

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	27/113/0.019/2.22e-07	20/85/0.015/9.07e-07	26/90/0.016/4.35e-07	25/104/0.018/5.73e-08	56/146/0.023/7.09e-07	34/107/0.017/1.13e-07	30/105/0.016/4.69e-07	
cosine/43000	27/94/0.148/2.04e-07	19/84/0.135/7.93e-07	29/99/0.160/8.62e-07	39/146/0.204/3.62e-07	30/101/0.155/3.60e-07	41/122/0.175/1.76e-07	25/97/0.138/6.55e-07	
dixmaana/96000	16/87/1.495/8.36e-07	15/85/1.486/3.74e-07	18/90/1.586/6.28e-07	17/89/1.479/8.14e-07	27/96/2.123/9.13e-07	24/102/2.398/6.99e-07	18/87/1.956/5.26e-07	
dixmaana/120000	19/89/2.475/5.64e-07	22/94/2.248/7.96e-07	22/92/2.114/8.62e-07	22/95/2.180/8.61e-08	29/101/2.253/3.63e-07	20/95/2.137/1.01e-07	17/88/1.983/2.60e-07	
dixmaanb/43500	20/89/0.789/4.80e-07	17/81/0.670/3.97e-08	15/73/0.618/3.99e-07	21/91/0.776/1.25e-07	24/92/0.793/3.47e-07	14/82/0.685/9.27e-07	14/83/0.707/8.17e-07	
dixmaanb/53700	20/84/0.873/2.02e-07	20/88/0.931/9.01e-07	23/91/0.924/3.72e-07	23/93/0.965/8.81e-08	20/98/1.061/5.95e-07	19/87/0.908/3.28e-07	18/93/0.949/1.23e-07	
dixmaanb/24900	18/90/0.456/1.49e-07	20/88/0.460/7.86e-07	16/80/0.387/1.84e-07	18/90/0.440/7.86e-09	21/89/0.437/6.04e-07	21/108/0.548/7.76e-07	17/92/0.461/5.57e-07	
dixmaanc/30300	18/93/0.642/9.86e-07	16/81/0.480/3.45e-07	19/89/0.539/6.28e-07	20/101/0.587/2.95e-07	22/92/0.545/5.31e-07	19/90/0.539/3.69e-07	19/98/0.641/8.65e-07	
dixmaanc/150000	17/91/2.786/4.53e-07	17/89/2.693/9.37e-07	16/89/2.781/8.48e-07	17/91/2.809/4.36e-07	23/97/3.121/3.64e-07	20/92/2.854/3.13e-08	18/97/2.921/2.16e-07	
dixmaanc/300000	22/95/6.043/9.92e-07	21/94/5.803/3.97e-07	16/90/5.455/6.69e-07	22/95/5.819/8.99e-07	23/97/5.955/5.93e-07	22/104/6.281/7.37e-07	23/104/6.280/1.07e-07	
dixmaand/300	21/93/0.027/8.34e-08	14/71/0.007/5.25e-07	15/73/0.007/8.34e-07	21/93/0.010/1.98e-07	20/81/0.008/1.98e-07	19/79/0.009/8.51e-07	13/73/0.010/9.85e-07	
dixmaand/7200	20/87/0.159/4.23e-07	16/79/0.131/9.95e-07	18/85/0.133/1.87e-07	20/87/0.146/3.82e-07	25/93/0.143/4.35e-07	18/87/0.159/3.26e-07	16/84/0.145/1.32e-07	
dixmaand/13650	17/85/0.247/1.04e-08	19/82/0.237/9.60e-07	18/86/0.265/1.51e-07	17/85/0.283/1.62e-08	24/94/0.303/3.77e-07	18/87/0.267/8.72e-07	19/87/0.255/3.62e-07	
dixmaane/90	92/198/0.008/9.08e-07	89/182/0.006/8.41e-07	84/183/0.008/5.15e-07	108/238/0.010/6.98e-07	101/224/0.010/8.50e-07	92/172/0.007/2.53e-07	152/261/0.011/5.46e-07	
dixmaane/2100	496/1054/0.537/3.38e-07	425/863/0.412/7.56e-07	386/863/0.398/4.04e-07	499/1074/0.502/8.09e-07	501/1108/0.600/7.84e-07	325/625/0.318/7.84e-07	NaN/NaN/NaN/NaN	
