DE parameters: population size (10, 100, 1,000, 10,000)

S parameters: procedural iterations (10, 20, 30, 40, 50, 100, 150, 200), alpha cut (0.0 to 1.0)

|  |  |  |
| --- | --- | --- |
| jDES Parameter Configuration | | |
| Algorithm | **Parameter** | **Value** |
| jDE |  | 10 \* |
|  | 0.1 |
|  | 1.0 |
|  | 1.0 |
|  | 1.0 |
| S | α | 0.2 |
| Procedural iterations | 100 |

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| Dimensionality 10D (30 executions per experiment) | | | | | | |
| Problem  Type | **Problem Function** | **jDES** | **S** | **W** | **DE** | **W** |
| Unimodal | |  | 1.156e+03 ± 8.476e+02 | 1.553e+08 ± 6.232e+08 | + | 2.593e+02 ± 8.106e+01 | - |
|  | 2.000e+02 ± 2.434e-02 | 2.614e+09 ± 1.013e+10 | + | 2.000e+02 ± 3.490e-05 | - |
|  | 3.000e+02 ± 4.458e-05 | 1.347e+04 ± 1.773e+04 | + | 3.000e+02 ± 8.395e-09 | - |
| Simple Multimodal |  | 4.078e+02 ± 1.357e+01 | 4.206e+02 ± 1.630e+01 | + | 4.099e+02 ± 1.510e+01 | + |
|  | 5.181e+02 ± 5.840e+00 | 5.200e+02 ± 4.228e-04 | + | 5.203e+02 ± 9.786e-02 | + |
|  | 6.001e+02 ± 2.279e-01 | 6.053e+02 ± 2.152e+00 | + | 6.000e+02 ± 2.186e-02 | - |
|  | 7.001e+02 ± 5.767e-02 | 7.052e+02 ± 2.765e+01 | + | 7.004e+02 ± 8.405e-02 | + |
|  | 8.000e+02 ± 2.090e-05 | 8.042e+02 ± 1.393e+00 | + | 8.193e+02 ± 2.869e+00 | + |
|  | 9.101e+02 ± 4.029e+00 | 9.528e+02 ± 5.233e+01 | + | 9.292e+02 ± 3.960e+00 | + |
|  | 1.013e+03 ± 9.620e+00 | 1.236e+03 ± 1.087e+02 | + | 1.900e+03 ± 1.288e+02 | + |
|  | 1.577e+03 ± 2.199e+02 | 2.079e+03 ± 3.480e+02 | + | 2.448e+03 ± 1.361e+02 | + |
|  | 1.200e+03 ± 1.546e-01 | 1.201e+03 ± 3.078e-01 | + | 1.201e+03 ± 1.802e-01 | + |
|  | 1.300e+03 ± 4.569e-02 | 1.300e+03 ± 1.870e-01 | + | 1.300e+03 ± 3.055e-02 | + |
|  | 1.400e+03 ± 4.714e-02 | 1.404e+03 ± 1.526e+01 | + | 1.400e+03 ± 4.094e-02 | + |
|  | 1.501e+03 ± 4.778e-01 | 7.888e+05 ± 2.414e+06 | + | 1.502e+03 ± 3.146e-01 | + |
|  | 1.602e+03 ± 4.299e-01 | 1.604e+03 ± 3.488e-01 | + | 1.603e+03 ± 1.466e-01 | + |
| Hybrid 1 |  | 1.770e+03 ± 4.001e+01 | 2.414e+06 ± 9.160e+06 | + | 1.801e+03 ± 2.600e+01 | + |
|  | 1.803e+03 ± 1.262e+00 | 1.647e+04 ± 1.083e+04 | + | 1.805e+03 ± 1.345e+00 | + |
|  | 1.901e+03 ± 3.055e-01 | 1.903e+03 ± 1.325e+00 | + | 1.901e+03 ± 2.465e-01 | + |
