

Comparison tables: BBOB 2009 function 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 [14, 9]. The experimental set-up is described in [13].

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 [13] 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 ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	0.1	8.9	84	230	410	590	780	950	1100	1500	ALPS [17]
AMaLgAM IDEA	1	5	18	18	45	73	100	130	160	190	240	AMaLgAM IDEA [4]
avg NEWUOA	1	27	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	avg NEWUOA [31]
BayEDAacG	1	6.5	39	39	100	230	300	370	440	500	640	BayEDAacG [10]
BFGS	1	13	1	1	1	1	1	1	1	1	1	BFGS [30]
Cauchy-EDA	1	240	160	160	350	510	700	870	1100	1200	1600	Cauchy-EDA [24]
BIPOP-CMA-ES	1	7.8	5.7	5.7	12	18	25	31	38	44	58	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	5.3	3.8	3.8	7.5	11	15	18	22	25	33	(1+1)-CMA-ES [2]
DASA	1	110	29	45	45	59	77	95	110	130	180	DASA [19]
DEPSO	1	3.2	19	19	45	84	130	170	220	280	390	DEPSO [12]
DIRECT	1	1	1	8.8	31	64	97	140	190	240	400	DIRECT [25]
EDA-PSO	1	9.2	22	22	800	1500	2300	3100	3900	4700	6400	EDA-PSO [6]
full NEWUOA	1	40	3.1	3.1	3	3	3	3	3	3	3	full NEWUOA [31]
G3-PCX	1	4.7	7.9	11	11	15	20	24	28	33	43	G3-PCX [26]
simple GA	1	4.4	310	310	1200	2100	3200	4400	7100	1.2e4	6.1e4	simple GA [22]
GLOBAL	1	5.3	15	15	14	14	14	14	14	14	14	GLOBAL [23]
iAMaLgAM IDEA	1	5.7	8.5	7.1	8.1	8.3	8.3	8.3	8.3	8.3	8.3	iAMaLgAM IDEA [4]
LSfminbd	1	39	140	140	150	160	160	160	160	160	160	LSfminbd [28]
LSstep	1	960	12	12	36	58	80	110	120	140	180	LSstep [28]
MA-LS-Chain	1	4.7	1.2	1.2	2	2.1	2.2	2.9	2.9	2.9	2.9	MA-LS-Chain [21]
MCS (Neum)	1	1	1.2	2.5	6.1	9.5	13	16	19	23	31	MCS (Neum) [18]
NELDER (Han)	1	7.1	2.5	2.4	5.3	8.1	11	14	17	21	32	NELDER (Han) [16]
NELDER (Doe)	1	8.3	14	1	1	1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1	17	3.9	3.9	6.9	10	13	16	19	22	28	NEWUOA [31]
(1+1)-ES	1	1600	140	140	220	620	1e3	1500	2e3	2400	3300	(1+1)-ES [1]
POEMS	1	5.8	10	10	55	100	150	210	280	330	450	POEMS [20]
PSO	1	5.7	18	18	180	700	1400	1700	2100	2500	5300	PSO [7]
PSO_Bounds	1	5.4	3e3	3e3	<i>35e-1/1e6</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	37	3.4	3.4	4.9	6.5	8.1	9.7	11	13	16	Monte Carlo [3]
Rosenbrock	1	5.3	4.8	4.8	11	16	21	26	33	37	48	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	12	12	12	18	26	32	38	44	51	65	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	12	12	12	18	26	32	38	44	51	65	VNS (Garcia) [11]

Table 2: 10-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	47	58	80	100	130	150	170	200	220	280	ALPS [17]
AMaLGaM IDEA	8.7	11	15	20	25	29	32	35	39	46	AMaLGaM IDEA [4]
avg NEWUOA	2.5	6.1	16	39	67	90	120	160	180	250	avg NEWUOA [31]
BayEDAeG	32	34	42	57	66	74	81	89	97	110	BayEDAeG [10]
BFGS	4.7	7.5	10	12	14	14	14	14	15	15	BFGS [30]
Cauchy EDA	60	72	95	120	140	160	190	210	230	270	Cauchy EDA [24]
BIPOP-CMA-ES	11	14	20	24	26	27	28	28	29	30	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	7.9	10	16	20	21	22	23	23	24	25	(1+1)-CMA-ES [2]
DASA	6.4	6.7	8.6	11	13	15	18	21	25	34	DASA [19]
DEPSO	8.9	11	16	22	28	34	42	48	55	69	DEPSO [12]
DIRECT	11	12	15	150	150	160	170	380	410	1e3	DIRECT [25]
EDA-PSO	200	250	350	440	520	620	710	810	890	1100	EDA-PSO [6]
full NEWUOA	6.2	18	53	150	300	590	2500	7700	<i>53e-4/1e4</i>	860	full NEWUOA [31]
G3-PCX	13	31	89	190	290	370	460	540	640	860	G3-PCX [26]
simple GA	240	300	820	1400	2700	4400	7e3	1.2e4	7.4e4	<i>53e-4/1e5</i>	simple GA [22]
GLOBAL	6.5	8.6	12	13	14	14	15	15	15	16	GLOBAL [23]
iAMaLGaM IDEA	5.9	7.9	11	14	16	18	19	21	23	27	iAMaLGaM IDEA [4]
LSfminbd	1.2	1	1	1	1	1	1	1	1	1	LSfminbd [28]
LSstep	19	16	16	16	16	16	16	16	16	16	LSstep [28]
MA-LS-Chain	7	9.6	14	18	23	27	32	37	42	52	MA-LS-Chain [21]
MCS (Neum)	1	1.3	3.2	4.6	6.5	7.5	10	11	11	110	MCS (Neum) [18]
NELDER (Han)	3.9	5.1	6.1	7	8.1	8.6	9.2	9.7	10	11	NELDER (Han) [16]
NELDER (Doe)	4.2	10	22	52	83	100	120	130	130	200	NELDER (Doe) [5]
NEWUOA	1.2	4.4	13	37	74	100	150	180	220	300	NEWUOA [31]
(1+1)-ES	280	1300	5600	1.4e4	2.3e4	3.1e4	4.9e4	1.4e5	2.4e5	7.5e5	(1+1)-ES [1]
POEMS	130	180	220	280	320	380	430	470	540	650	POEMS [20]
PSO	17	26	41	420	420	430	430	440	440	450	PSO [7]
PSO.Bounds	120	190	290	420	530	600	890	1200	1500	1800	PSO.Bounds [8]
Monte Carlo	<i>67e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.6	3.4	39	100	160	210	220	280	370	650	Rosenbrock [27]
IPOP-SEF-CMA-ES	4.9	5.6	6.9	7.7	8.5	9.3	9.9	11	11	12	IPOP-SEF-CMA-ES [29]
VNS (Garcia)	20	24	29	33	37	39	41	43	44	47	VNS (Garcia) [11]

Table 3: 10-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS [17]		0.1	6.9	174	360	361	364	364	364	365	365	ALPS [17]
AMaLGaM IDEA [4]	2.6	3.7	6.7	4.6	1300	3.9e4	3.9e4	3.8e4	3.8e4	3.8e4	3.8e4	AMaLGaM IDEA [4]
avg NEWUOA [31]	11	16	<i>21e+0/7e3</i>									avg NEWUOA [31]
BayEDAeG [10]	2.1	18	<i>22e+0/2e3</i>									BayEDAeG [10]
BFGS [30]	30	370	<i>70e+0/5e3</i>									BFGS [30]
Cauchy EDA [24]	160	69	4100	<i>15e+0/5e4</i>								Cauchy EDA [24]
BIPOP-CMA-ES [15]	4.5	3.4	3.6	310	5900	5900	5900	5900	5900	5900	5900	BIPOP-CMA-ES [15]
(1+1)-CMA-ES [2]	4.3	14	390	<i>17e+0/1e4</i>								(1+1)-CMA-ES [2]
DASA [19]	17	7.2	1	11	19	19	19	19	19	19	20	DASA [19]
DEPSO [12]	1.5	8	170	<i>19e+0/2e3</i>								DEPSO [12]
DIRECT [25]	1	5.6	87	<i>20e+0/1e4</i>								DIRECT [25]
EDA-PSO [6]	2.6	34	18	1800	<i>20e-1/1e5</i>							EDA-PSO [6]
full NEWUOA [31]	9.3	14	<i>17e+0/1e4</i>									full NEWUOA [31]
G3-PCX [26]	1.7	71	<i>20e+0/5e4</i>									G3-PCX [26]
simple GA [22]	2.6	150	26	23	73	140	460	610	830	3900		simple GA [22]
GLOBAL [23]	2.3	6.8	140	<i>34e+0/2e3</i>								GLOBAL [23]
iAMaLGaM IDEA [4]	2.7	3.6	4.4	270	2300	2300	2300	2300	2300	2300	2300	iAMaLGaM IDEA [4]
LSfminbd [28]	57	2.2	47	<i>11e+0/5e3</i>								LSfminbd [28]
LSstep [28]	1300	46	2.1	1	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain [21]	1.9	5.6	3.9	43	79	79	79	79	79	79	79	MA-LS-Chain [21]
MCS (Neum) [18]	1	1	11	<i>40e-1/4e3</i>								MCS (Neum) [18]
NELDER (Han) [16]	5.1	31	320	<i>90e-1/1e5</i>								NELDER (Han) [16]
NELDER (Doe) [5]	4.4	1.1	180	<i>11e+0/2e4</i>								NELDER (Doe) [5]
NEWUOA [31]	5.1	20	<i>23e+0/6e3</i>									NEWUOA [31]
(1+1)-ES [1]	5.9	74	6400	<i>90e-1/1e6</i>								(1+1)-ES [1]
POEMS [20]	470	42	6.7	29	66	68	73	75	79	84	84	POEMS [20]
PSO [7]	3.9	6.4	150	1800	1800	1800	1800	1800	1800	1800	1800	PSO [7]
PSO.Bounds [8]	2	11	50	44	51	52	54	55	55	70	95	PSO.Bounds [8]
Monte Carlo [3]	2.4	2900	<i>63e+0/1e6</i>									Monte Carlo [3]
Rosenbrock [27]	18	330	<i>53e+0/8e3</i>									Rosenbrock [27]
IPOP-SEPP-CMA-ES [29]	2.5	2.7	3.1	62	<i>20e-1/1e4</i>							IPOP-SEPP-CMA-ES [29]
VNS (Garcia) [11]	2	5.6	3.2	24	190	210	230	230	260	290	290	VNS (Garcia) [11]