dixmaanf/6	22/70/0.017/4.69e-07	23/71/0.002/9.63e-07	21/72/0.002/7.39e-07	28/78/0.003/9.08e-07	34/87/0.002/2.85e-07	22/69/0.002/8.26e-07	35/86/0.002/3.19e-07	
dixmaanf/15	40/95/0.004/6.01e-07	40/92/0.004/6.58e-07	34/84/0.002/9.79e-07	43/96/0.003/9.11e-07	54/111/0.003/9.21e-07	37/91/0.004/8.28e-07	48/95/0.005/8.64e-07	
dixmaanf/60	65/151/0.007/6.59e-07	73/158/0.005/4.02e-07	70/152/0.006/5.72e-07	94/202/0.008/9.13e-07	110/247/0.010/4.57e-07	58/120/0.004/6.03e-07	125/209/0.008/7.64e-07	
dixmaang/150	100/209/0.027/9.36e-07	102/215/0.013/9.68e-07	95/216/0.014/8.80e-07	98/223/0.014/7.94e-07	134/280/0.017/9.74e-07	99/197/0.012/5.13e-07	232/355/0.022/8.62e-07	
dixmaanb/9	32/85/0.017/7.61e-07	35/88/0.002/9.59e-07	32/85/0.002/6.42e-07	29/81/0.002/8.96e-07	40/106/0.002/5.26e-07	33/84/0.002/9.98e-07	47/99/0.002/2.98e-07	
dixmaanb/90	85/171/0.008/9.74e-07	80/168/0.007/9.16e-07	74/158/0.007/9.45e-07	82/181/0.009/9.62e-07	104/230/0.010/8.28e-07	72/149/0.007/6.54e-07	179/281/0.012/8.41e-07	
dixmaanb/150	100/223/0.014/9.11e-07	91/202/0.012/8.04e-07	93/210/0.013/8.33e-07	120/264/0.017/9.80e-07	137/300/0.017/9.62e-07	90/190/0.011/9.04e-07	317/476/0.035/9.61e-07	
dixmaani/9	72/165/0.018/8.53e-07	83/174/0.007/4.48e-07	64/143/0.006/7.27e-07	86/200/0.004/8.62e-07	102/223/0.004/7.04e-07	78/166/0.003/8.10e-07	266/402/0.007/8.96e-07	
dixmaani/45	222/492/0.031/9.13e-07	575/1181/0.036/8.02e-07	295/659/0.022/8.84e-07	355/791/0.025/9.07e-07	321/700/0.021/7.06e-07	317/607/0.019/6.11e-07	NaN/NaN/NaN/NaN	
dixmaank/3000	NaN/NaN/NaN/NaN	NaN/NaN/NaN/NaN	294/637/0.412/8.52e-07	661/1482/0.990/9.06e-07	881/1896/1.229/9.86e-07	1574/3087/2.033/7.75e-07	NaN/NaN/NaN/NaN	
dixmaank/6000	466/994/1.382/8.94e-07	490/994/1.318/9.16e-07	393/868/1.167/9.25e-07	411/893/1.108/9.87e-07	754/1664/2.117/9.14e-07	140/290/0.373/7.21e-07	779/1090/1.449/6.45e-07	
dixmaank/12000	331/688/2.138/7.46e-07	480/958/2.522/7.57e-07	372/826/2.122/5.20e-07	517/1141/2.920/9.27e-07	1182/2501/6.654/8.76e-07	616/1221/3.634/3.79e-07	1332/1789/5.081/8.65e-07	
dixmaank/21000	969/2055/10.820/8.61e-07	1207/2496/10.975/8.81e-07	918/2116/9.173/6.14e-07	792/1749/7.780/8.13e-07	1059/2263/9.829/9.18e-07	NaN/NaN/NaN/NaN	NaN/NaN/NaN/NaN	
dixmaank/24000	520/1093/5.622/9.65e-07	507/1016/5.013/5.80e-07	560/1148/5.587/9.94e-07	520/1105/5.582/6.76e-07	961/2058/10.492/8.43e-07	608/1185/7.282/7.21e-07	1425/2011/17.007/8.89e-07	
dixmaank/90000	751/1574/27.463/8.53e-07	427/873/15.266/4.54e-07	247/531/9.630/8.44e-07	603/1301/22.982/5.48e-07	1108/2339/41.998/8.58e-07	NaN/NaN/NaN/NaN	235/388/6.642/9.56e-07	