|  | 2.001e+03 ± 5.201e-01 | 7.060e+07 ± 1.671e+08 | + | 2.001e+03 ± 4.649e-01 | + |
|  | 2.108e+03 ± 5.958e+00 | 2.451e+04 ± 1.842e+04 | + | 2.105e+03 ± 3.829e+00 | - |
|  | 2.208e+03 ± 5.559e+00 | 3.394e+04 ± 1.436e+05 | + | 2.204e+03 ± 4.013e+00 | - |
| Composition |  | 2.629e+03 ± 7.050e-12 | 2.618e+03 ± 5.910e+01 | = | 2.629e+03 ± 9.095e-13 | - |
|  | 2.517e+03 ± 4.860e+00 | 2.570e+03 ± 3.578e+01 | + | 2.536e+03 ± 3.336e+00 | + |
|  | 2.635e+03 ± 9.440e+00 | 2.700e+03 ± 1.764e+01 | + | 2.662e+03 ± 2.338e+01 | + |
|  | 2.700e+03 ± 4.304e-02 | 2.756e+03 ± 7.814e+01 | + | 2.700e+03 ± 3.850e-02 | + |
|  | 2.713e+03 ± 5.355e+01 | 3.195e+03 ± 5.708e+02 | + | 2.723e+03 ± 7.407e+01 | + |
|  | 3.158e+03 ± 3.012e+00 | 3.437e+03 ± 4.461e+02 | + | 3.173e+03 ± 4.052e+01 | + |
|  | 3.124e+03 ± 1.150e+01 | 4.182e+05 ± 7.546e+05 | + | 3.072e+03 ± 2.912e+01 | - |
|  | 3.545e+03 ± 2.904e+01 | 4.510e+03 ± 3.576e+02 | + | 3.583e+03 ± 3.174e+01 | + |

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| Dimensionality 50D (30 executions per experiment) | | | | | | |
| Problem  Type | **Problem Function** | **jDES** | **S** | **W** | **DE** | **W** |
| Unimodal | |  | 4.854e+07 ± 2.448e+07 | 4.543e+05 ± 1.108e+05 | - | 8.278e+08 ± 1.183e+08 | + |
|  | 5.021e+05 ± 1.155e+06 | 1.170e+10 ± 6.300e+10 | + | 1.194e+10 ± 1.367e+09 | + |
|  | 1.856e+04 ± 1.019e+04 | 4.373e+04 ± 1.525e+04 | + | 1.066e+05 ± 8.127e+03 | + |
| Simple Multimodal |  | 5.677e+02 ± 4.580e+01 | 4.132e+02 ± 2.577e+01 | - | 3.602e+03 ± 2.937e+02 | + |
|  | 5.200e+02 ± 1.746e-02 | 5.200e+02 ± 8.505e-03 | - | 5.212e+02 ± 3.849e-02 | + |
|  | 6.358e+02 ± 5.014e+00 | 6.347e+02 ± 4.184e+00 | = | 6.699e+02 ± 1.184e+00 | + |
|  | 7.002e+02 ± 2.823e-01 | 7.000e+02 ± 7.929e-03 | - | 8.129e+02 ± 1.468e+01 | + |
|  | 8.201e+02 ± 6.621e+00 | 8.212e+02 ± 3.496e+00 | = | 1.279e+03 ± 1.374e+01 | + |
|  | 1.136e+03 ± 5.498e+01 | 1.152e+03 ± 6.882e+01 | = | 1.408e+03 ± 2.076e+01 | + |
|  | 2.049e+03 ± 3.718e+02 | 2.145e+03 ± 3.120e+02 | = | 1.343e+04 ± 4.204e+02 | + |
|  | 6.892e+03 ± 8.988e+02 | 6.893e+03 ± 8.377e+02 | = | 1.473e+04 ± 3.670e+02 | + |
|  | 1.200e+03 ± 1.403e-01 | 1.200e+03 ± 7.623e-02 | = | 1.204e+03 ± 2.190e-01 | + |