Table 4: 10-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS		0.1	9.82	223	363	170	370	371	374	374	2880	ALPS [17]
AMaLGaM IDEA		2.4	39	14	100	170	170	170	180	190	30	AMaLGaM IDEA [4]
avg NEWUOA		2.6	8.9	41	<i>50e-1/1e6</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAeG		13	42	<i>27e+0/1e4</i>	.	.	.	.	.	.	.	BayEDAeG [10]
BFGS		2.1	28	<i>18e+0/2e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA		89	850	<i>10e+1/5e3</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES		190	100	<i>31e+0/5e4</i>	.	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES		5.8	2.8	6.5	<i>50e-1/3e5</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA		3.3	20	<i>33e+0/1e4</i>	.	.	.	.	.	.	.	DASA [19]
DEPSO		130	7.8	1	16	52	51	51	51	51	6.8	DEPSO [12]
DIRECT		3.1	9.4	66	<i>18e+0/2e3</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO		1	4.2	180	<i>19e+0/1e4</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA		2.5	83	20	<i>50e-1/1e5</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX		35	13	<i>27e+0/1e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA		2.9	500	<i>35e+0/5e4</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL		2.7	140	22	26	79	310	1800	<i>84e-4/1e5</i>	.	.	GLOBAL [23]
iAMaLGaM IDEA		2.5	33	<i>57e+0/2e3</i>	.	.	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbd		3.5	5.5	29	<i>50e-1/1e6</i>	.	.	.	.	.	.	LSfminbd [28]
LSstep		56	1.6	<i>21e+0/6e3</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain		670	31	1.6	1	1	1	1	1	1	1	MA-LS-Chain [21]
MCS (Neum)		2.8	6.1	5.1	290	2e3	2e3	2e3	2e3	2e3	260	MCS (Neum) [18]
NELDER (Han)		1	1	27	<i>12e+0/4e3</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)		5.1	46	3300	<i>17e+0/1e5</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA		3.1	2.8	<i>20e+0/2e4</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES		11	110	<i>55e+0/7e3</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS		9.5	120	6.3e4	<i>15e+0/1e6</i>	.	.	.	.	.	.	POEMS [20]
PSO		570	35	6.4	43	85	89	91	94	97	13	PSO [7]
PSO_Bounds		3.3	8.5	120	<i>80e-1/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo		3.5	28	37	190	200	200	200	200	210	30	Monte Carlo [3]
Rosenbrock		2.3	2e4	<i>86e+0/1e6</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES		32	780	<i>70e+0/1e4</i>	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)		6.5	2.7	6.6	<i>60e-1/1e4</i>	.	.	.	.	.	.	VNS (Garcia) [11]
		3.2	5	7.2	2900	2.5e4	2.5e4	2.7e4	2.7e4	2.7e4	4600	

Table 5: 10-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target}	$1e+03$	$1e+02$	$1e+01$	$1e+00$	$1e-01$	$1e-02$	$1e-03$	$1e-04$	$1e-05$	$1e-07$	Δf_{target}
ERT_{best}/D	0.1	1.64	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	ERT_{best}/D
ALPS	1	7.4	130	190	220	240	250	250	250	260	ALPS [17]
AMaLGA _M IDEA	1	4.6	39	45	46	46	46	46	46	46	AMaLGA _M IDEA [4]
avg NEWUOA	1	1.9	2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	avg NEWUOA [31]
BayEDA _{cG}	1	5.9	91	120	140	140	140	140	140	140	BayEDA _{cG} [10]
BFGS	1	1.3	2.2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	BFGS [30]
Cauchy EDA	1	24	68	70	72	72	72	72	72	72	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.2	4.8	6	6.1	6.1	6.1	6.1	6.1	6.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	3.2	3.9	3.9	3.9	3.9	3.9	3.9	3.9	(1+1)-CMA-ES [2]
DASA	1	13	23	31	36	40	43	47	50	58	DASA [19]
DEPSO	1	7	33	47	50	50	50	50	50	50	DEPSO [12]
DIRECT	1	6	36	52	53	53	53	53	53	53	DIRECT [25]
EDA-PSO	1	2.9	11	17	20	20	21	21	21	21	EDA-PSO [6]
full_NEWUOA	1	2.8	3.6	4	4	4	4	4	4	4	full_NEWUOA [31]
G3-PCX	1	6.8	17	26	27	28	28	28	28	28	G3-PCX [26]
simple GA	1	5.8	1400	3100	5400	8200	1.1e4	1.5e4	1.9e4	3e4	simple GA [22]
GLOBAL	1	5.2	17	18	18	18	18	18	18	18	GLOBAL [23]
iAMaLGA _M IDEA	1	2.4	8.8	11	12	12	12	12	12	12	iAMaLGA _M IDEA [4]
LSfmnbnd	1	8.3	14	15	15	15	15	15	15	15	LSfmnbnd [28]
LSstep	1	83	170	180	180	180	180	180	180	180	LSstep [28]
MA-LS-Chain	1	4.7	41	45	49	49	49	49	49	49	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1.6	3.4	4.2	4.3	4.3	4.3	4.3	4.3	4.3	NELDER (Han) [16]
NELDER (Doe)	1	1.2	3.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	NELDER (Doe) [5]
NEWUOA	1	1.3	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	NEWUOA [31]
(1+1)-ES	1	1.1	2.1	2.6	2.8	2.8	2.8	2.8	2.8	2.8	(1+1)-ES [1]
POEMS	1	130	190	230	260	270	270	270	270	270	POEMS [20]
PSO	1	2.9	13	17	19	19	20	20	20	20	PSO [7]
PSO_Bounds	1	3.1	10	14	15	15	16	16	16	16	PSO_Bounds [8]
Monte Carlo	1	11	<i>27e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.7	4.1	4.3	4.4	4.4	4.4	4.4	4.4	4.4	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.2	5.4	7.1	7.2	7.3	7.3	7.3	7.3	7.3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	5.6	9.6	10	11	11	11	11	11	11	VNS (Garcia) [11]

Table 6: 10-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	30	24	32	32	43	51	59	64	67	68	87	ALPS [17]
AMaLGaM IDEA	8	6.1	7.9	7.9	9.8	11	12	12	11	11	11	AMaLGaM IDEA [4]
avg NEWUOA	1.5	1.6	1	1	1	1	1	1.1	1.1	1.1	1.1	avg NEWUOA [31]
BayEDAeG	23	20	360	360	<i>25e+0/2e3</i>	.	.	.	.	.	.	BayEDAeG [10]
BFGS	2.9	3.7	3.9	3.9	4.2	4.5	4.6	4.5	4.4	4.5	66	BFGS [30]
Cauchy EDA	690	550	190	190	150	140	130	120	110	100	99	Cauchy EDA [24]
BIPOP-CMA-ES	2.2	3.6	2.1	2.1	2.1	2	1.9	1.9	1.8	1.7	1.7	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.7	1.4	1.1	1.1	2.6	20	69	150	<i>21e-4/1e4</i>	.	.	(1+1)-CMA-ES [2]
DASA	15	9.9	75	150	150	350	490	570	620	670	700	DASA [19]
DEPSO	11	5.5	6.8	11	14	14	24	37	<i>50e-4/2e3</i>	.	.	DEPSO [12]
DIRECT	4.9	3.1	98	98	<i>34e-1/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	5.7	14	49	49	62	68	73	72	71	71	71	EDA-PSO [6]
full NEWUOA	2.4	2.1	1	1	1	1	1	1	1	1	1	full NEWUOA [31]
G3-PCX	5	2.2	1.7	1.7	2.4	3.6	3.8	3.9	4.1	4.5	5.4	G3-PCX [26]
simple GA	160	80	140	140	4700	<i>28e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	9.3	4.6	3.2	3.2	3.3	3.5	3.4	3.4	3.3	4	83	GLOBAL [23]
iAMaLGaM IDEA	3.8	3.8	3.2	3.2	4.2	4.8	5.1	5.1	5.1	5	4.9	iAMaLGaM IDEA [4]
LSfminbd	8.2	85	220	370	370	300	680	1100	920	790	<i>40e-1/1e4</i>	LSfminbd [28]
LSstep	120	160	600	600	2400	<i>24e+0/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	10	4.9	6.6	6.6	9.1	9.7	9.5	8.6	7.8	7.3	6.4	MA-LS-Chain [21]
MCS (Neum)	1.8	3.6	19	180	180	170	280	<i>16e-1/4e3</i>	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.8	4.6	4.2	4.2	5.3	5.5	5.8	5.7	6.1	6.3	9	NELDER (Han) [16]
NELDER (Doe)	1.3	1.1	3.8	3.8	10	15	18	25	58	260	<i>14e-6/2e4</i>	NELDER (Doe) [5]
NEWUOA	1	1.1	2.1	2.1	3.3	4	4.9	5.5	5.9	5.9	6.2	NEWUOA [31]
(1+1)-ES	2	2.8	1.8	1.8	1.9	2.1	2.5	2.4	2.4	2.4	2.6	(1+1)-ES [1]
POEMS	92	36	30	30	40	44	46	46	45	44	45	POEMS [20]
PSO	4.9	4.7	400	400	420	320	260	210	180	160	130	PSO [7]
PSO_Bounds	4.8	5.6	45	45	120	140	150	140	130	130	160	PSO_Bounds [8]
Monte Carlo	1300	1500	<i>25e+0/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.5	1	10	10	38	41	37	34	33	31	29	Rosenbrock [27]
IPOP-SEP-CMA-ES	3	4.2	2.2	2.2	2.3	2.4	2.4	2.4	2.3	2.2	2.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	6	6.1	2.6	2.6	2.4	2.3	2.2	2.1	2	1.9	1.8	VNS (Garcia) [11]

