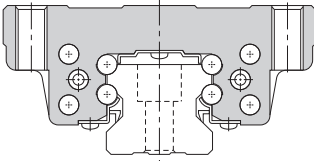
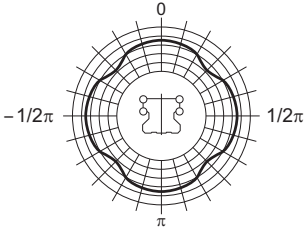
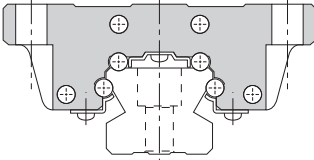
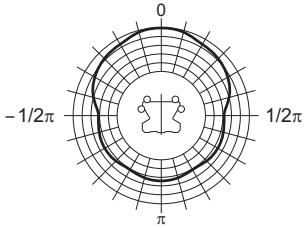


# Calculating the Equivalent Load

## Load Rating of an LM Guide in Each Direction

The LM Guide is categorized into roughly two types: the 4-way equal load type, which has the same load rating in the radial, reverse-radial, and lateral directions; and the radial type, which has a large rated load in the radial direction. With the radial type LM Guide, the load rating in the radial direction is different from that in the reverse-radial and lateral directions. The basic load rating in the radial direction is indicated in the dimensional table. The values in the reverse-radial and lateral directions are obtained from Table 7 on **A1-61**.



### Load Ratings in Each Direction

| Type  | Load distribution curve   |
|---|---|
| <p data-bbox="210 520 426 544"><b>4-way equal load type</b></p>  |  |
| <p data-bbox="264 772 372 796"><b>Radial type</b></p>            |  |

