

Notes: 'n' represents the dimension of the corresponding problem. 'NI' represents the total number of iterations. 'NF' represents the number of the function evaluation. 'Time' represents the running time of the algorithm. ' $\|g^*\|$ ' represents the gradient value for the solution. The values of 'NI', 'NF', 'Time' and ' $\|g^*\|$ ' are set as 'NaN' if and only if the number of iterations is greater than 2000.

Problem/n	Table 1: Numerical results for the constrained optimization problems						
	SCGMrf1	SCGMrf2	SCGMrf3	SCGMrf-NG	HZ	KD	JJSL
	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $	NI/NF/Time/ $\ g^*\ $
cosine/4070	27/113/0.032/2.22e-07	20/85/0.018/9.07e-07	26/90/0.019/4.35e-07	25/104/0.021/5.73e-08	27/100/0.019/8.37e-07	34/107/0.020/1.13e-07	30/105/0.018/4.69e-07
cosine/43000	27/94/0.133/2.04e-07	19/84/0.131/7.93e-07	29/99/0.160/8.62e-07	39/146/0.194/3.62e-07	37/118/0.171/1.19e-07	41/122/0.169/1.76e-07	25/97/0.136/6.55e-07
dixmaana/96000	16/87/1.507/8.36e-07	15/85/1.450/3.74e-07	18/90/1.584/6.28e-07	17/89/1.660/8.14e-07	20/102/2.298/8.62e-07	24/102/2.261/6.99e-07	18/87/1.808/5.26e-07
dixmaana/120000	19/89/2.326/5.64e-07	22/94/2.532/7.96e-07	22/92/2.422/8.62e-07	22/95/2.591/8.61e-08	23/95/2.706/2.03e-07	20/95/2.567/1.01e-07	17/88/2.351/2.60e-07
dixmaanb/24900	18/90/0.616/1.49e-07	20/88/0.536/7.86e-07	16/80/0.500/1.84e-07	18/90/0.582/7.86e-09	21/89/0.564/9.34e-07	21/108/0.692/7.76e-07	17/92/0.570/5.57e-07
dixmaanb/43500	20/89/0.877/4.80e-07	17/81/0.808/3.97e-08	15/73/0.708/3.99e-07	21/91/0.876/1.25e-07	22/91/0.974/2.37e-07	14/82/0.830/9.27e-07	14/83/0.823/8.17e-07
dixmaanb/53700	20/84/0.996/2.02e-07	20/88/1.022/9.01e-07	23/91/1.170/3.72e-07	23/93/1.183/8.81e-08	24/94/1.232/2.61e-07	19/87/1.090/3.28e-07	18/93/1.140/1.23e-07
dixmaanc/30300	18/93/0.755/9.86e-07	16/81/0.613/3.45e-07	19/89/0.666/6.28e-07	20/101/0.746/2.95e-07	22/92/0.668/4.40e-07	19/90/0.657/3.69e-07	19/98/0.710/7.85e-07
dixmaanc/150000	17/91/3.241/4.53e-07	17/89/3.078/9.37e-07	16/89/3.058/8.48e-07	17/91/3.341/4.36e-07	23/95/3.386/2.41e-07	20/92/3.124/3.13e-08	18/97/3.222/2.16e-07
dixmaand/300000	22/95/6.533/9.92e-07	21/94/6.775/3.97e-07	16/90/6.439/6.69e-07	22/95/6.757/8.99e-07	22/95/6.591/8.41e-07	22/104/7.391/7.37e-07	23/104/7.501/1.07e-07
dixmaand/300	21/93/0.042/8.34e-08	14/71/0.014/5.25e-07	15/73/0.013/8.34e-07	21/93/0.016/1.98e-07	22/80/0.016/6.91e-07	19/79/0.015/8.51e-07	13/73/0.012/9.85e-07
dixmaand/7200	20/87/0.215/4.23e-07	16/79/0.180/9.95e-07	18/85/0.189/1.87e-07	20/87/0.190/3.82e-07	21/89/0.203/1.88e-07	18/87/0.201/3.26e-07	16/84/0.191/1.32e-07
dixmaand/13650	17/85/0.327/1.04e-08	19/82/0.308/9.60e-07	18/86/0.327/1.51e-07	17/85/0.310/1.62e-08	26/96/0.354/2.28e-07	18/87/0.327/8.72e-07	19/87/0.326/3.62e-07