|  | 1.300e+03 ± 6.645e-02 | 1.301e+03 ± 1.203e-01 | + | 1.301e+03 ± 2.200e-01 | + |
|  | 1.400e+03 ± 2.005e-01 | 1.401e+03 ± 3.406e-01 | + | 1.426e+03 ± 3.726e+00 | + |
|  | 1.530e+03 ± 9.014e+00 | 1.520e+03 ± 7.526e+00 | - | 6.683e+04 ± 2.579e+04 | + |
|  | 1.620e+03 ± 6.624e-01 | 1.621e+03 ± 7.679e-01 | + | 1.623e+03 ± 1.890e-01 | + |
| Hybrid 1 |  | 5.176e+06 ± 3.368e+06 | 1.133e+05 ± 6.058e+04 | - | 2.045e+07 ± 3.430e+06 | + |
|  | 2.546e+04 ± 2.869e+04 | 4.499e+03 ± 1.129e+03 | - | 3.432e+05 ± 1.068e+05 | + |
|  | 1.925e+03 ± 1.058e+01 | 1.915e+03 ± 2.705e+00 | - | 1.939e+03 ± 1.905e+00 | + |
|  | 1.313e+04 ± 4.212e+03 | 2.562e+08 ± 6.129e+08 | + | 3.932e+04 ± 7.048e+03 | + |
|  | 1.057e+06 ± 4.055e+05 | 2.220e+05 ± 1.257e+05 | - | 2.893e+06 ± 7.348e+05 | + |
|  | 3.128e+03 ± 2.817e+02 | 3.648e+03 ± 3.237e+02 | + | 3.890e+03 ± 1.682e+02 | + |
| Composition |  | 2.641e+03 ± 2.158e-01 | 2.641e+03 ± 1.076e-06 | - | 2.662e+03 ± 2.195e+00 | + |
|  | 2.667e+03 ± 4.447e+00 | 2.677e+03 ± 3.938e+00 | + | 2.734e+03 ± 3.436e+00 | + |
|  | 2.725e+03 ± 5.602e+00 | 2.716e+03 ± 6.239e+00 | - | 2.812e+03 ± 8.236e+00 | + |
|  | 2.700e+03 ± 7.391e-02 | 2.782e+03 ± 1.227e+02 | + | 2.707e+03 ± 5.415e-01 | + |
|  | 3.938e+03 ± 1.178e+02 | 3.922e+03 ± 1.210e+02 | = | 4.745e+03 ± 3.459e+01 | + |
|  | 4.875e+03 ± 5.202e+02 | 5.306e+03 ± 7.488e+02 | + | 1.063e+04 ± 4.048e+02 | + |
|  | 1.279e+05 ± 1.101e+05 | 3.585e+08 ± 1.338e+09 | + | 2.868e+07 ± 6.845e+06 | + |
|  | 2.999e+04 ± 1.107e+04 | 1.739e+04 ± 3.308e+03 | - | 3.260e+05 ± 5.866e+04 | + |

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| Dimensionality 100D (30 executions per experiment) | | | | | | |
| Problem  Type | **Problem Function** | **jDES** | **S** | **W** | **DE** | **W** |
| Unimodal | |  | 2.244e+08 ± 8.593e+07 | 1.330e+06 ± 3.824e+05 | - | 5.228e+09 ± 5.272e+08 | + |
|  | 4.912e+07 ± 4.826e+07 | 2.192e+04 ± 2.130e+04 | - | 2.028e+11 ± 1.356e+10 | + |
|  | 5.404e+04 ± 1.866e+04 | 5.255e+04 ± 1.858e+04 | = | 4.461e+05 ± 2.299e+04 | + |
| Simple Multimodal |  | 8.089e+02 ± 1.138e+02 | 1.569e+04 ± 8.187e+04 | + | 4.419e+04 ± 3.882e+03 | + |