Table 7: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	$\Delta\text{ftarget}$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$
	$\text{ERT}_{\text{best}}/D$											$\text{ERT}_{\text{best}}/D$
ALPS	1.6	15	3.29	17.2	161	25	57	59	59	59	56	ALPS [17]
iAMaLgAM IDEA	1.5	4.9	1.4	3.9	1	2.3	2.6	2.6	2.6	2.6	2.5	iAMaLgAM IDEA [4]
avg NEWUOA	3	1.4	16	16	38	<i>73e-2/1e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAacG	2.4	13	23	23	<i>47e-1/2e3</i>	.	.	.	.	.	.	BayEDAacG [10]
BFGS	14	150	<i>13e+1/100</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	93	50	31	31	7.2	4.4	4.7	4.9	4.9	4.9	4.9	Cauchy EDA [24]
BIPOP-CMA-ES	3.2	2.8	2.3	2.3	1.2	1.3	1.3	1.3	1.3	1.3	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.5	2.1	7.4	7.4	5.9	5	20	20	20	20	19	(1+1)-CMA-ES [2]
DASA	37	33	280	280	8800	<i>13e-1/6e5</i>	.	.	.	.	.	DASA [19]
DEPSO	2.1	6.6	9.2	9.2	21	32	<i>14e-1/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1.7	16	16	68	<i>70e-2/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1.7	5.6	57	57	17	130	110	110	110	110	100	EDA-PSO [6]
full NEWUOA	3.7	2.1	2.1	1	7.6	110	<i>51e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	2.1	3.7	21	21	520	<i>19e-1/2e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	2.7	23	140	140	270	680	2900	2800	2800	2800	<i>48e-2/1e5</i>	simple GA [22]
GLOBAL	1.8	6.1	11	11	50	<i>45e-1/500</i>	.	.	.	.	.	GLOBAL [23]
iAMaLgAM IDEA	1.8	4	3	3	1	1	2.1	2.1	2.1	2.1	2	iAMaLgAM IDEA [4]
LStmimbd	16	12	95	95	270	<i>40e-1/1e4</i>	.	.	.	.	.	LStmimbd [28]
LSstep	110	160	720	720	<i>93e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	2.7	4.8	7.7	7.7	15	110	120	120	120	120	110	MA-LS-Chain [21]
MCS (Neum)	1	1.3	53	53	<i>50e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3	1.4	69	69	940	<i>11e-1/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	4.5	1.1	59	59	400	<i>19e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	4.1	1	27	27	1e3	<i>24e-1/1e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	6.3	2.7	190	190	7e3	<i>85e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1100	88	40	40	12	74	80	80	80	80	76	POEMS [20]
PSO	2.2	3.4	10	10	770	<i>11e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1.9	4.2	19	19	730	<i>13e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	2.2	32	6e4	6e4	<i>94e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	150	400	<i>67e+0/3e3</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.4	2.2	2.5	2.5	1.5	1.1	1	1	1	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.4	8.3	3.2	3.2	4.1	19	31	34	34	34	33	VNS (Garcia) [11]

Table 8: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

8 Rosenbrock original											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
$\text{ERT}_{\text{best}}/D$	4.23	13.2	32.2	80.6	93.4	101	104	106	108	110	$\text{ERT}_{\text{best}}/D$
ALPS	53	43	43	120	170	250	330	450	570	3300	ALPS [17]
AMaLGam IDEA [4]	10	7.4	7.4	13	14	14	15	15	15	16	AMaLGam IDEA [4]
avg NEWUOA	1.2	1.2	1	1	1	1	1	1	1	1	avg NEWUOA [31]
BayEDAacG	29	22	75	<i>93e-1/2e3</i>	1.6	1.5	1.5	1.5	1.5	1.5	BayEDAacG [10]
BFGS	1.9	2.3	1.7	1.7	1.6	1.5	1.5	1.5	1.5	1.5	BFGS [30]
Cauchy EDA	110	82	66	120	110	110	110	110	120	120	Cauchy EDA [24]
BIPOP-CMA-ES	4	2.4	1.9	4.7	5	5.1	5.2	5.3	5.4	5.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.1	2.9	1.9	6.8	6.7	6.5	6.5	6.6	6.6	6.7	(1+1)-CMA-ES [2]
DASA	18	21	22	200	420	630	900	1200	1400	1900	DASA [19]
DEPSO	11	9	12	<i>54e-1/2e3</i>	1.6	1.5	1.5	1.5	1.5	1.5	DEPSO [12]
DIRECT	9.1	7.7	32	550	<i>64e-1/1e4</i>	1.5	1.5	1.5	1.5	1.5	DIRECT [25]
EDA-PSO	65	130	140	220	300	410	530	640	760	<i>46e-8/1e5</i>	EDA-PSO [6]
full NEWUOA	2.8	2	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.2	full NEWUOA [31]
G3-PCX	4.6	3.5	2.9	6.9	6.8	6.7	6.7	6.7	6.8	7	G3-PCX [26]
simple GA	280	230	210	<i>53e-1/1e5</i>	1.6	1.5	1.5	1.5	1.5	1.5	simple GA [22]
GLOBAL	7.7	3.2	2.1	1.7	1.6	1.5	1.5	1.5	1.5	1.5	GLOBAL [23]
iAMaLGam IDEA [4]	6.5	4.7	4	8.4	8.8	8.9	9.1	9.3	9.6	10	iAMaLGam IDEA [4]
LSfminbnd	7.2	7.3	19	180	180	440	1300	1400	<i>40e-1/1e4</i>	1.6	LSfminbnd [28]
LSstep	140	80	63	180	470	1500	<i>12e-1/1e4</i>	1.6	1.6	1.6	LSstep [28]
MA-LS-Chain	7.9	6.7	7.3	13	14	14	15	15	15	15	MA-LS-Chain [21]
MCS (Neum)	1.6	1	1	1.6	1.5	1.6	1.6	1.6	1.6	1.6	MCS (Neum) [18]
NELDER (Han)	1.6	2.5	2	5.4	5.1	5	5	5.1	5.1	5.2	NELDER (Han) [16]
NELDER (Doe)	2.2	1.3	1.4	2.5	3.3	3.5	3.7	3.8	4	4.4	NELDER (Doe) [5]
NEWUOA	1	1.4	1	1.7	1.6	1.6	1.6	1.6	1.6	1.6	NEWUOA [31]
(1+1)-ES	3.7	13	22	160	150	170	200	240	270	340	(1+1)-ES [1]
POEMS	80	59	64	470	840	<i>45e-3/1e5</i>	1.6	1.6	1.6	1.6	POEMS [20]
PSO	9.1	10	13	270	350	470	620	790	1500	6700	PSO [7]
PSO_Bounds	17	44	66	690	750	820	1700	1.4e4	1.4e4	<i>98e-5/1e5</i>	PSO_Bounds [8]
Monte Carlo	5400	<i>36e+1/1e6</i>	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	Monte Carlo [3]
Rosenbrock	2.1	3.6	12	59	81	110	170	320	430	1300	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.2	2.4	2.9	7.5	7.5	7.4	7.5	7.5	7.5	7.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	10	5.6	3.5	8.4	8.7	8.6	8.8	8.8	8.9	9	VNS (Garcia) [11]

Table 9: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	$\text{ERT}_{\text{best}}/D$											$\text{ERT}_{\text{best}}/D$
ALPS	1700	0.1	0.1	66	320	85.7	730	1900	3e3	4400	6.1e4	ALPS [17]
AMaLGaM IDEA	350	350	700	9.3	17	15	15	15	15	15	16	AMaLGaM IDEA [4]
avg NEWUOA	69	150	150	1.3	1.8	1.5	1.4	1.3	1.3	1.2	1.2	avg NEWUOA [31]
BayEDA _{cG}	860	2500	2500	56	<i>88e-1/2e3</i>							BayEDA _{cG} [10]
BFGS	88	230	230	2.1	1.9	1.6	1.4	1.4	1.3	1.3	1.3	BFGS [30]
Cauchy EDA	4400	1e4	1e4	100	150	130	120	110	110	110	120	Cauchy EDA [24]
BIPOP-CMA-ES	130	350	350	3.4	6.3	5.9	5.5	5.4	5.4	5.5	5.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	100	350	350	3.3	7.7	6.6	6.1	5.9	5.8	5.8	5.8	(1+1)-CMA-ES [2]
DASA	750	1.6e4	1.6e4	160	2200	2e3	2400	2900	3700	4300	5800	DASA [19]
DEPSO	420	1100	1100	15	<i>70e-1/2e3</i>							DEPSO [12]
DIRECT	1	1	1	9.4	350	<i>17e-1/1e4</i>						DIRECT [25]
EDA-PSO	3200	1.7e4	1.7e4	220	340	540	1500	<i>85e-4/1e5</i>				EDA-PSO [6]
full NEWUOA	140	250	250	1.6	2	1.7	1.6	1.5	1.5	1.5	1.4	full NEWUOA [31]
G3-PCX	190	470	470	4.7	15	12	11	10	10	10	9.9	G3-PCX [26]
simple GA	9e3	2.8e4	2.8e4	370	<i>79e-1/1e5</i>							simple GA [22]
GLOBAL	330	450	450	2.9	2.2	1.8	1.6	1.5	1.5	1.5	1.4	GLOBAL [23]
iAMaLGaM IDEA	250	560	560	6.3	10	9.6	9	8.9	8.9	9.1	9.3	iAMaLGaM IDEA [4]
LSfminbd	230	1200	1200	51	120	860	<i>14e-2/1e4</i>					LSfminbd [28]
LSstep	5800	3.3e4	3.3e4	420	<i>90e-1/1e4</i>							LSstep [28]
MA-LS-Chain	290	870	870	12	36	31	28	27	26	26	25	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	45	240	240	2.4	3.7	3.4	3.1	3.2	3.2	3.2	3.3	NELDER (Han) [16]
NELDER (Doe)	49	150	150	2.7	7.1	6.5	6.1	6	5.9	6	6	NELDER (Doe) [5]
NEWUOA	39	140	140	1.7	1.7	1.4	1.3	1.2	1.2	1.2	1.2	NEWUOA [31]
(1+1)-ES	100	1600	1600	9.5	230	190	190	220	240	280	330	(1+1)-ES [1]
POEMS	3100	6200	6200	110	770	1.7e4	<i>18e-2/1e5</i>					POEMS [20]
PSO	320	1700	1700	24	840	1900	<i>11e-2/1e5</i>					PSO [7]
PSO_Bounds	770	4.3e4	4.3e4	450	1100	1600	<i>78e-3/1e5</i>					PSO_Bounds [8]
Monte Carlo	3.7e5	<i>33e+1/1e6</i>										Monte Carlo [3]
Rosenbrock	79	200	200	27	77	70	87	130	180	<i>12e-5/1e4</i>		Rosenbrock [27]
IPOP-SEP-CMA-ES	130	780	780	6.9	10	8.9	8.1	7.8	7.7	7.7	7.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	340	580	580	4.6	9.8	12	13	13	12	12	12	VNS (Garcia) [11]

