

# Ersatzgrößen der Längsbewegung

|                    | A1      | A2      | A3      | B1      | B2      | B3      | C1      | C2      | C3      | D1      | D2      | D3       | F1      | F2        | F3       |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|-----------|----------|
| $X_u$              | 0.0055  | 0.0015  | -0.0050 | -0.0283 | -0.0050 | -0.0087 | 0.0192  | 0.0045  | -0.0042 | -0.0049 | -0.0161 | -0.0162  | -0.0616 | -0.0711   | -0.0155  |
| $X_\alpha$         | 9.4411  | 10.1950 | 3.5092  | 8.8006  | 8.4637  | 0.4960  | -0.3627 | 3.4353  | 5.7566  | 8.1008  | 13.1954 | 10.6155  | 4.8837  | 11.0221   | 6.7344   |
| $X_{\dot{\alpha}}$ | 0.0804  | 0.0606  | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | 0.0119  | 0.0157  | 0.0016   | -0.0000 | -0.0000   | -0.0000  |
| $X_q$              | 0.2572  | 0.1928  | -0.0000 | -0.0000 | -0.0000 | -0.0000 | 0.6757  | 0.4876  | 0.3359  | 0.0342  | 0.0744  | 0.0077   | -0.0000 | -0.0000   | -0.0000  |
| $X_\Theta$         | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066 | -9.8066  | -9.8066 | -9.8066   | -9.8066  |
| $X_\eta$           | -0.0209 | 0.0358  | -0.1956 | 0.2828  | 0.3715  | 0.1928  | -2.2852 | -1.9203 | -0.2452 | 0.0706  | 0.2987  | 0.0432   | 0.3151  | 2.2084    | 2.2073   |
| $X_f$              | 3.4769  | 3.4769  | 3.4769  | 3.2080  | 3.2080  | 3.2080  | 4.5067  | 4.5067  | 4.5067  | 2.6048  | 2.6048  | 2.6048   | 9.5483  | 9.5483    | 9.5483   |
| $X_\kappa$         | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000  | -0.0000 | -0.0000   | -0.0000  |
| $Z_u$              | -0.0033 | -0.0011 | -0.0003 | -0.0031 | -0.0010 | -0.0003 | -0.0028 | -0.0004 | -0.0000 | -0.0070 | -0.0019 | -0.0009  | -0.0022 | -0.0001   | -0.0000  |
| $Z_\alpha$         | -0.5282 | -0.5712 | -0.6802 | -0.5144 | -0.7102 | -0.6126 | -0.4953 | -0.4693 | -0.2427 | -0.8219 | -1.4077 | -1.8531  | -0.4909 | -2.8466   | -0.4559  |
| $Z_{\dot{\alpha}}$ | -0.0007 | -0.0003 | -0.0001 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0003 | -0.0001 | -0.0001  | -0.0000 | -0.0000   | -0.0000  |
| $Z_q$              | -0.0244 | -0.0210 | -0.0104 | -0.0000 | -0.0000 | -0.0000 | -0.0254 | -0.0175 | -0.0073 | -0.0203 | -0.0203 | -0.0191  | -0.0000 | -0.0000   | -0.0000  |
| $Z_\Theta$         | -0.0108 | -0.0052 | -0.0000 | -0.0021 | -0.0016 | 0.0011  | -0.0302 | -0.0038 | -0.0014 | 0.0038  | -0.0084 | -0.0002  | 0.0014  | -0.0005   | -0.0009  |
| $Z_\eta$           | -0.0393 | -0.0474 | -0.0211 | -0.0298 | -0.0396 | -0.0251 | -0.1119 | -0.1433 | -0.0187 | -0.0419 | -0.0815 | -0.1073  | -0.0897 | -0.3383   | -0.0715  |
| $Z_f$              | -0.0017 | -0.0010 | -0.0005 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | 0.0013  | 0.0007  | 0.0005   | -0.0000 | -0.0000   | -0.0000  |
| $Z_\kappa$         | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000  | -0.0000 | -0.0000   | -0.0000  |
| $M_u$              | -0.0005 | -0.0003 | -0.0002 | -0.0023 | 0.0018  | 0.0008  | -0.0002 | 0.0000  | -0.0000 | 0.0030  | 0.0066  | 0.0106   | 0.0000  | 0.0067    | -0.0010  |
| $M_\alpha$         | -0.6718 | -0.9568 | -2.5335 | -0.6645 | -1.3863 | -2.4414 | -0.0987 | -0.6342 | -1.6905 | -1.4635 | -5.0481 | -10.0722 | -2.0002 | -102.7739 | -22.8276 |
| $M_{\dot{\alpha}}$ | -0.2494 | -0.3375 | -0.5068 | -0.2349 | -0.3232 | -0.2864 | 0.0000  | 0.0000  | 0.0000  | -0.2870 | -0.3395 | -0.4372  | -0.0831 | -0.7552   | -0.1970  |
| $M_q$              | -0.9009 | -1.2074 | -1.5451 | -0.8984 | -1.2160 | -0.9940 | -0.1846 | -0.3492 | -0.1406 | -1.1505 | -2.0177 | -2.6481  | -0.3846 | -2.6655   | -0.5207  |
| $M_\eta$           | -0.9427 | -1.9739 | -1.8070 | -0.7544 | -1.6203 | -1.8903 | -0.5194 | -3.1026 | -1.1249 | -1.6654 | -6.2898 | -11.5849 | -4.5629 | -59.9515  | -22.8276 |
| $M_f$              | 0.1138  | 0.1138  | 0.1138  | -0.0700 | -0.0700 | -0.0700 | 0.0261  | 0.0261  | 0.0261  | -0.0952 | -0.0952 | -0.0952  | 0.0000  | 0.0000    | 0.0000   |
| $M_\kappa$         | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000  | 0.0000    | 0.0000   |
| $M_{W_x}$          | -0.4021 | -0.5323 | -0.5314 | -0.4285 | -0.5697 | -0.4212 | -0.1846 | -0.3492 | -0.1406 | -0.5766 | -1.3387 | -1.7738  | -0.2183 | -1.1551   | -0.1267  |