## Selection Criteria

## Calculating the Equivalent Load

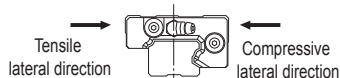
Table 7: Load Rating in Each Direction

| Classification   | Model No.   |                         | Reverse-radial direction<br> |                                | Lateral directions<br> |                                      |
|------------------|-------------|-------------------------|---|--------------------------------|---|--------------------------------------|
|                  | Type        | Size                    | Dynamic load rating<br>$C_L$  | Static load rating<br>$C_{0L}$ | Dynamic load rating<br>$C_T$  | Static load rating<br>$C_{0T}$       |
| 4-way equal load | SHS         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | SHW         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | SRS         | 12,15,25                | C   | $C_0$                          | C   | $C_0$                                |
|                  | SCR         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | EPF         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | HSR         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | NRS         | 75,85,100               | C   | $C_0$                          | C   | $C_0$                                |
|                  | HRW         | 17,21,27,35,50,60       | C   | $C_0$                          | C   | $C_0$                                |
|                  | RSX         | 12,15                   | C   | $C_0$                          | C   | $C_0$                                |
|                  | RSR         | 2,3                     | C   | $C_0$                          | C   | $C_0$                                |
|                  | CSR         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | MX          |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | JR          |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | HCR         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | HMG         |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | HSR-M1      |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | RSX-M1      | 12,15                   | C   | $C_0$                          | C   | $C_0$                                |
|                  | RSR-M1      | 9                       | C   | $C_0$                          | C   | $C_0$                                |
|                  | HSR-M2      |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | HSR-M1VV    |                         | C   | $C_0$                          | C   | $C_0$                                |
| SRG              |             | C                       | $C_0$   | C                              | $C_0$   |                                      |
| SRN              | 35,45,55,65 | C                       | $C_0$   | C                              | $C_0$   |                                      |
| SRW              |             | C                       | $C_0$   | C                              | $C_0$   |                                      |
| HRX              |             | C                       | $C_0$   | C                              | $C_0$   |                                      |
| Radial           | SSR         |                         | 0.50C   | 0.50 $C_0$                     | 0.53C   | 0.43 $C_0$                           |
|                  | SVR         |                         | 0.64C   | 0.64 $C_0$                     | 0.47C   | 0.38 $C_0$                           |
|                  | SR          | 15,20,25,30,35,45,55,70 | 0.62C   | 0.50 $C_0$                     | 0.56C   | 0.43 $C_0$                           |
|                  | SR          | 85,100,120,150          | 0.78C   | 0.71 $C_0$                     | 0.48C   | 0.35 $C_0$                           |
|                  | NR-X        |                         | 0.64C   | 0.64 $C_0$                     | 0.47C   | 0.38 $C_0$                           |
|                  | NR          | 75,85,100               | 0.78C   | 0.71 $C_0$                     | 0.48C   | 0.45 $C_0$                           |
|                  | HRW         | 12,14                   | 0.78C   | 0.71 $C_0$                     | 0.48C   | 0.35 $C_0$                           |
|                  | NSR         |                         | 0.62C   | 0.50 $C_0$                     | 0.56C   | 0.43 $C_0$                           |
|                  | SR-M1       |                         | 0.62C   | 0.50 $C_0$                     | 0.56C   | 0.43 $C_0$                           |
| Other            | SVS         |                         | 0.84C   | 0.84 $C_0$                     | 0.92C   | 0.85 $C_0$                           |
|                  | NRS-X       |                         | 0.84C   | 0.84 $C_0$                     | 0.92C   | 0.85 $C_0$                           |
|                  | SRS         | 5,7,9,20                | C   | $C_0$                          | 1.19C   | 1.19 $C_0$                           |
|                  | RSX         | 5,7,9                   | C   | $C_0$                          | 1.19C   | 1.19 $C_0$                           |
|                  | RSR         | 14                      | 0.78C   | 0.70 $C_0$                     | 0.78C   | 0.71 $C_0$                           |
|                  | HR          |                         | C   | $C_0$                          | C   | $C_0$                                |
|                  | GSR         |                         | 0.93C   | 0.90 $C_0$                     | (T) 0.84C*<br>(C) 0.93C*  | (T) 0.78 $C_0$ *<br>(C) 0.90 $C_0$ * |
|                  | GSR-R       |                         | 0.93C   | 0.90 $C_0$                     | (T) 0.84C*<br>(C) 0.93C*  | (T) 0.78 $C_0$ *<br>(C) 0.90 $C_0$ * |
|                  | RSX-M1      | 9                       | C   | $C_0$                          | 1.19C   | 1.19 $C_0$                           |
|                  | RSR-M1      | 12,15,20                | 0.78C   | 0.70 $C_0$                     | 0.78C   | 0.71 $C_0$                           |

\*(T): Tensile lateral direction; (C): Compressive lateral direction  
 Note) C and  $C_0$  in the table each represent the basic load rating indicated in the specification table of the respective model.

For types with no size indication in the table, the same factor is applied to all sizes.

Models HR, GSR, and GSR-R cannot be used in single-axis applications.



### Equivalent Load $P_E$

The LM Guide can bear loads and moments in all directions, including a radial load ( $P_R$ ), reverse-radial load ( $P_L$ ), and lateral loads ( $P_T$ ), simultaneously.

When two or more loads (e.g., radial load and lateral load) are simultaneously applied to the LM Guide, the service life and the static safety factor are calculated using equivalent load values obtained by converting all the loads into radial load or reverse-radial load.

### Equivalent Load Equation

When the LM block receives loads simultaneously in the radial and lateral directions, or the reverse-radial and lateral directions, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_{R(L)} + Y \cdot P_T$$

|       |                           |               |
|-------|---------------------------|---------------|
| $P_E$ | : Equivalent load         | (N)           |
|       | ·Radial direction         |               |
|       | ·Reverse-radial direction |               |
| $P_L$ | : Reverse-radial load     | (N)           |
| $P_T$ | : Lateral load            | (N)           |
| X, Y  | : Equivalent factor       | (see Table 8) |