dixon3dq/4	33/89/0.006/8.52e-07	46/97/0.001/4.30e-07	37/76/0.001/9.60e-07	50/106/0.001/9.60e-07	58/117/0.001/4.99e-07	40/87/0.001/6.53e-07	57/104/0.002/9.24e-07	
dixon3dq/8	70/146/0.005/3.19e-07	89/193/0.006/8.45e-07	84/192/0.004/8.68e-07	123/258/0.003/6.86e-07	99/218/0.002/9.38e-07	64/133/0.001/7.94e-07	253/395/0.010/8.29e-07	
dqdrtic/1000000	67/235/2.024/9.27e-07	72/226/1.920/9.35e-07	117/332/2.778/9.59e-07	119/346/2.754/9.52e-07	128/356/2.895/9.30e-07	95/298/2.371/3.28e-07	873/1249/10.808/9.69e-07	
dqdrtic/2200000	85/280/4.954/7.45e-07	101/310/5.489/6.51e-07	91/280/4.971/9.24e-07	117/345/6.013/6.12e-07	110/314/5.565/3.70e-07	86/285/5.095/8.20e-07	732/1068/21.017/7.92e-07	
dqdrtic/4700000	71/246/9.172/9.03e-08	80/252/9.766/4.99e-07	101/289/11.373/9.85e-07	79/267/9.957/7.99e-07	94/285/10.888/9.54e-07	81/271/10.558/6.17e-07	588/912/38.794/6.42e-07	
dqrtric/64	14/77/0.002/4.24e-07	17/76/0.002/1.43e-07	16/70/0.002/1.43e-07	18/80/0.002/5.60e-07	58/117/0.001/4.99e-07	20/79/0.002/7.73e-07	20/79/0.002/7.73e-07	
dqrtric/6800	37/151/0.245/6.40e-07	36/150/0.237/2.60e-07	44/151/0.236/4.04e-07	49/159/0.249/2.66e-07	69/213/0.331/7.09e-07	53/168/0.265/1.01e-07	46/167/0.266/4.17e-07	
dqrtric/8000	41/163/0.305/2.84e-07	37/156/0.286/1.97e-07	39/152/0.272/2.25e-07	46/166/0.304/1.34e-07	73/216/0.412/7.53e-07	58/175/0.313/7.32e-07	58/201/0.380/1.38e-07	
edensch/500	35/119/0.020/8.06e-07	30/90/0.010/4.40e-07	30/96/0.010/6.18e-07	39/148/0.017/9.38e-07	48/139/0.017/5.68e-07	49/292/0.033/8.93e-07	38/102/0.010/7.95e-07	
edensch/15000	46/260/0.868/9.68e-07	52/267/0.891/2.03e-07	43/212/0.671/4.37e-07	75/445/1.026/2.28e-07	105/827/2.649/8.21e-07	45/226/0.709/5.03e-07	56/188/0.293/3.63e-07	
edensch/35020	50/235/0.879/2.78e-07	69/402/3.153/3.98e-07	56/295/2.243/8.59e-07	84/611/4.580/4.36e-07	103/692/5.194/3.24e-07	139/1156/5.080/8.50e-07	81/477/1.056/3.92e-07	
eg2/7	44/104/0.006/7.39e-07	33/94/0.001/4.10e-07	36/94/0.001/5.07e-07	45/102/0.001/8.02e-07	110/273/0.003/8.24e-07	48/115/0.001/9.89e-07	150/231/0.002/7.91e-07	
fletcher/5000	90/451/0.064/5.70e-07	89/540/0.030/9.98e-07	117/842/0.045/6.16e-07	150/1154/0.055/8.77e-07	72/489/0.021/7.84e-07	107/760/0.035/8.94e-07	188/308/0.015/2.82e-07	
fletcher/100000	90/358/0.283/5.63e-07	139/1226/1.002/5.69e-07	103/210/0.207/7.25e-07	231/1977/1.613/4.00e-07	158/1323/1.077/4.63e-07	268/1779/1.433/1.66e-07	150/289/0.256/2.19e-08	
fletcher/210000	253/2249/4.499/1.12e-07	86/342/0.732/7.46e-07	169/1327/2.579/1.64e-07	199/1699/3.240/6.08e-07	237/1453/2.864/5.08e-07	274/2624/4.942/7.09e-07	170/378/0.777/9.44e-07	
