

# BHT-1500

## Hall Effect Thruster

Pioneering center-mounted cathode.  
Compact and efficient.

### Efficient and high-performance propulsion system designed for use with xenon and krypton propellants.

Busek's BHT-1500 is a 2kW-class Hall Effect thruster with an innovative center-mounted cathode. The center-mounted cathode precludes performance degradation and outperforms all other competitive designs by minimizing beam divergence.

Using novel design features like a two-piece "composite" anode and shortened dielectric channel, the BHT-1500 stands apart from other SPT designs.

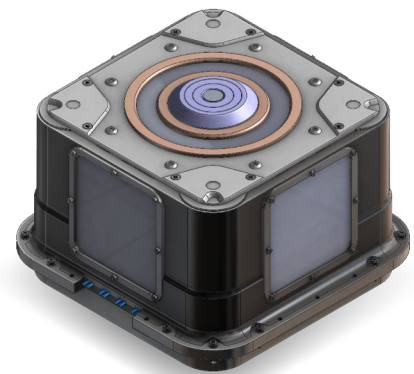


Table: Standard Specifications

|                                  |                        |                                 |            |
|----------------------------------|------------------------|---------------------------------|------------|
| <b>Discharge Power:</b>          | 1500 W                 | <b>Thruster Mass:</b>           | 6.3 kg     |
| <b>Throttle Range:</b>           | 1000 W - 2700 W        | <b>Cathode Mass:</b>            | 0.3 kg     |
| <b>Nominal Thrust:</b>           | 101 mN                 | <b>Demonstrated Impulse:</b>    | Pending    |
| <b>Nominal Specific Impulse:</b> | 1710 seconds           | <b>Predicted Total Impulse:</b> | > 6.5 MN-s |
| <b>Propellants:</b>              | Xenon, Krypton, Iodine |                                 |            |

Operation with the internally mounted cathode confers a number of advantages, including improved performance, reduced sensitivity of performance to cathode flow rate, and more efficient cathode-plume coupling. In addition, the thruster is less sensitive to vacuum facility background pressure and exhibits less plume divergence.

## Thruster

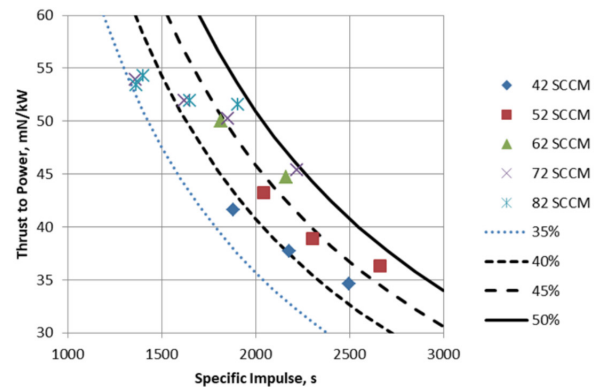
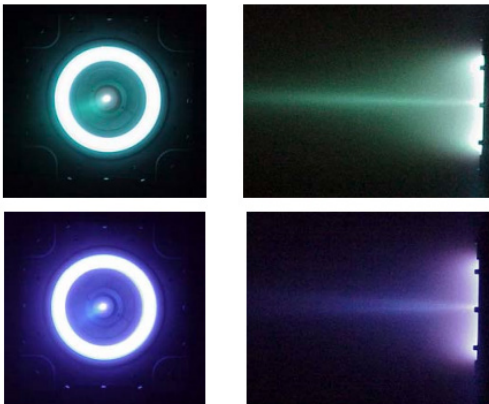
### Thruster Performance Details

The life of the thruster extends well beyond the typical needs of GEO satellites and Busek’s design minimizes erosion via the use of a virtual magnetic field wall. The BHT-1500 thruster system operates in two modes; orbit-raising mode producing over 120 milliNewtons (mN) of thrust with 1,700 seconds total specific impulse ( $I_{sp}$ ) at 1,800 Watts (W) of power, and station-keeping mode producing more than 100 mN thrust and 1,900 seconds  $I_{sp}$ .

| Power | High Thrust Mode |                    | High $I_{sp}$ Mode |                    |
|-------|------------------|--------------------|--------------------|--------------------|
|       | Thrust (mN)      | Total $I_{sp}$ (s) | Thrust (mN)        | Total $I_{sp}$ (s) |
| 1,000 | 68               | 1615               | 58                 | 1860               |
| 1,500 | 101              | 1710               | 87                 | 1895               |
| 1,800 | 120              | 1740               | 103                | 1940               |
| 2,000 | 134              | 1700               | 118                | 1915               |
| 2,400 | 158              | 1735               | 143                | 2045               |
| 2,700 | 179              | 1865               | 154                | 2035               |

### Krypton Performance

Thruster testing was performed at Busek’s T8 facility to determine performance and the operating efficiency with krypton propellant. The use of krypton increased specific impulse by approximately 140-190 s at equivalent power and voltage, but decrease total efficiency by 7% to 8%.



BHT-1500-C operating on xenon (top) and krypton (bottom)

Curves of thrust to power ratio vs. specific impulse including experimental krypton data.

A full writeup of the most recent BHT-1500 characterization tests are available at the following papers:

Szabo, J., Tedrake, R., Kolencik, G., Pote, B., "Measurements of a Krypton Fed 1.5 kW Hall Effect Thruster with a Centrally Located Cathode", 35th International Electric Propulsion Conference, Atlanta, Georgia, October 2017.

[http://electricrocket.org/IEPC/IEPC\\_2017\\_26.pdf](http://electricrocket.org/IEPC/IEPC_2017_26.pdf)

Diamant, K., Curtiss, T., Spektor, R., Beiting, E., Hruby, V., Pote, B., Kolencik, J., and Paintal, S., "Performance and Plume Characterization of the BHT-1500 Hall Thruster," Joint Conference of 30th International Symposium on Space Technology and Science 34th International Electric Propulsion Conference and 6th Nano-satellite Symposium, Hyogo-Kobe, Japan, July 4-10, 2015.

[http://electricrocket.org/IEPC/IEPC-2015-69\\_ISTS-2015-b-69.pdf](http://electricrocket.org/IEPC/IEPC-2015-69_ISTS-2015-b-69.pdf)