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

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	59	180	850	7800	217	245	273	280	308	454	474	ALPS [17]
AMaLGaM IDEA	2.9	2.2	1.8	1.9	2	2	2	2.2	2.2	1.6	1.9	AMaLGaM IDEA [4]
avg NEWUOA	1.3	1.3	1.9	3.5	5.4	5.4	6.6	9	9.9	8.1	10	avg NEWUOA [31]
BayEDAacG	<i>16e+3/2e3</i>											BayEDAacG [10]
BFGS	1.8	1.3	1	1	1	1	1	1	1	1.3	920	BFGS [30]
Cauchy EDA	22	14	10	11	11	11	12	13	13	10	11	Cauchy EDA [24]
BIPOP-CMA-ES	3.8	2.7	2.3	2.1	2.1	1.9	1.8	1.8	1.7	1.2	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.8	2.1	1.7	1.8	1.8	1.7	1.6	1.5	1.4	1	1	(1+1)-CMA-ES [2]
DASA	320	1500	7200	2.2e4	6.1e4	6.1e4	<i>76e-1/1e6</i>					DASA [19]
DEPSO	310	<i>19e+2/2e3</i>										DEPSO [12]
DIRECT	89	<i>37e+1/1e4</i>										DIRECT [25]
EDA-PSO	300	830	<i>56e+0/1e5</i>									EDA-PSO [6]
full NEWUOA	1.9	5.3	10	20	33	33	54	260	240	<i>79e-1/1e4</i>		full NEWUOA [31]
G3-PCX	6.1	6.9	10	19	26	26	30	37	40	31	38	G3-PCX [26]
simple GA	3500	1.4e4	<i>12e+2/1e5</i>									simple GA [22]
GLOBAL	2.6	1.6	1.2	1.2	1.3	1.3	1.2	1.2	1.2	1.6	<i>29e-7/1e3</i>	GLOBAL [23]
iAMaLGaM IDEA	2.1	1.5	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1	1.1	iAMaLGaM IDEA [4]
LSfminbd	440	<i>14e+2/1e4</i>										LSfminbd [28]
LSStep	1600	<i>88e+2/1e4</i>										LSStep [28]
MA-LS-Chain	10	8	11	11	11	9.8	9	9	8.3	5.7	5.6	MA-LS-Chain [21]
MCS (Neum)	170	<i>11e+2/4e3</i>										MCS (Neum) [18]
NELDER (Han)	1.8	2.2	4.1	16	43	43	100	240	820	1600	<i>27e-5/1e5</i>	NELDER (Han) [16]
NELDER (Doe)	2.7	3.7	3.7	25	34	34	57	330	970	<i>31e-4/2e4</i>		NELDER (Doe) [5]
NEWUOA	1	1	2.1	3.8	6	6	7.4	10	11	9.2	12	NEWUOA [31]
(1+1)-ES	43	170	530	1100	1700	1700	2400	3700	9100	1.1e4	<i>43e-5/1e6</i>	(1+1)-ES [1]
POEMS	300	1300	<i>10e+1/1e5</i>									POEMS [20]
PSO	110	1e3	3900	<i>74e+0/1e5</i>								PSO [7]
PSO_Bounds	640	2200	<i>12e+1/1e5</i>									PSO_Bounds [8]
Monte Carlo												Monte Carlo [3]
Rosenbrock	57	80	120	230	<i>22e+0/1e4</i>							Rosenbrock [27]
IPOP-SEP-CMA-ES	9.3	5.6	4	3.7	3.4	3.4	3.2	3.2	2.9	2	2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	6	3.7	2.8	2.7	2.5	2.3	2.3	2.3	2.2	1.5	1.5	VNS (Garcia) [11]

Table 11: 10-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	6.3	83	370	26.6	104	260	990	4300	<i>14e-4/5e5</i>	409	484	ALPS [17]
AMaLGaM IDEA	5.5	14	4.4	1.9	1.1	1.1	1.2	1.3	1.4	1.4	1.5	AMaLGaM IDEA [4]
avg NEWUOA	10	220	36	18	9.5	9.5	1.2	1.4	14	15	15	avg NEWUOA [31]
BayEDAacG	4	58	<i>62e+0/2e3</i>									BayEDAacG [10]
BFGS	2.2	7.1	1	1	1.7	6	6	56	<i>12e-4/8e3</i>			BFGS [30]
Cauchy EDA	37	200	36	13	7	7.5	7.5	7.8	8.1	8.3	8.8	Cauchy EDA [24]
BIPOP-CMA-ES	6	82	13	3.8	1.7	1.6	1.5	1.5	1.4	1.3	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.2	42	9.9	3.8	1.9	2	1.9	1.9	1.8	1.7	1.5	(1+1)-CMA-ES [2]
DASA	5.9	850	1300	1e3	750	1100	1100	1400	1600	2e3	3500	DASA [19]
DEPSO	7.1	140	<i>47e+0/2e3</i>									DEPSO [12]
DIRECT	1.8	7.9	<i>20e+0/1e4</i>									DIRECT [25]
EDA-PSO	6.7	200	550	990	5700	<i>57e-2/1e5</i>						EDA-PSO [6]
full NEWUOA	15	820	290	<i>31e-1/1e4</i>								full NEWUOA [31]
G3-PCX	5.7	65	40	22	14	16	16	17	18	19	21	G3-PCX [26]
simple GA	5.3	100	1.6e4									simple GA [22]
GLOBAL	5	17	2.5	1.7	1.5	8.1	8.1	<i>11e-3/2e3</i>				GLOBAL [23]
iAMaLGaM IDEA	5	25	5.7	2	1	1	1	1	1	1	1	iAMaLGaM IDEA [4]
LSfminbnd	2.2	9400	<i>13e+1/1e4</i>									LSfminbnd [28]
LSStep	4.3	6.1e4	<i>14e+1/1e4</i>									LSStep [28]
MA-LS-Chain	7	31	39	14	6	5.6	5.6	5.1	4.6	4.3	3.8	MA-LS-Chain [21]
MCS (Neum)	1	1	<i>30e+0/4e3</i>									MCS (Neum) [18]
NELDER (Han)	3.8	17	15	8.8	6.9	13	13	37	85	440	<i>24e-6/1e5</i>	NELDER (Han) [16]
NELDER (Doe)	5.2	17	13	7.8	5.4	9.7	9.7	17	34	93	<i>32e-6/2e4</i>	NELDER (Doe) [5]
NEWUOA	1.4	41	11	5.5	3.1	3.4	3.4	4	4.1	4.3	4.6	NEWUOA [31]
(1+1)-ES	840	2.1e4	5300	2400	1300	1500	1500	1700	1800	1900	3e3	(1+1)-ES [1]
POEMS	86	200	220	200	200	140	160	210	270	350	1500	POEMS [20]
PSO	6.7	240	220	150	100	100	130	160	170	190	500	PSO [7]
PSO_Bounds	6.5	670	1400	920	670	1200	1200	1400	3900	3600	<i>12e-2/1e5</i>	PSO_Bounds [8]
Monte Carlo	7.9	120	5.3e5									Monte Carlo [3]
Rosenbrock	2.3	1e3	5500	1400	570	500	500	440	390	360	300	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.3	260	29	8.4	3.5	3.2	3.2	2.9	2.6	2.4	2.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	5.9	160	17	4.7	2	1.9	1.9	1.7	1.6	1.5	1.3	VNS (Garcia) [11]

Table 12: 10-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	86	84	57	51.5	89.6	124	139	157	197	366	515	ALPS [17]
AMaLGaM IDEA	14	13	8.5	4.7	6.6	6.6	7.9	9.1	9.2	5.9	5.3	AMaLGaM IDEA [4]
avg NEWUOA	1.1	1.7	4.8	4.7	8	10	12	12	12	6.9	10	avg NEWUOA [31]
BayEDAeG	73	72	48	48	59	<i>71e-1/2e3</i>						BayEDAeG [10]
BFGS	1.5	1.3	1.3	1.3	1.4	1.4	1.3	1.3	2.2	2.6	23	BFGS [30]
Cauchy EDA	100	110	84	69	68	71	74	74	68	42	34	Cauchy EDA [24]
BIPOP-CMA-ES	3.7	3.3	3.7	4.6	5.3	5.6	5.6	5.6	5.2	3.1	2.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2	2.3	4.2	5.5	6.1	7.4	7.4	7.2	6.4	3.8	3.5	(1+1)-CMA-ES [2]
DASA	12	10	7100	4.5e4	1.1e5	<i>39e-1/1e6</i>						DASA [19]
DEPSO	19	19	19	42	110	<i>55e-1/2e3</i>						DEPSO [12]
DIRECT	35	31	29	130	170	340	<i>64e-2/1e4</i>					DIRECT [25]
EDA-PSO	300	290	490	300	810	4800	<i>66e-3/1e5</i>				4.7	EDA-PSO [6]
full NEWUOA	1.2	1.4	2.9	4.1	4.6	6.2	6.2	6.6	6.2	4.4	4.7	full NEWUOA [31]
G3-PCX	2.5	2.3	2.8	3.7	4	4.4	4.4	4.6	4.1	2.5	2	G3-PCX [26]
simple GA	460	490	1300	1900	1.1e4	<i>18e-1/1e5</i>						simple GA [22]
GLOBAL	1.8	1.4	1	1	1	1	1	1	1	1	2.9	GLOBAL [23]
iAMaLGaM IDEA	7.7	7.2	5	4.8	4.9	5.4	5.4	5.7	5.5	3.4	3	iAMaLGaM IDEA [4]
LSfminbnd	2.6	2.4	98	170	1100	1e3	1e3	890	<i>51e-1/1e4</i>			LSfminbnd [28]
LSStep	74	67	170	730	730	<i>63e-1/1e4</i>						LSStep [28]
MA-LS-Chain	12	11	8	7.2	9.7	16	16	25	29	16	12	MA-LS-Chain [21]
MCS (Neum)	1.2	1	3.2	3.9	7	11	11	13	27	76	110	MCS (Neum) [18]
NELDER (Han)	1.6	1.8	3	4.7	5.3	5.3	5.3	5.4	4.8	2.8	2.3	NELDER (Han) [16]
NELDER (Doe)	1.8	1.6	3	6	7.2	7.2	7.6	7.7	6.9	4.3	6.5	NELDER (Doe) [5]
NEWUOA	1.1	1	1.9	2	2.1	2.3	2.3	2.3	2.1	1.2	1	NEWUOA [31]
(1+1)-ES	1.9	1600	1.5e4	4.8e4	<i>56e-1/1e6</i>							(1+1)-ES [1]
POEMS	160	160	1100	2300	3300	<i>25e-1/1e5</i>						POEMS [20]
PSO	19	20	310	1700	5200	<i>41e-1/1e5</i>						PSO [7]
PSO_Bounds	160	160	580	1800	3300	<i>27e-1/1e5</i>						PSO_Bounds [8]
Monte Carlo												Monte Carlo [3]
Rosenbrock	1	27	38	340	1200	<i>14e-1/1e4</i>						Rosenbrock [27]
IPOP-SEP-CMA-ES	3	2.9	3	4.5	5.6	6.3	6.3	6.3	5.7	3.4	2.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	4.4	5.1	4.9	5.6	5.6	17	16	15	12	6.9	5.2	VNS (Garcia) [11]