dixmaane/90	92/198/0.047/9.08e-07	89/182/0.016/8.41e-07	84/183/0.016/5.15e-07	108/238/0.023/6.98e-07	129/263/0.022/9.94e-07	92/172/0.011/2.53e-07	152/261/0.024/5.46e-07
dixmaane/2100	496/1054/0.773/3.38e-07	425/863/0.628/7.56e-07	386/863/0.630/4.04e-07	499/1074/0.786/8.09e-07	469/974/0.682/9.45e-07	325/625/0.438/6.84e-07	NaN/NaN/NaN/NaN
dixmaanf/6	22/70/0.023/4.69e-07	23/71/0.002/9.63e-07	21/72/0.005/7.39e-07	28/78/0.005/9.08e-07	34/87/0.005/2.85e-07	22/69/0.004/8.26e-07	35/86/0.003/3.19e-07
dixmaanf/15	40/95/0.007/6.01e-07	40/92/0.002/6.58e-07	34/84/0.003/9.79e-07	43/96/0.008/9.11e-07	54/111/0.008/9.21e-07	37/91/0.006/8.28e-07	48/95/0.006/8.64e-07
dixmaanf/60	65/151/0.013/6.59e-07	73/158/0.012/4.02e-07	73/158/0.012/4.02e-07	94/202/0.013/9.25e-07	79/176/0.016/8.25e-07	58/120/0.007/6.03e-07	125/209/0.017/7.64e-07
dixmaang/150	100/209/0.049/9.36e-07	102/215/0.025/9.68e-07	95/216/0.026/8.80e-07	98/223/0.023/7.94e-07	130/265/0.024/6.17e-07	99/197/0.023/5.13e-07	232/355/0.035/8.62e-07
dixmaanb/9	32/85/0.032/7.61e-07	35/88/0.004/9.59e-07	32/85/0.005/6.42e-07	29/81/0.006/8.96e-07	40/106/0.002/5.26e-07	33/84/0.004/9.98e-07	47/99/0.002/2.98e-07
dixmaanb/90	85/171/0.010/9.74e-07	80/168/0.015/9.16e-07	74/158/0.009/9.45e-07	82/181/0.017/9.62e-07	81/180/0.016/9.67e-07	72/149/0.014/6.54e-07	179/281/0.023/8.41e-07
dixmaanb/150	100/223/0.028/9.11e-07	91/202/0.023/8.04e-07	93/210/0.025/8.33e-07	120/264/0.029/9.80e-07	95/222/0.025/9.40e-07	90/190/0.022/9.04e-07	317/476/0.056/9.61e-07
dixmaani/9	72/165/0.038/8.53e-07	83/174/0.005/4.48e-07	64/143/0.005/7.27e-07	86/200/0.005/8.62e-07	102/223/0.009/7.04e-07	78/166/0.006/8.10e-07	266/402/0.017/8.96e-07
dixmaani/45	222/492/0.068/9.13e-07	575/1181/0.088/8.02e-07	295/659/0.045/8.84e-07	355/791/0.057/9.07e-07	321/700/0.049/7.06e-07	317/607/0.045/6.11e-07	NaN/NaN/NaN/NaN
dixmaank/3000	NaN/NaN/NaN/NaN	NaN/NaN/NaN/NaN	294/637/0.610/8.52e-07	661/1482/1.442/9.06e-07	1320/2841/2.826/9.26e-07	1574/3087/3.120/7.75e-07	NaN/NaN/NaN/NaN
dixmaank/6000	466/986/1.941/8.94e-07	490/994/1.946/9.16e-07	393/868/1.662/9.25e-07	411/893/1.710/9.87e-07	872/1832/3.465/9.71e-07	140/290/0.545/7.21e-07	779/1090/2.850/6.45e-07
dixmaank/12000	331/688/2.473/7.46e-07	480/958/3.434/7.57e-07	372/826/2.910/5.20e-07	517/1141/3.908/9.27e-07	740/1550/5.321/7.71e-07	616/1221/4.305/3.79e-07	1332/1789/9.572/8.65e-07
dixmaank/21000	969/2055/11.617/8.61e-07	1207/2496/14.062/8.81e-07	918/2116/11.792/6.14e-07	792/1749/9.778/8.13e-07	885/1908/10.746/8.23e-07	NaN/NaN/NaN/NaN	NaN/NaN/NaN/NaN
dixmaank/24000	520/1093/6.646/9.65e-07	507/1016/6.452/5.80e-07	560/1148/7.191/9.94e-07	520/1105/6.898/6.76e-07	884/1954/12.193/9.82e-07	608/1185/7.454/7.21e-07	1425/2011/13.608/8.89e-07