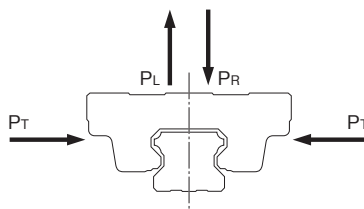




Fig. 7: Equivalent Load of the LM Guide

Table 8: Equivalent Factor in Each Direction

| Classification   | Model No. |                         | If radial and lateral loads are applied simultaneously                            |       | If reverse-radial and lateral loads are applied simultaneously                    |       |
|------------------|-----------|-------------------------|---|-------|---|-------|
|                  |           |                         |  |       |  |       |
|                  |           |                         | Equivalent in radial direction  |       | Equivalent in reverse-radial direction  |       |
| Type             | Size      | X                       | Y   | X     | Y   |       |
| 4-way equal load | SHS       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | SHW       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | SRS       | 12,15,25                | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | SCR       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | EPF       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HSR       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | NRS       | 75,85,100               | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HRW       | 17,21,27,35,50,60       | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | RSX       | 12,15                   | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | RSR       | 2,3                     | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | CSR       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | MX        |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | JR        |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HCR       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HMG       |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HSR-M1    |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | RSX-M1    | 12,15                   | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | RSR-M1    | 9                       | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HSR-M2    |                         | 1.000   | 1.000 | 1.000   | 1.000 |
|                  | HSR-M1VV  |                         | 1.000   | 1.000 | 1.000   | 1.000 |
| SRG              |           | 1.000                   | 1.000   | 1.000 | 1.000   |       |
| SRN              |           | 1.000                   | 1.000   | 1.000 | 1.000   |       |
| SRW              |           | 1.000                   | 1.000   | 1.000 | 1.000   |       |
| HRX              |           | 1.000                   | 1.000   | 1.000 | 1.000   |       |
| Radial           | SSR       |                         | —   | —     | 1.000   | 1.155 |
|                  | SVR       |                         | —   | —     | 1.000   | 1.678 |
|                  | SR        | 15,20,25,30,35,45,55,70 | —   | —     | 1.000   | 1.155 |
|                  | SR        | 85,100,120,150          | —   | —     | 1.000   | 2.000 |
|                  | NR-X      |                         | —   | —     | 1.000   | 1.678 |
|                  | NR        | 75,85,100               | —   | —     | 1.000   | 2.000 |
|                  | HRW       | 12,14                   | —   | —     | 1.000   | 2.000 |
|                  | NSR       |                         | —   | —     | 1.000   | 1.155 |
| SR-M1            |           | —                       | —   | 1.000 | 1.155   |       |
| Other            | SVS       |                         | 1.000   | 0.935 | 1.000   | 1.020 |
|                  | NRS-X     |                         | 1.000   | 0.935 | 1.000   | 1.020 |
|                  | SRS       | 5,7,9,20                | 1.000   | 0.839 | 1.000   | 0.839 |
|                  | RSX       | 5,7,9                   | 1.000   | 0.839 | 1.000   | 0.839 |
|                  | RSR       | 14                      | 1.000   | 0.830 | 1.000   | 0.990 |
|                  | HR        |                         | 1.000   | 0.500 | 1.000   | 0.500 |
|                  | GSR       |                         | 1.000   | 1.280 | 1.000   | 1.000 |
|                  | GSR-R     |                         | 1.000   | 1.280 | 1.000   | 1.280 |
|                  | RSX-M1    | 9                       | 1.000   | 0.839 | 1.000   | 0.839 |
| RSR-M1           | 12,15,20  | 1.000                   | 0.830   | 1.000 | 0.990   |       |

Note) If the radial type LM Guide receives radial and lateral loads simultaneously, study the static safety factor and the rated load in the radial-load and lateral-load directions.

For types with no size indication in the table, the same factor is applied to all sizes.

Models HR, GSR, and GSR-R cannot be used in single-axis applications.