freuroth/2	113/381/0.008/8.33e-07	100/335/0.003/7.09e-07	187/505/0.006/5.01e-07	230/884/0.010/9.23e-07	206/411/0.004/9.86e-07	89/448/0.005/2.00e-07	NaN/NaN/NaN/NaN	
genrose/4	149/388/0.008/6.30e-07	291/675/0.006/7.33e-07	246/574/0.006/5.09e-07	329/765/0.008/9.74e-07	169/396/0.004/8.16e-07	114/312/0.003/9.02e-07	NaN/NaN/NaN/NaN	
quartc/8000	41/163/0.285/2.84e-07	37/156/0.282/1.97e-07	39/152/0.277/2.25e-07	46/166/0.300/1.34e-07	73/216/0.392/7.53e-07	58/175/0.311/7.32e-07	58/201/0.380/1.38e-07	
quartc/15300	49/171/0.602/2.60e-07	51/184/0.652/2.18e-07	46/169/0.584/3.70e-07	60/196/0.677/8.83e-07	71/236/0.797/5.79e-07	65/205/0.734/7.70e-07	55/192/0.664/7.14e-07	
quartc/40000	50/192/1.757/5.66e-07	55/183/1.728/4.65e-07	38/158/1.497/3.25e-07	63/213/1.970/6.07e-07	84/269/2.448/2.00e-07	81/248/2.244/9.90e-07	44/169/1.649/9.18e-07	
tridia/7	79/166/0.006/5.80e-07	70/152/0.002/7.87e-07	70/157/0.001/6.75e-07	105/211/0.002/6.81e-07	110/230/0.002/6.38e-07	79/166/0.002/6.15e-07	172/290/0.002/8.17e-07	
woods/2500	271/690/0.015/7.74e-07	401/987/0.021/6.08e-07	434/1073/0.024/6.23e-07	555/1304/0.026/7.84e-07	479/1221/0.024/6.52e-07	183/448/0.009/4.73e-07	NaN/NaN/NaN/NaN	
woods/25000	496/1149/0.235/8.46e-07	402/999/0.230/6.89e-07	321/793/0.172/7.46e-07	438/1090/0.241/1.39e-07	83/1102/0.219/9.17e-07	311/741/0.142/9.19e-07	NaN/NaN/NaN/NaN	
woods/250000	274/699/1.536/7.76e-07	455/1167/2.509/9.55e-07	298/736/1.594/9.11e-07	476/1168/2.533/9.36e-07	667/1611/3.455/9.17e-07	386/920/1.886/3.83e-07	NaN/NaN/NaN/NaN	
bdexp/10000	2/17/0.012/2.68e-61	2/17/0.010/2.68e-61	2/17/0.010/2.68e-61	2/17/0.015/2.68e-61	2/17/0.011/1.25e-63	2/17/0.010/7.79e-63	2/17/0.011/4.62e-61	
bdexp/100000	2/12/0.097/4.58e-106	2/12/0.090/4.58e-106	2/12/0.089/4.58e-106	2/12/0.087/4.58e-106	2/12/0.085/4.45e-106	2/12/0.087/4.59e-106	2/12/0.087/4.59e-106	
bdexp/500000	2/12/0.466/1.55e-120	2/12/0.458/1.55e-120	2/12/0.489/1.55e-120	2/12/0.494/1.55e-120	2/12/0.465/1.54e-120	2/12/0.469/1.55e-120	2/12/0.469/1.55e-120	
exdenschnf/22000	28/99/0.047/8.17e-07	27/106/0.032/7.27e-07	23/97/0.028/7.27e-07	33/112/0.022/2.48e-07	30/107/0.030/8.57e-07	25/105/0.034/5.82e-07	21/102/0.029/1.52e-07	
exdenschnf/1019000	30/116/1.178/9.50e-07	34/121/1.168/8.24e-07	29/114/1.162/7.41e-07	28/126/1.199/5.64e-07	36/123/1.220/7.93e-07	28/135/1.330/5.05e-07	29/126/1.184/4.34e-08	
exdenschnf/2250000	27/115/2.660/7.45e-07	26/112/2.587/7.26e-07	41/125/2.931/7.95e-07	27/115/2.455/6.39e-07	37/122/2.707/3.47e-07	27/123/2.620/3.49e-07	33/118/2.665/6.95e-07	
exdenschnb/10000	15/80/0.020/8.30e-07	15/80/0.005/8.30e-07	15/80/0.005/8.30e-07					