dixmaank/90000	751/1574/32.678/8.53e-07	427/873/18.245/4.54e-07	247/531/11.101/8.44e-07	603/1301/27.013/5.48e-07	426/944/20.124/9.06e-07	NaN/NaN/NaN/NaN	235/388/8.491/9.56e-07
dixon3dq/4	33/89/0.010/8.52e-07	46/97/0.003/4.30e-07	33/76/0.002/9.60e-07	50/106/0.004/5.68e-07	58/117/0.004/4.99e-07	40/87/0.003/6.53e-07	57/104/0.003/8.93e-07
dixon3dq/8	70/146/0.005/3.19e-07	89/193/0.006/8.45e-07	84/192/0.006/8.68e-07	123/258/0.009/6.86e-07	99/218/0.006/9.38e-07	64/133/0.004/7.94e-07	253/395/0.006/8.29e-07
dqdrtic/1000000	67/235/3.115/9.27e-07	72/226/2.884/9.35e-07	117/332/4.073/9.59e-07	119/346/4.120/9.52e-07	152/422/5.317/6.73e-07	95/298/3.873/3.28e-07	873/1249/17.593/9.69e-07
dqdrtic/2200000	85/280/7.343/7.45e-07	101/310/8.194/6.51e-07	91/280/7.204/9.24e-07	117/345/8.450/6.12e-07	74/242/6.085/7.66e-07	86/285/7.708/8.20e-07	732/1068/32.145/7.92e-07
dqdrtic/4700000	71/246/12.704/9.03e-08	80/252/13.440/4.99e-07	101/289/16.834/9.85e-07	79/267/13.237/7.99e-07	106/300/16.624/6.94e-07	81/271/16.092/6.17e-07	588/912/57.661/6.42e-07
dqrtric/64	14/77/0.009/4.24e-07	17/76/0.003/1.43e-07	16/76/0.004/1.43e-07	18/80/0.004/5.60e-07	20/79/0.004/4.99e-07	20/79/0.004/4.99e-07	18/80/0.004/4.99e-07
dqrtric/6800	37/151/0.296/6.40e-07	36/150/0.304/2.60e-07	44/151/0.314/4.04e-07	49/159/0.313/2.66e-07	67/199/0.383/7.12e-07	53/168/0.327/1.01e-07	46/167/0.322/4.17e-07
dqrtric/8000	41/163/0.367/2.84e-07	37/156/0.353/1.97e-07	39/152/0.354/2.25e-07	46/166/0.378/1.34e-07	63/190/0.450/3.23e-07	58/175/0.397/7.32e-07	58/201/0.451/1.38e-07
edensch/500	35/119/0.031/8.06e-07	30/90/0.014/4.40e-07	30/96/0.016/6.18e-07	39/148/0.027/9.38e-07	41/107/0.019/9.39e-07	49/292/0.048/8.93e-07	38/102/0.014/7.95e-07
edensch/15000	46/260/1.054/9.68e-07	52/267/1.093/2.03e-07	43/212/0.865/4.37e-07	75/445/1.327/2.28e-07	40/192/0.776/9.11e-07	45/226/0.918/5.03e-07	56/188/0.359/3.63e-07
edensch/35020	50/235/1.161/2.78e-07	69/402/3.523/3.98e-07	56/295/2.579/8.59e-07	84/611/5.454/4.36e-07	60/233/2.047/2.57e-07	139/1156/6.200/8.50e-07	81/476/1.415/3.92e-07
eg2/7	44/104/0.012/7.39e-07	33/94/0.002/4.10e-07	36/94/0.002/5.07e-07	45/102/0.003/8.02e-07	90/240/0.003/9.97e-07	48/115/0.001/9.89e-07	150/231/0.002/7.91e-07
fletcher/5000	90/451/0.096/5.70e-07	89/540/0.051/9.98e-07	117/842/0.084/6.16e-07	150/1154/0.106/8.77e-07	124/788/0.075/1.11e-07	107/760/0.070/8.94e-07	188/308/0.032/2.82e-07
fletcher/100000	90/358/0.431/5.63e-07	139/1226/1.402/5.69e-07	103/210/0.269/7.25e-07	231/1977/2.237/4.00e-07	267/2385/2.893/2.70e-07	268/1779/2.118/1.66e-07	150/289/0.384/2.19e-08
