**	**1**	8	170	35	19	19	20	20	20	AMaLGaM IDEA [4]
avg NEWUOA	**1**	**1**	**1.9**	6	8.6	*41e-2/7e3*	.	.	.	.	avg NEWUOA [23]
BayEDAcG	**1**	**1**	17	23	*20e-1/2e3*	.	.	.	.	.	BayEDAcG [9]
BFGS	**1**	**1**	100	*10e+0/2e3*	.	.	.	.	.	.	BFGS [22]
BIPOP-CMA-ES	**1**	**1**	4.9	34	18	9.7	9.6	**9.6**	**9.5**	**9.4**	BIPOP-CMA-ES [14]
(1+1)-CMA-ES	**1**	**1**	**2.5**	6.5	11	*51e-2/1e4*	.	.	.	.	(1+1)-CMA-ES [2]
DASA	**1**	**1**	590	*30e-1/5e5*	.	.	.	.	.	.	DASA [18]
DEPSO	**1**	**1**	8.3	10	**1.8**	*19e-1/2e3*	.	.	.	.	DEPSO [11]
EDA-PSO	**1**	**1**	380	680	*53e-1/1e5*	.	.	.	.	.	EDA-PSO [5]
full NEWUOA	**1**	**1**	6.7	8.3	5.1	*12e-2/1e4*	.	.	.	.	full NEWUOA [23]
GLOBAL	**1**	**1**	**1**	**1**	**1**	*50e-2/600*	.	.	.	.	GLOBAL [20]
iAMaLGaM IDEA	**1**	**1**	**1**	**4.4**	**1.5**	**1.8**	**8.4**	**11**	**12**	21	iAMaLGaM IDEA [4]
MA-LS-Chain	**1**	**1**	4.7	19	7.1	**3.9**	**5.2**	15	*15e-5/5e4*	.	MA-LS-Chain [19]
MCS (Neum)	**1**	**1**	32	*30e-1/4e3*	.	.	.	.	.	.	MCS (Neum) [16]
NEWUOA	**1**	**1**	**2.6**	11	8	8.8	8.7	*14e-1/4e3*	.	.	NEWUOA [23]
(1+1)-ES	**1**	**1**	**1.7**	**4.6**	24	460	*18e-3/1e6*	.	.	.	(1+1)-ES [1]
PSO	**1**	**1**	180	680	190	*25e-1/1e5*	.	.	.	.	PSO [6]
PSO_Bounds	**1**	**1**	770	*69e-1/1e5*	.	.	.	.	.	.	PSO_Bounds [7]
Monte Carlo	**1**	**1**	160	2.4e4	*21e-1/1e6*	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	**1**	**1**	**2.3**	11	**1.9**	**1**	**1**	**1**	**1**	**1**	IPOP-SEP-CMA-ES [21]
SNOBFIT	**1**	**1**	**2.2**	12	*28e-1/500*	.	.	.	.	.	SNOBFIT [17]
VNS (Garcia)	**1**	**1**	97	210	38	20	20	20	20	**19**	VNS (Garcia) [10]

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