Table 13: 10-D, running time excess ERT/ERT_{best} on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	1.18	7.75	38.7	59.6	101	830	1100	459	534	621	778	ALPS [17]
AMaLGA-M IDEA	22	93	15	6.8	6.9	7	6.8	1.8	1.8	1.8	1.8	AMaLGA-M IDEA [4]
avg NEWUOA	3.6	1.4	3	13	13	30	76	32	70	280	<i>39e-5/1e4</i>	avg NEWUOA [31]
BayEDA-cG	17	99	230	<i>20e+0/2e3</i>								BayEDA-cG [10]
BFGS	2.8	1.5	1	1	1	1	1	86	<i>14e-4/1e4</i>			BFGS [30]
Cauchy EDA	160	130	46	43	41	41	11	11	11	11	11	Cauchy EDA [24]
BIPOP-CMA-ES	4.5	5.3	3.6	4.2	4.2	5.6	4.8	1.3	1.3	1.5	1.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.9	3.3	4.7	5.7	5.7	6.9	9.7	3.5	3.7	4.4	6.9	(1+1)-CMA-ES [2]
DASA	24	20	220	380	380	1200	3600	1800	2900	1.1e4	<i>14e-5/1e6</i>	DASA [19]
DEPSO	8.8	19	58	<i>70e-1/2e3</i>								DEPSO [12]
DIRECT	2.9	22	62	160	160	580	<i>28e-2/1e4</i>					DIRECT [25]
EDA-PSO	5.9	300	140	150	150	990	2900	3100	<i>22e-3/1e5</i>			EDA-PSO [6]
full NEWUOA	6.2	2.1	1.8	12	12	25	66	40	130	<i>14e-4/1e4</i>		full NEWUOA [31]
G3-PCX	9.8	4.9	13	50	50	96	160	72	290	820	<i>26e-5/3e4</i>	G3-PCX [26]
simple GA	22	490	480	1.1e4								simple GA [22]
GLOBAL	11	4.9	1.7	1.4	1.4	1.3	1.2	5.3	<i>23e-4/600</i>			GLOBAL [23]
iAMaLGA-M IDEA	4.7	9.6	3.9	3.8	3.8	3.9	3.8	1	1	1	1	iAMaLGA-M IDEA [4]
LSfminbd	9	16	28	70	70	180	460	53e-3/1e4				LSfminbd [28]
LSStep	250	300	470	750	750	1800	1500	<i>12e+0/1e4</i>				LSStep [28]
MA-LS-Chain	6.6	19	16	33	33	140	160	50	43	43	43	MA-LS-Chain [21]
MCS (Neum)	1	4.2	37	44	44	59	280	<i>86e-3/4e3</i>				MCS (Neum) [18]
NELDER (Han)	2	3.8	4.4	9.1	9.1	15	21	5.9	6.2	9	13	NELDER (Han) [16]
NELDER (Doe)	2	2.4	7.2	16	16	40	76	64	160	480	<i>11e-4/2e4</i>	NELDER (Doe) [5]
NEWUOA	2.3	1	2	9	9	20	42	29	69	<i>20e-4/8e3</i>		NEWUOA [31]
(1+1)-ES	4.4	8.1	11	21	21	44	99	130	390	940	1.9e4	(1+1)-ES [1]
POEMS	190	130	270	2e3	2e3	5100	<i>31e-1/1e5</i>					POEMS [20]
PSO	6	25	950	1.1e4	1.1e4	1.8e4	1.4e4	<i>44e-1/1e5</i>				PSO [7]
PSO_Bounds	5.2	98	2300	6800	6800	1.8e4	1.4e4	<i>86e-1/1e5</i>				PSO_Bounds [8]
Monte Carlo	25	<i>28e+1/1e6</i>										Monte Carlo [3]
Rosenbrock	5.2	2	3.4	11	11	15	33	15	42	110	<i>31e-5/1e4</i>	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.2	5.2	8.7	10	10	9.2	8.4	2.1	1.9	1.8	2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.3	7.7	4.9	16	16	20	17	9.4	14	14	20	VNS (Garcia) [11]

Table 14: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	$\text{ERT}_{\text{best}}/D$	0.1	0.1	3.69	9.83	13.3	20.5	39.2	50.5	68.7	430	$\text{ERT}_{\text{best}}/D$
ALPS	1	2.7	19	74	50	74	76	85	320	1400	<i>28e-7/5e5</i>	ALPS [17]
AMaLGA-M IDEA	1	3.1	4.7	13	9	13	12	8.5	8.4	7.5	1.6	AMaLGA-M IDEA [4]
avg NEWUOA	1	9.2	1.7	1.3	1.3	1.2	1.1	1.1	2.2	7.1	64	avg NEWUOA [31]
BayEDA-cG	1	2.5	7.8	110	75	110	210	<i>11e-3/2e3</i>	1	1	<i>11e-7/9e3</i>	BayEDA-cG [10]
BFGS	1	11	1.6	1.6	1.6	1.4	1	1	1	1	11	BFGS [30]
Cauchy EDA	1	230	71	88	85	94	88	60	57	51	11	Cauchy EDA [24]
BIPOP-CMA-ES	1	9.2	2.6	3.3	3.3	3.8	4.1	4.3	4.9	5.2	1.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	4.9	2	1.9	2.3	2.4	2.5	3.7	4.4	4.4	1.1	(1+1)-CMA-ES [2]
DASA	1	27	14	14	13	14	15	80	600	3600	<i>18e-7/1e6</i>	DASA [19]
DEPSO	1.1	2.5	6.6	15	9.5	21	21	33	<i>35e-5/2e3</i>	1	1	DEPSO [12]
DIRECT	1	1	2.5	11	11	50	110	500	<i>23e-4/1e4</i>	1100	120	DIRECT [25]
EDA-PSO	1	4	4.2	130	240	250	250	170	190	12	<i>68e-7/1e5</i>	EDA-PSO [6]
full NEWUOA	1	7	3.1	2	1.8	1.7	1.4	2.8	2.8	16	120	full NEWUOA [31]
G3-PCX	1	2.5	3.9	3.1	2.8	3.1	3.1	2.9	5.5	16	120	G3-PCX [26]
simple GA	1	3.2	18	250	370	400	4200	1.4	<i>13e-4/1e5</i>	1.1	<i>23e-7/300</i>	simple GA [22]
GLOBAL	1.1	3.1	8	3.7	3.7	2.3	1.4	1.3	5.1	4.5	1	GLOBAL [23]
iAMaLGA-M IDEA	1.1	3.4	2.2	7.2	5	7	5	5.1	<i>30e-5/1e4</i>	1	1	iAMaLGA-M IDEA [4]
LSfminbd	1	45	7.5	5.5	5.5	5.6	8.1	52	<i>29e-4/1e4</i>	1	1	LSfminbd [28]
LSstep	1	560	150	110	120	110	170	<i>29e-4/1e4</i>	15	16	16	LSstep [28]
MA-LS-Chain	1	2.7	4.4	8.3	8.3	12	13	13	6.9	<i>32e-6/4e3</i>	3.6	MA-LS-Chain [21]
MCS (Neum)	1	1	1.1	2.4	2.4	2.9	2.8	2.8	3.2	4.2	8.8	MCS (Neum) [18]
NELDER (Han)	1	3.7	1.2	2.1	2.1	2.9	2.9	2.6	3.2	4.2	43	NELDER (Han) [16]
NELDER (Doe)	1	4.9	1.1	2.4	2.4	3.5	3.7	3.7	4.5	7.3	570	NELDER (Doe) [5]
NEWUOA	1	7.2	1	1	1	1	1	2.3	4.4	580	<i>82e-8/1e6</i>	NEWUOA [31]
(1+1)-ES	1	6.8	2.2	2.2	2	2.3	2.3	4.6	170	2100	<i>12e-6/1e5</i>	(1+1)-ES [1]
POEMS	110	970	68	110	50	110	140	120	140	3e3	<i>83e-7/1e5</i>	POEMS [20]
PSO	1.1	2.9	3.2	8.6	8.6	17	22	28	140	560	190	PSO [7]
PSO_Bounds	1	3.2	3.7	3.7	29	93	180	230	560	<i>13e-6/1e5</i>	190	PSO_Bounds [8]
Monte Carlo	1	2.5	17	<i>15e-1/1e6</i>	1.3	1.4	1.7	6.3	46	8.9	<i>96e-7/1e4</i>	Monte Carlo [3]
Rosenbrock	1	25	2.1	2.1	1.3	3.7	3.9	5.2	9	7.4	2	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	4.4	3	7.6	5.3	5.6	6.1	7.6	7.6	7.4	1.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3	3	3	3	3	3	3	3	3	3	VNS (Garcia) [11]

Table 15: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$
ALPS	1.9	1.2	15	<i>30e-1/5e5</i>	7360	7470	7580	7670	7780	7980	ALPS [17]
AMaLGaM IDEA	1.9	2.5	1	3.5	3.7	3.7	3.7	3.7	3.7	3.6	AMaLGaM IDEA [4]
avg NEWUOA	5.5	4.3	230	<i>25e+0/7e3</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDA-cG	1.8	7.6	<i>28e+0/2e3</i>	.	.	.	.	.	.	.	BayEDA-cG [10]
BFGS	59	110	<i>70e+0/4e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy-EDA	80	22	<i>16e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy-EDA [24]
BIPOP-CMA-ES	1.9	1	1	1.7	1.3	1.3	1.3	1.3	1.3	1.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.2	2.9	150	<i>18e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	29	270	2.9e4	<i>19e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1.6	3.4	<i>37e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	2.2	84	<i>17e+0/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.5	23	7	170	190	190	190	180	180	180	EDA-PSO [6]
full NEWUOA	5.4	2.6	300	<i>21e+0/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.7	100	1500	<i>24e+0/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1.7	56	27	<i>41e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	1.4	13	<i>67e+0/900</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.7	1.6	2.6	9.4	10	10	10	10	10	9.9	iAMaLGaM IDEA [4]
LSfminbd	14	14	<i>29e+0/1e4</i>	.	.	.	.	.	.	.	LSfminbd [28]
LSstep	450	310	<i>74e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1.8	2.3	3.6	23	98	96	95	94	92	90	MA-LS-Chain [21]
MCS (Neum)	1	1.7	<i>24e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.3	8.1	240	<i>99e-1/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	2.9	3.7	47	<i>90e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	5.1	4.5	170	<i>22e+0/6e3</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	5.4	17	2100	<i>99e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	240	19	320	<i>11e+0/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1.6	2.1	840	<i>23e+0/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO-Bounds	1.7	5.7	360	<i>11e+0/1e5</i>	.	.	.	.	.	.	PSO-Bounds [8]
Monte Carlo	1.3	1e3	<i>68e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	13	710	<i>89e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.3	1	1.2	1	1	1	1	1	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.6	1.8	6.5	4300	6200	6100	6e3	5900	5900	7700	VNS (Garcia) [11]