|  | 5.201e+02 ± 4.254e-02 | 5.200e+02 ± 1.208e-03 | - | 5.213e+02 ± 2.439e-02 | + |
|  | 6.795e+02 ± 7.490e+00 | 6.777e+02 ± 5.135e+00 | = | 7.575e+02 ± 1.782e+00 | + |
|  | 7.011e+02 ± 4.603e-01 | 7.000e+02 ± 6.662e-03 | - | 2.566e+03 ± 1.027e+02 | + |
|  | 8.415e+02 ± 1.196e+01 | 8.417e+02 ± 5.220e+00 | = | 2.139e+03 ± 3.521e+01 | + |
|  | 1.459e+03 ± 9.019e+01 | 1.485e+03 ± 8.019e+01 | = | 2.394e+03 ± 4.569e+01 | + |
|  | 3.647e+03 ± 5.075e+02 | 3.733e+03 ± 5.077e+02 | = | 3.020e+04 ± 4.426e+02 | + |
|  | 1.401e+04 ± 1.443e+03 | 1.436e+04 ± 1.245e+03 | = | 3.186e+04 ± 3.468e+02 | + |
|  | 1.200e+03 ± 7.846e-02 | 1.200e+03 ± 9.972e-02 | - | 1.204e+03 ± 2.611e-01 | + |
|  | 1.301e+03 ± 7.641e-02 | 1.301e+03 ± 7.641e-02 | + | 1.307e+03 ± 2.691e-01 | + |
|  | 1.400e+03 ± 2.471e-01 | 1.400e+03 ± 1.649e-01 | = | 1.933e+03 ± 3.309e+01 | + |
|  | 1.635e+03 ± 6.527e+01 | 1.546e+03 ± 1.243e+01 | - | 1.752e+07 ± 2.871e+06 | + |
|  | 1.643e+03 ± 9.489e-01 | 1.643e+03 ± 1.023e+00 | = | 1.647e+03 ± 2.343e-01 | + |
| Hybrid 1 |  | 4.907e+07 ± 2.674e+07 | 2.435e+05 ± 8.385e+04 | - | 4.609e+08 ± 7.390e+07 | + |
|  | 1.044e+05 ± 8.730e+04 | 4.473e+03 ± 2.175e+03 | - | 7.062e+07 ± 1.248e+07 | + |
|  | 2.039e+03 ± 2.323e+01 | 2.654e+03 ± 3.603e+03 | + | 2.484e+03 ± 3.567e+01 | + |
|  | 1.812e+05 ± 6.113e+04 | 1.431e+05 ± 5.149e+04 | - | 8.336e+05 ± 1.736e+05 | + |
|  | 2.365e+07 ± 1.102e+07 | 2.100e+05 ± 1.005e+05 | - | 1.434e+08 ± 3.129e+07 | + |
|  | 5.132e+03 ± 5.905e+02 | 5.121e+03 ± 6.360e+02 | = | 6.902e+03 ± 2.238e+02 | + |
| Composition |  | 2.645e+03 ± 4.979e+00 | 3.399e+03 ± 4.087e+03 | + | 2.930e+03 ± 2.015e+01 | + |
|  | 2.784e+03 ± 1.158e+01 | 2.783e+03 ± 4.894e+00 | = | 3.325e+03 ± 3.056e+01 | + |
|  | 2.781e+03 ± 1.049e+01 | 2.751e+03 ± 1.356e+01 | - | 3.308e+03 ± 3.999e+01 | + |
|  | 2.734e+03 ± 5.146e+01 | 2.788e+03 ± 3.229e+01 | + | 3.238e+03 ± 3.880e+01 | + |
|  | 5.112e+03 ± 1.569e+02 | 4.976e+03 ± 1.870e+02 | - | 7.156e+03 ± 5.305e+01 | + |
|  | 8.726e+03 ± 1.153e+03 | 8.031e+03 ± 1.135e+03 | - | 2.503e+04 ± 9.988e+02 | + |
|  | 2.318e+05 ± 1.242e+05 | 6.705e+03 ± 4.108e+02 | - | 1.090e+09 ± 1.373e+08 | + |
|  | 1.637e+05 ± 1.071e+05 | 1.862e+04 ± 2.406e+03 | - | 7.226e+06 ± 1.293e+06 | + |