fletcher/210000	253/2249/6.802/1.12e-07	86/342/1.050/7.46e-07	169/1327/3.761/1.64e-07	199/1699/4.852/6.08e-07	224/2004/5.574/3.72e-07	274/2624/7.203/7.09e-07	170/378/1.149/9.44e-07
freuroth/2	113/381/0.022/8.33e-07	100/335/0.011/7.09e-07	187/505/0.015/5.01e-07	230/884/0.026/9.23e-07	226/625/0.018/6.48e-07	89/448/0.009/2.00e-07	89/448/0.009/2.00e-07
genrose/4	149/388/0.014/6.30e-07	291/675/0.013/7.33e-07	246/574/0.011/5.09e-07	329/765/0.010/9.74e-07	215/518/0.006/7.28e-07	114/312/0.009/9.02e-07	NaN/NaN/NaN/NaN
quartc/8000	41/163/0.375/2.84e-07	37/156/0.381/1.97e-07	39/152/0.330/2.25e-07	46/166/0.364/1.34e-07	63/190/0.414/3.23e-07	58/175/0.374/7.32e-07	58/201/0.428/1.38e-07
quartc/15300	49/171/0.677/2.60e-07	51/184/0.728/2.18e-07	46/169/0.674/3.70e-07	60/196/0.784/8.83e-07	72/221/0.902/2.95e-07	65/205/0.842/7.70e-07	55/192/0.780/7.14e-07
quartc/40000	50/192/1.985/5.66e-07	55/183/1.869/4.65e-07	38/158/1.636/3.25e-07	63/213/2.157/6.07e-07	105/312/3.191/4.07e-07	81/248/2.489/9.90e-07	44/169/1.700/9.18e-07
tridia/7	79/166/0.015/5.80e-07	70/152/0.006/7.87e-07	70/157/0.005/6.75e-07	105/211/0.006/6.81e-07	110/221/0.004/3.86e-07	79/166/0.002/8.15e-07	172/290/0.003/3.17e-07
woods/2500	271/690/0.055/7.74e-07	401/987/0.058/6.08e-07	434/1073/0.037/6.23e-07	555/1304/0.065/7.84e-07	486/1211/0.048/7.29e-07	183/448/0.015/4.73e-07	NaN/NaN/NaN/NaN
woods/25000	496/1149/0.273/8.46e-07	402/999/0.240/6.89e-07	321/793/0.187/7.46e-07	438/1090/0.258/1.39e-07	311/741/0.180/9.19e-07	311/741/0.180/9.19e-07	NaN/NaN/NaN/NaN
woods/250000	274/699/2.093/7.76e-07	455/1167/3.467/9.55e-07	298/736/2.310/9.11e-07	476/1168/3.630/9.36e-07	382/945/2.982/5.11e-07	386/920/2.834/3.83e-07	NaN/NaN/NaN/NaN
bdexp/10000	2/17/0.041/2.68e-61	2/17/0.019/2.68e-61	2/17/0.014/2.68e-61	2/17/0.014/2.68e-61	2/17/0.014/1.25e-63	2/17/0.015/7.79e-63	2/17/0.013/4.62e-61
bdexp/100000	2/12/0.102/4.58e-106	2/12/0.101/4.58e-106	2/12/0.105/4.58e-106	2/12/0.103/4.58e-106	2/12/0.103/4.58e-106	2/12/0.098/4.59e-106	2/12/0.098/4.59e-106
bdexp/500000	2/12/0.504/1.55e-120	2/12/0.570/1.55e-120	2/12/0.605/1.55e-120	2/12/0.594/1.55e-120	2/12/0.566/1.54e-120	2/12/0.575/1.55e-120	2/12/0.566/1.55e-120
exdenschnf/22000	28/99/0.061/8.17e-07	27/106/0.033/7.27e-07	23/97/0.031/7.27e-07	33/112/0.034/2.48e-07	30/107/0.035/3.25e-07	25/105/0.034/3.25e-07	21/102/0.030/1.52e-07
exdenschnf/1019000	30/116/1.535/9.50e-07	34/121/1.694/8.24e-07	29/114/1.593/7.41e-07	28/126/1.673/5.64e-07	35/121/1.643/9.83e-07	28/135/1.816/5.05e-07	29/126/1.667/4.34e-08
exdenschnf/2250000	27/115/3.416/7.45e-07	26/112/3.213/7.26e-07	41/125/3.826/7.95e-07	27/115/3.281/6.39e-07	38/124/3.647/8.43e-07	27/123/3.866/3.49e-07	33/118/4.123/6.95e-07
exdenschnb/10000	15/80/0.021/8.30e-07	15/80/0.014/8.30e-07	15/80/0.011/8.30e				