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Table 16: 10-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass															
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}				
ERT_{best}/D	0.1	0.1	42.5	703	1580	4570	5120	6510	6580	7160	ERT_{best}/D				
ALPS [17]	1	1.5	8.2	3	56	470	<i>23e-3/5e5</i>	6510	6580	7160	ALPS [17]				
AMaLGaM IDEA [4]	1	1.4	8.5	4.9	5.8	4.5	5.1	4.2	4.2	3.9	AMaLGaM IDEA [4]				
avg NEWUOA [31]	1	1.5	3.3	41	<i>13e-1/1e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAacG [10]	1	1.3	41	<i>95e-1/2e3</i>	.	.	.	.	.	.	BayEDAacG [10]
BFGS [30]	1	190	<i>18e+0/1e4</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA [24]	1	4.3	400	<i>76e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES [15]	1	1.3	3	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]				
(1+1)-CMA-ES [2]	1	1.3	5.4	49	<i>12e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA [19]	1	1.7	190	3e3	<i>11e-1/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO [12]	1	1.2	170	<i>11e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT [25]	1	2.2	2.5	1.6	2.4	9.9	<i>21e-3/1e4</i>	.	.	.	DIRECT [25]				
EDA-PSO [6]	1	1.5	55	130	190	95	130	100	100	95	EDA-PSO [6]				
full NEWUOA [31]	1	1.1	3.6	16	90	<i>99e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX [26]	1	1.3	4.7	69	<i>75e-2/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA [22]	1	1.5	28	130	910	<i>91e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL [23]	1	1.3	1	1.7	<i>11e-1/800</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA [4]	1	1.2	3.3	1.8	6.5	8.2	9.8	8.6	8.6	8	iAMaLGaM IDEA [4]				
LSfminbnd [28]	1	1.4	7.9	<i>28e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep [28]	1	2.1	51	<i>47e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain [21]	1	1.2	2	16	460	<i>30e-2/5e4</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum) [18]	1	2.4	17	86	<i>33e-1/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han) [16]	1	1.5	17	100	<i>75e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe) [5]	1	1.3	1.4	23	<i>69e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA [31]	1	2.3	4.7	<i>25e-1/9e3</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES [1]	1	1.6	65	3700	<i>12e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS [20]	1	1	12	4.4	58	61	79	62	62	92	POEMS [20]				
PSO [7]	1	1.4	5.2	130	<i>92e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds [8]	1	1.5	42	140	260	<i>89e-2/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo [3]	1	1.6	43	<i>31e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock [27]	1	2.9	770	<i>12e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES [29]	1	1.5	2.9	1.2	1.6	1.2	1.3	1.3	1.3	1.2	IPOP-SEP-CMA-ES [29]				
VNS (Garcia) [11]	1	1.4	4.1	3.7	28	37	180	370	670	1600	VNS (Garcia) [11]				

Table 17: 10-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT _{best} /D	ERT _{best} /D	0.1	0.1	2.64	220	633	1100	1530	14e-4/5e5	2020	2650	ERT _{best} /D
ALPS	ALPS	1	1.2	3.5	18	130	130	1100	14e-4/5e5	2020	2650	ALPS [17]
AMaLGaM IDEA	1	1	1	2.8	3.8	1.5	1.7	2.3	3.2	4.1	4	AMaLGaM IDEA [4]
avg NEWUOA	1	1.1	2.2	2.2	990	<i>10e-1/3e4</i>						avg NEWUOA [31]
BayEDAeG	1	1.3	4	4	11	6.4	7.3	<i>18e-3/2e3</i>				BayEDAeG [10]
BFGS	1	79	53	53	<i>36e-1/8e3</i>							BFGS [30]
Cauchy EDA	1	56	67	67	35	27	12	9.4	6.9	6.2	6.6	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.4	1.6	1.4	1.1	1.7	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	3.9	1.4	1.4	620	<i>15e-1/1e4</i>						(1+1)-CMA-ES [2]
DASA	1	1	1.5	5.5	110	2e4	15	<i>28e-3/2e3</i>				DASA [19]
DEPSO	1	1	1	1.3	3.7	4.9	23	<i>44e-4/1e4</i>				DEPSO [12]
DIRECT	1	1	1	1.3	3.7	7.2	13	11	9.4	8.8	9.4	DIRECT [25]
EDA-PSO	1	1.1	2.4	2.4	44	22	13	11	9.4	8.8	9.4	EDA-PSO [6]
full NEWUOA	1	2.1	3.1	3.1	290	<i>95e-2/1e4</i>						full NEWUOA [31]
G3-PCX	1	1.2	3	3	5400	<i>15e-1/5e4</i>						G3-PCX [26]
simple GA	1	1.5	4.8	4.8	77	45	210	1500	<i>11e-3/1e5</i>			simple GA [22]
GLOBAL	1	1.2	3.9	3.9	<i>27e-1/2e3</i>							GLOBAL [23]
iAMaLGaM IDEA	1	1	1.6	1.6	1.8	3.3	2.2	3.6	5	8.6	12	iAMaLGaM IDEA [4]
LSfminbnd	1	4.1	35	35	<i>26e-1/1e4</i>							LSfminbnd [28]
LSstep	1	110	2.8	2.8	<i>73e-1/1e4</i>							LSstep [28]
MA-LS-Chain	1	1	1.2	1	5	8.9	15	21	21	26	53	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1400	<i>18e-1/4e3</i>						MCS (Neum) [18]
NELDER (Han)	1	2.4	19	19	4200	6600	<i>11e-1/1e5</i>					NELDER (Han) [16]
NELDER (Doe)	1	1.2	1.2	1.2	450	<i>77e-2/2e4</i>						NELDER (Doe) [5]
NEWUOA	1	2.9	1.4	1.4	2100	<i>14e-1/2e4</i>						NEWUOA [31]
(1+1)-ES	1	1.9	3500	3500	<i>32e-1/1e6</i>							(1+1)-ES [1]
POEMS	1	290	91	91	23	15	33	58	63	140	250	POEMS [20]
PSO	1	1.3	1.6	1.6	5	230	1e3	<i>52e-3/1e5</i>				PSO [7]
PSO_Bounds	1	1.2	1.5	1.5	29	320	1e3	1400	<i>71e-3/1e5</i>			PSO_Bounds [8]
Monte Carlo	1	1.3	3.2	3.2	<i>21e-1/1e6</i>							Monte Carlo [3]
Rosenbrock	1	1.5e4	8300	8300	<i>12e+0/1e4</i>							Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1.6	1.6	1	1.1	1.3	1.3	1	1	1.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1	5.7	1.4	1	2.2	7.7	28	330	<i>39e-8/7e6</i>	VNS (Garcia) [11]

Table 18: 10-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000												
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}	
ERT_{best}/D	0.1	0.193	23.8	83.6	701	1590	2750	3160	3720	4270	ERT_{best}/D	
ALPS	1	3.2	13	20	60	4700	<i>19e-3/5e5</i>	.	.	.	ALPS [17]	
AMaLGaM IDEA	1.2	1.8	2.9	2.8	1.4	1.5	2.2	2.3	2.7	2.4	AMaLGaM IDEA [4]	
avg NEWUOA	1	10	73	<i>32e-1/9e4</i>	.	.	.	.	.	.	avg NEWUOA [31]	
BayEDAeG	1	2.3	8.8	13	6.4	19	<i>17e-2/2e3</i>	.	.	.	BayEDAeG [10]	
BFGS	1.7	160	5e3	<i>16e+0/8e3</i>	.	.	.	.	.	.	BFGS [30]	
Cauchy EDA	1.1	110	31	24	5.2	3.6	2.8	3	3.1	4.1	Cauchy EDA [24]	
BIFOP-CMA-ES	1	3.1	1	1	1	1	1.2	1.1	1.1	1.2	BIFOP-CMA-ES [15]	
(1+1)-CMA-ES	1	4	110	<i>40e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]	
DASA	1.4	17	1400	8.1e4	<i>19e-1/1e6</i>	.	.	.	.	.	DASA [19]	
DEPSO	1	4.4	4.3	10	13	<i>19e-2/2e3</i>	.	.	.	.	DEPSO [12]	
DIRECT	1	1	2.3	8.1	4.2	28	<i>38e-3/1e4</i>	.	.	.	DIRECT [25]	
EDA-PSO	1	2.1	28	42	9.2	6	7.5	21	79	<i>43e-6/1e5</i>	EDA-PSO [6]	
full NEWUOA	1.1	13	120	1700	<i>39e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]	
G3-PCX	1.1	1.6	800	<i>51e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]	
simple GA	1	1	57	85	120	<i>88e-3/1e5</i>	.	.	.	.	simple GA [22]	
GLOBAL	1	1.9	84	<i>90e-1/2e3</i>	.	.	.	.	.	.	GLOBAL [23]	
iAMaLGaM IDEA	1.1	2.1	1.6	3.3	1.4	2.9	3.1	4.8	6.5	9.1	iAMaLGaM IDEA [4]	
LSfminbd	1	15	210	<i>66e-1/1e4</i>	.	.	.	.	.	.	LSfminbd [28]	
LSStep	1.1	230	<i>19e+0/1e4</i>	.	.	.	.	.	.	.	LSStep [28]	
MA-LS-Chain	1.1	3.4	2.5	6.1	12	49	260	<i>13e-3/5e4</i>	.	.	MA-LS-Chain [21]	
MCS (Neum)	1	1	57	<i>51e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]	
NELDER (Han)	1	3.5	510	8400	<i>32e-1/1e5</i>	.	.	.	.	.	NELDER (Han) [16]	
NELDER (Doe)	1.1	2.8	72	3500	<i>34e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]	
NEWUOA	1.1	99	560	<i>51e-1/4e4</i>	.	.	.	.	.	.	NEWUOA [31]	
(1+1)-ES	2	10	2.8e5	<i>14e+0/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]	
POEMS	2.1	530	19	28	42	130	240	450	<i>24e-3/1e5</i>	.	POEMS [20]	
PSO	1	1.7	3.5	2400	2e3	<i>11e-1/1e5</i>	.	.	.	.	PSO [7]	
PSO_Bounds	1.1	2.5	10	140	580	880	<i>38e-2/1e5</i>	.	.	.	PSO_Bounds [8]	
Monte Carlo	1	1.4	3300	<i>72e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	1	8700	<i>40e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1	3.3	4.4	2.8	1.2	1.1	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	2.7	1.7	1.1	1.8	22	93	1500	<i>85e-6/6e6</i>	.	VNS (Garcia) [11]	

