

## GYRE Stellar Model (GSM) Format

GSM-format files store data describing a stellar model in an HDF5-format file. The attributes of the root group contain global stellar parameters, while 1-D datasets contained within the root group specify the structure data on a grid of  $n$  points extending from center to surface. These attributes and datasets are defined as follows:

| Variable              | Object name | (A)ttribute /<br>(D)ataset | Object datatype | Definition   |
|-----------------------|-------------|----------------------------|-----------------|--|
| $R_*$                 | R_star      | A                          | H5T_IEEE_F64LE  | Stellar radius (cm)  |
| $M_*$                 | M_star      | A                          | H5T_IEEE_F64LE  | Stellar mass (g)   |
| $L_*$                 | L_star      | A                          | H5T_IEEE_F64LE  | Stellar luminosity ( $\text{erg s}^{-1}$ )                               |
| $n$                   | n           | A                          | H5T_STD_I64LE   | Number of grid points  |
| $r$                   | r           | D                          | H5T_IEEE_F64LE  | Radius (cm)  |
| $w$                   | w           | D                          | H5T_IEEE_F64LE  | $M_r/(M_* - M_r)$  |
| $p$                   | p           | D                          | H5T_IEEE_F64LE  | Total pressure ( $\text{dyn cm}^{-2}$ )                                  |
| $T$                   | T           | D                          | H5T_IEEE_F64LE  | Temperature (K)  |
| $\rho$                | rho         | D                          | H5T_IEEE_F64LE  | Density ( $\text{g cm}^{-3}$ )   |
| $\nabla$              | nabla       | D                          | H5T_IEEE_F64LE  | $d \ln p / d \ln T$  |
| $N^2$                 | N2          | D                          | H5T_IEEE_F64LE  | Brunt-Väisälä frequency squared ( $\text{s}^{-2}$ )                      |
| $\Gamma_1$            | Gamma_1     | D                          | H5T_IEEE_F64LE  | $(\partial \ln p / \partial \ln \rho)_{\text{ad}}$                       |
| $\delta$              | delta       | D                          | H5T_IEEE_F64LE  | $-(\partial \ln \rho / \partial \ln T)_p$                                |
| $c_p$                 | c_p         | D                          | H5T_IEEE_F64LE  | Specific heat at constant pressure ( $\text{erg K}^{-1} \text{g}^{-1}$ ) |
| $\epsilon$            | epsilon     | D                          | H5T_IEEE_F64LE  | energy generation rate ( $\text{erg s}^{-1} \text{g}^{-1}$ )             |
| $\epsilon_T$          | epsilon_T   | D                          | H5T_IEEE_F64LE  | $(\partial \ln \epsilon / \partial \ln T)_\rho$                          |
| $\epsilon_\rho$       | epsilon_rho | D                          | H5T_IEEE_F64LE  | $(\partial \ln \epsilon / \partial \ln \rho)_T$                          |
| $\kappa$              | kappa       | D                          | H5T_IEEE_F64LE  | opacity ( $\text{cm}^2 \text{g}^{-1}$ )                                  |
| $\kappa_T$            | kappa_T     | D                          | H5T_IEEE_F64LE  | $(\partial \ln \kappa / \partial \ln T)_\rho$                            |
| $\kappa_\rho$         | kappa_rho   | D                          | H5T_IEEE_F64LE  | $(\partial \ln \kappa / \partial \ln \rho)_T$                            |
| $\Omega_{\text{rot}}$ | Omega_rot   | D                          | H5T_IEEE_F64LE  | Rotation angular velocity ( $\text{rad s}^{-1}$ )                        |