Table 19: 10-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	ERT_{best}/D	$1e+03$	$1e+02$	$1e+01$	$1e+00$	$1e-01$	$1e-02$	$1e-03$	$1e-04$	$1e-05$	$1e-07$	Δf_{target}
													ERT_{best}/D
ALPS	1	1	410	7.7e4	550	<i>74e-3/5e5</i>	7.7	8.8	8.7	8.7	8.6		ALPS [17]
AMaLGaM IDEA	1	1.1	160	7300	83								AMaLGaM IDEA [4]
avg NEWUOA	1	1	48	7.1e5	<i>83e-2/1e5</i>								avg NEWUOA [31]
BayEDAcG	1	1.3	210	<i>20e-1/2e3</i>									BayEDAcG [10]
BFGS	1	1.7	1.9e4	<i>51e-1/8e3</i>									BFGS [30]
Cauchy EDA	1	6.8	1400	3.4e6	<i>14e-1/5e4</i>								Cauchy EDA [24]
BIPOP-CMA-ES	1	1	52	9400	9.8	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	63	8.7e4	<i>55e-2/1e4</i>								(1+1)-CMA-ES [2]
DASA	1	1.1	7100	1.5e7	<i>13e-1/1e6</i>								DASA [19]
DEPSO	1	1	210	<i>29e-1/2e3</i>									DEPSO [12]
DIRECT	1	1	1	1	16	<i>11e-2/1e4</i>							DIRECT [25]
EDA-PSO	1	1.1	130	3.7e5	1300	<i>73e-2/1e5</i>							EDA-PSO [6]
full NEWUOA	1	1.4	150	1.4e5	<i>11e-1/1e4</i>								full NEWUOA [31]
G3-PCX	1	1.1	3.6e4	1.5e6	<i>16e-1/5e4</i>								G3-PCX [26]
simple GA	1	1.1	1e3	1.7e5	290	<i>14e-2/1e5</i>							simple GA [22]
GLOBAL	1	1.2	370	1.2e5	<i>15e-1/2e3</i>								GLOBAL [23]
iAMaLGaM IDEA	1	1	78	2.5e5	370	73	110	110	110	110	110	110	iAMaLGaM IDEA [4]
LSfminbd	1	3.1	200	1.4e6	<i>18e-1/1e4</i>								LSfminbd [28]
LsStep	1	55	2700	<i>17e-1/1e4</i>									LsStep [28]
MA-LS-Chain	1	1.1	120	8600	87	<i>13e-2/5e4</i>							MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	<i>16e-3/4e3</i>							MCS (Neum) [18]
NELDER (Han)	1	1	28	2.8e4	<i>24e-2/1e5</i>								NELDER (Han) [16]
NELDER (Doe)	1	1.1	24	1.2e4	<i>26e-2/2e4</i>								NELDER (Doe) [5]
NEWUOA	1	2.1	27	3.2e5	<i>63e-2/1e5</i>								NEWUOA [31]
(1+1)-ES	1	1.5	6500	2.8e7	<i>18e-1/1e6</i>								(1+1)-ES [1]
POEMS	1	380	2500	2.1e5	1400	<i>57e-2/1e5</i>							POEMS [20]
PSO	1	1.3	110	3.7e5	<i>51e-2/1e5</i>								PSO [7]
PSO_Bounds	1	1.1	120	9.2e5	<i>57e-2/1e5</i>								PSO_Bounds [8]
Monte Carlo	1	1.1	500	<i>31e-1/1e6</i>									Monte Carlo [3]
Rosenbrock	1	2.5	6.5e5	<i>24e+0/1e4</i>									Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	54	1.6e4	17	<i>10e-2/1e4</i>							IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.4	220	3.1e4	1900	<i>60e-3/5e6</i>							VNS (Garcia) [11]

Table 20: 10-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D											ERT_{best}/D
ALPS	31	2.58	3	3.19	1.5	10	9.7	9.6	9.6	9.6	9.7	ALPS [17]
AMaLGaM IDEA	8.1	9.6	11	11	18	270	260	260	260	260	250	AMaLGaM IDEA [4]
avg NEWUOA	1.5	1.3	1.2	1.2	37	<i>12e-1/8e3</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDA-cG	16	22	30	30	<i>27e-1/2e3</i>	.	.	.	.	.	.	BayEDA-cG [10]
BFGS	1.6	1.9	2.4	2.4	1.1	<i>65e-2/1e4</i>	.	.	.	.	.	BFGS [30]
Cauchy-EDA	110	140	140	140	<i>21e-1/5e4</i>	.	.	.	.	.	.	Cauchy-EDA [24]
BIPOP-CMA-ES	4.4	5.1	5.5	3.3	3.3	<i>83e-2/1e4</i>	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.9	3.2	3.0	3.0	270	270	260	260	260	250	250	(1+1)-CMA-ES [2]
DASA	27	29	30	30	1.9	.	.	.	.	.	.	DASA [19]
DEPSO	11	14	15	15	1.1	<i>68e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	7.2	17	16	16	<i>14e-1/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	15	44	44	92	7.8	3.8	3.7	3.7	3.7	3.7	3.7	EDA-PSO [6]
full NEWUOA	2.6	2.2	2.1	2.1	10	<i>10e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	5.8	6	6.1	12	12	<i>85e-2/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	130	310	360	360	3.2	1.8	2	2.6	25	<i>18e-4/1e5</i>	.	simple GA [22]
GLOBAL	12	11	11	11	2.6	<i>11e-1/1e3</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	4.8	5.8	6.2	38	38	<i>24e-2/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	9.6	11	13	3.5	3.5	<i>81e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LStep	200	250	300	300	8.3	<i>98e-2/1e4</i>	.	.	.	.	.	LStep [28]
MA-LS-Chain	7.4	8.5	9.3	2.2	2.2	1.1	1.1	1.1	1.1	1.1	1.1	MA-LS-Chain [21]
MCS (Neum)	4.8	4.6	4.4	1	1	<i>77e-2/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.5	1.9	2.3	16	16	<i>75e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.7	2.1	2.3	5.7	5.7	<i>81e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	1	1	1.9	<i>69e-2/1e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	2.7	3	3.1	3.1	7.2	<i>47e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	95	95	97	10	1.1	12	12	12	12	12	12	POEMS [20]
PSO	6.8	8.9	10	10	1.5	<i>57e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO-Bounds	9.4	29	38	38	2	5.1	7.1	7.1	7.1	7	7.4	PSO-Bounds [8]
Monte Carlo	210	2400	8200	8200	<i>29e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	3	3.1	3.1	1.7	1.7	<i>67e-2/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.4	4.6	4.8	3.1	3.1	<i>55e-2/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	11	11	11	11	1.2	52	50	50	49	49	51	VNS (Garcia) [11]

Table 21: 10-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target} ERT _{best} /D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT _{best} /D
ALPS	1	0.1	1	21	4.5	5	5.8	6.6	7.3	8	4.6	ALPS [17]
AMaLGaM IDEA	1	1	1	27	140	120	120	110	110	100	48	AMaLGaM IDEA [4]
avg NEWUOA	1	1	1	3.2	8.2	4.7	4.7	4.5	4.3	4.1	1.9	avg NEWUOA [31]
BayEDA _c G	1	1	1	48	27	32	<i>19e-1/2e3</i>					BayEDA _c G [10]
BFGS	1	1	1	4.6	2.9	2.8	2.7	2.7	2.6	2.5	2	BFGS [30]
Cauchy EDA	1	1	1	79	340	320	310	300	290	280	120	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1	5.9	28	16	15	15	14	14	6.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1	9.7	6.1	5.1	5	4.9	4.6	4.5	2	(1+1)-CMA-ES [2]
DASA	1	1	1	170	500	430	420	410	390	370	170	DASA [19]
DEPSO	1	1	1	11	26	19	19	18	18	17	7.8	DEPSO [12]
DIRECT	1	1	1	2.5	7.5	17	36	35	33	34	17	DIRECT [25]
EDA-PSO	1	1	1	53	1200	920	900	870	830	800	360	EDA-PSO [6]
full NEWUOA	1	1	1	4.4	7.3	4.4	4.3	4.2	4	3.8	1.7	full NEWUOA [31]
G3-PCX	1	1	1	5	13	9	8.8	8.6	8.2	7.8	3.5	G3-PCX [26]
simple GA	1	1	1	91	85	95	97	130	120	120	260	simple GA [22]
GLOBAL	1	1	1	3.6	1	1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	1	3.2	49	44	44	43	41	40	18	iAMaLGaM IDEA [4]
LSfminbd	1	1	1	99	100	170	160	160	150	140	65	LSfminbd [28]
LSstep	1	1	1	690	630	330	320	320	300	290	<i>91e-1/1e4</i>	LSstep [28]
MA-LS-Chain	1	1	1	7.5	66	43	42	41	39	38	17	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	20	10	10	10	9.5	9.1	4.9	MCS (Neum) [18]
NELDER (Han)	1	1	1	20	16	16	16	15	14	14	6.2	NELDER (Han) [16]
NELDER (Doe)	1	1	1	8.4	6	3.7	3.6	3.5	3.4	3.3	1.6	NELDER (Doe) [5]
NEWUOA	1	1	1	2.1	7.4	4.8	4.7	4.6	4.4	4.2	1.9	NEWUOA [31]
(1+1)-ES	1	1	1	9.8	20	18	18	17	17	16	7.1	(1+1)-ES [1]
POEMS	1	1	1	290	1800	1500	1500	1400	1300	1300	580	POEMS [20]
PSO	1	1	1	1200	510	340	330	330	310	300	130	PSO [7]
PSO_Bounds	1	1	1	560	1200	1500	1500	1400	1300	1300	580	PSO_Bounds [8]
Monte Carlo	1	1	1	570	<i>6.3e4</i>	<i>20e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	1	16	18	12	12	12	11	11	4.8	Rosenbrock [27]
IPOP-SEFP-CMA-ES	1	1	1	5.9	1.4	10	10	9.9	9.5	9.1	4.1	IPOP-SEFP-CMA-ES [29]
VNS (Garcia)	1	1	1	10	22	30	46	66	68	68	32	VNS (Garcia) [11]

Table 22: 10-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D	0.1	0.1	9.79	284	635	662	680	692	830	1040	ERT_{best}/D
ALPS	1	1	1	33	7	12	15	18	24	24	27	ALPS [17]
AMaLgAM IDEA	1	1	1	8.8	490	4900	4700	4600	4500	3800	363	AMaLgAM IDEA [4]
avg NEWUOA	1	1	1	3.6	2.6	2.1	2.1	2	2	1.7	1.4	avg NEWUOA [31]
BayEDAeG	1	1	1	62	31	<i>20e-1/2e3</i>	.	.	.	.	.	BayEDAeG [10]
BFGS	1	1	1	6.6	3.1	4.4	4.2	4.2	4.1	3.5	5.7	BFGS [30]
Cauchy EDA	1	1	1	450	360	<i>20e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1	29	58	200	190	190	180	150	120	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1	9.3	3.7	3.4	3.3	3.2	3.2	2.7	2.2	(1+1)-CMA-ES [2]
DASA	1	1	1	320	220	190	190	190	190	160	140	DASA [19]
DEPSO	1	1	1	66	47	<i>51e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1	3.5	5.1	<i>69e-2/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	1	1600	980	<i>20e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	1	3.6	1.1	1.9	1.8	1.8	1.8	1.5	1.3	full NEWUOA [31]
G3-PCX	1	1	1	9.3	5.6	5.6	5.5	5.4	5.3	4.5	3.7	G3-PCX [26]
simple GA	1	1	1	130	720	<i>20e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	1	4.5	1	1	1	1	1	1	1	GLOBAL [23]
iAMaLgAM IDEA	1	1	1	24	170	1200	1200	1100	1100	930	750	iAMaLgAM IDEA [4]
LSfmnbnd	1	1	1	170	26	48	47	48	49	42	72	LSfmnbnd [28]
LSstep	1	1	1	330	89	230	<i>20e-1/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	1	55	510	540	520	500	490	410	330	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1.1	3.2	6.4	6.1	6	5.9	4.9	12	MCS (Neum) [18]
NELDER (Han)	1	1	1	1	7.4	10	9.6	9.4	9.3	7.8	6.2	NELDER (Han) [16]
NELDER (Doe)	1	1	1	18	2.5	5	4.9	4.9	4.8	4	3.3	NELDER (Doe) [5]
NEWUOA	1	1	1	6.7	1.8	2.5	2.4	2.4	2.4	2	1.7	NEWUOA [31]
(1+1)-ES	1	1	1	47	17	13	13	13	13	11	8.9	(1+1)-ES [1]
POEMS	1	1	1	4400	1400	163	990	960	940	790	640	POEMS [20]
PSO	1	1	1	3700	1400	2200	2100	2100	263	1700	1400	PSO [7]
PSO_Bounds	1	1	1	740	1400	2200	2100	2100	2100	1700	1400	PSO_Bounds [8]
Monte Carlo	1	1	1	2500	<i>20e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	1	35	5	5.4	5.3	5.3	5.4	4.7	4.1	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1	22	61	220	210	210	200	170	140	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1	39	160	1100	1400	1500	1500	1200	980	VNS (Garcia) [11]

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Table 23: 10-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
	ERT_{best}/D	0.1	0.1	0.28	91.5	1640	18400	20400	20600	20900	21400	ERT_{best}/D
ALPS [17]		1	1	1.7	42	<i>1e3</i>	<i>14e-2/5e5</i>					ALPS [17]
AMaLGaM IDEA [4]		1	1	1.6	10	1	1	1	1	1	1	AMaLGaM IDEA [4]
avg NEWUOA [31]		1	1	11	2.6	<i>21e-2/1e4</i>						avg NEWUOA [31]
BayEDAacG [10]		1	1	1.3	<i>16e-1/2e3</i>							BayEDAacG [10]
BFGS [30]		1	1	17	130	<i>11e-1/5e3</i>						BFGS [30]
Cauchy EDA [24]		1	1	2.3	1700	<i>11e-1/5e4</i>						Cauchy EDA [24]
BIPOP-CMA-ES [15]		1	1	2	21	2.7	1.3	1.2	1.2	1.2	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES [2]		1	1	3.4	2.9	<i>22e-2/1e4</i>						(1+1)-CMA-ES [2]
DASA [19]		1	1	5	28	4300	<i>15e-2/1e6</i>					DASA [19]
DEPSO [12]		1	1	1.7	<i>18e-1/2e3</i>							DEPSO [12]
DIRECT [25]		1	1	2.1	2.1	<i>65e-2/1e4</i>						DIRECT [25]
EDA-PSO [6]		1	1	1.7	590	<i>87e-2/1e5</i>						EDA-PSO [6]
full NEWUOA [31]		1	1	13	2.9	44	<i>19e-2/1e4</i>					full NEWUOA [31]
G3-PCX [26]		1	1	1.8	4.9	98	<i>19e-2/4e4</i>					G3-PCX [26]
simple GA [22]		1	1	1.4	390	<i>85e-2/1e5</i>						simple GA [22]
GLOBAL [23]		1	1	2.1	1	<i>32e-2/700</i>						GLOBAL [23]
iAMaLGaM IDEA [4]		1	1	1.8	5.7	3.6	1.1	1	1	1	1	iAMaLGaM IDEA [4]
LSfminbnd [28]		1	1	2.1	26	<i>66e-2/1e4</i>						LSfminbnd [28]
LSstep [28]		1	1	1.2	31	<i>51e-2/1e4</i>						LSstep [28]
MA-LS-Chain [21]		1	1	2	2.3	17	38	35	<i>44e-3/5e4</i>			MA-LS-Chain [21]
MCS (Neum) [18]		1	1	3.4	15	<i>56e-2/4e3</i>						MCS (Neum) [18]
NELDER (Han) [16]		1	1	1	5.7	40	80	<i>59e-3/1e5</i>				NELDER (Han) [16]
NELDER (Doe) [5]		1	1	1.7	1.4	11	<i>97e-3/2e4</i>					NELDER (Doe) [5]
NEWUOA [31]		1	1	7.5	3.6	<i>34e-2/7e3</i>						NEWUOA [31]
(1+1)-ES [1]		1	1	4.4	7.6	2900	<i>14e-2/1e6</i>					(1+1)-ES [1]
POEMS [20]		1	1	15	31	19	36	69	<i>63e-3/1e5</i>			POEMS [20]
PSO [7]		1	1	1.7	91	<i>42e-2/1e5</i>						PSO [7]
PSO_Bounds [8]		1	1	1.5	130	<i>67e-2/1e5</i>						PSO_Bounds [8]
Monte Carlo [3]		1	1	1.6	530	<i>61e-2/1e6</i>						Monte Carlo [3]
Rosenbrock [27]		1	1	2.1	2.2	<i>32e-2/5e3</i>						Rosenbrock [27]
IPOP-SEP-CMA-ES [29]		1	1	2.4	17	12	<i>11e-2/1e4</i>					IPOP-SEP-CMA-ES [29]
VNS (Garcia) [11]		1	1	2.6	18	34	140	420	680	670	650	VNS (Garcia) [11]

Table 24: 10-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	0.1	6.64	9880	<i>1.04e5</i>	7.47e6	7.48e6	7.48e6	7.48e6	7.48e6	7.48e6	ALPS [17]
AMaLGaM IDEA	1	24	5.5	10	<i>44e-1/5e5</i>	78e-2/1e6						AMaLGaM IDEA [4]
avg NEWUOA	1	1.4	<i>21e+0/8e3</i>	18	8.3							avg NEWUOA [31]
BayEDAcG	1	19	<i>37e+0/2e3</i>	<i>37e+0/2e3</i>								BayEDAcG [10]
BFGS	1	350	<i>81e+0/4e3</i>	<i>81e+0/4e3</i>								BFGS [30]
Cauchy EDA	1	51	<i>27e+0/5e4</i>	<i>27e+0/5e4</i>								Cauchy EDA [24]
BIPOP-CMA-ES	1	2.2	2.7	2.7	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	8.6	14	14	<i>20e+0/1e4</i>							(1+1)-CMA-ES [2]
DASA	1	1300	<i>31e+0/1e6</i>	<i>31e+0/1e6</i>								DASA [19]
DEPSO	1	6.8	<i>38e+0/2e3</i>	<i>38e+0/2e3</i>								DEPSO [12]
DIRECT	1	5.9	<i>19e+0/1e4</i>	<i>19e+0/1e4</i>								DIRECT [25]
EDA-PSO	1	56	<i>23e+0/1e5</i>	<i>23e+0/1e5</i>								EDA-PSO [6]
full NEWUOA	1	2.6	<i>16e+0/1e4</i>	<i>16e+0/1e4</i>								full NEWUOA [31]
G3-PCX	1	16	<i>31e+0/5e4</i>	<i>31e+0/5e4</i>								G3-PCX [26]
simple GA	1	120	<i>14e+0/1e5</i>	<i>14e+0/1e5</i>								simple GA [22]
GLOBAL	1	7.2	<i>62e+0/1e3</i>	<i>62e+0/1e3</i>								GLOBAL [23]
iAMaLGaM IDEA	1	4.2	4.2	4.2	4.2	66e-2/1e6						iAMaLGaM IDEA [4]
LSfminbnd	1	20	<i>33e+0/1e4</i>	<i>33e+0/1e4</i>								LSfminbnd [28]
LSstep	3	170	<i>49e+0/1e4</i>	<i>49e+0/1e4</i>								LSstep [28]
MA-LS-Chain	1	5.7	<i>11e+0/5e4</i>	<i>11e+0/5e4</i>								MA-LS-Chain [21]
MCS (Neum)	1	15	<i>30e+0/4e3</i>	<i>30e+0/4e3</i>								MCS (Neum) [18]
NELDER (Han)	1	8.2	22	22	<i>11e+0/1e5</i>							NELDER (Han) [16]
NELDER (Doe)	1	4.7	2.6	2.6	<i>96e-1/2e4</i>							NELDER (Doe) [5]
NEWUOA	1	1	<i>26e+0/7e3</i>	<i>26e+0/7e3</i>								NEWUOA [31]
(1+1)-ES	1	140	740	740	<i>17e+0/1e6</i>							(1+1)-ES [1]
POEMS	1	48	140	140	<i>19e+0/1e5</i>							POEMS [20]
PSO	1	8.1	140	140	<i>20e+0/1e5</i>							PSO [7]
PSO-Bounds	1	22	140	140	<i>22e+0/1e5</i>							PSO-Bounds [8]
Monte Carlo	1	820	<i>60e+0/1e6</i>	<i>60e+0/1e6</i>								Monte Carlo [3]
Rosenbrock	1	1e4	<i>12e+1/1e4</i>	<i>12e+1/1e4</i>								Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.2	1	1	<i>91e-1/1e4</i>							IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	4.8	3.7	3.7	<i>21e-1/8e6</i>							VNS (Garcia) [11]

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