# Ersatzgrößen der Seitenbewegung

|                   | A1      | A2      | A3      | B1      | B2      | B3      | C1      | C2      | C3      | D1      | D2      | D3       | F1       | F2        | F3        |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|-----------|-----------|
| $Y_\beta$         | -0.0970 | -0.1236 | -0.1252 | -0.0747 | -0.1163 | -0.1002 | -0.0439 | -0.0566 | -0.0519 | -0.1481 | -0.2836 | -0.3674  | -0.1543  | -0.7330   | -0.1786   |
| $Y_{\dot{\beta}}$ | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000    | 0.0000    |
| $Y_p$             | 0.0179  | 0.0037  | -0.0008 | -0.0081 | -0.0066 | -0.0030 | 0.0009  | 0.0004  | 0.0001  | 0.0035  | 0.0036  | 0.0024   | 0.0000   | 0.0000    | 0.0000    |
| $Y_r$             | 0.0170  | 0.0134  | 0.0063  | 0.0148  | 0.0128  | 0.0062  | 0.0064  | 0.0026  | 0.0009  | 0.0136  | 0.0133  | 0.0128   | 0.0000   | 0.0000    | 0.0000    |
| $Y_\xi$           | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0169  | 0.0215  | 0.0035  | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000    | 0.0000    |
| $Y_\zeta$         | 0.0225  | 0.0275  | 0.0192  | 0.0320  | 0.0450  | 0.0324  | 0.0164  | 0.0275  | 0.0055  | 0.0495  | 0.0887  | 0.1196   | 0.0274   | 0.0620    | 0.0089    |
| $L_\beta$         | -1.3807 | -2.7559 | -6.4291 | -1.9035 | -2.6774 | -3.1744 | 2.9947  | -0.8162 | -6.0558 | -1.4881 | -6.6017 | -12.5629 | -36.1293 | -697.3325 | -114.2144 |
| $L_{\dot{\beta}}$ | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000    | 0.0000    |
| $L_p$             | -0.7735 | -0.9562 | -1.0140 | -1.1433 | -1.4546 | -1.2549 | -0.1303 | -0.1390 | -0.0930 | -1.4277 | -2.8322 | -3.8393  | -5.2863  | -28.0101  | -6.9576   |
| $L_r$             | 0.7747  | 0.4495  | 0.3348  | 3.4791  | 1.7773  | 0.9058  | 0.0520  | 0.0219  | 0.0160  | 0.4215  | 0.8519  | 0.8965   | 4.1951   | 26.8280   | 2.1609    |
| $L_\xi$           | -0.2586 | -0.5257 | -0.5187 | -0.4532 | -1.0854 | -1.5116 | -1.0746 | -5.0391 | -2.1381 | -2.0418 | -7.6954 | -14.1408 | -9.2852  | -164.2965 | -32.6517  |
| $L_\zeta$         | 0.0730  | 0.2729  | 0.4796  | 0.1450  | 0.3308  | 0.4397  | 0.1779  | 0.9617  | 0.4387  | 0.4367  | 1.6312  | 3.7123   | 8.9545   | 103.6580  | 13.4072   |
| $N_\beta$         | 0.3684  | 0.8923  | 2.4005  | 0.4128  | 0.7507  | 1.2517  | 0.0923  | 0.3832  | 0.5323  | 1.4719  | 3.3531  | 6.7190   | 5.4549   | 77.2704   | 15.5474   |
| $N_{\dot{\beta}}$ | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000    | 0.0000    |
| $N_p$             | -0.2200 | -0.1440 | -0.1099 | -0.2164 | -0.1423 | -0.0958 | -0.0022 | -0.0028 | -0.0020 | -0.1874 | -0.3728 | -0.4037  | -0.3903  | -1.3790   | -0.4166   |
| $N_r$             | -0.2308 | -0.2643 | -0.2589 | -0.1659 | -0.2329 | -0.2044 | -0.0203 | -0.0278 | -0.0217 | -0.3349 | -0.6348 | -0.8539  | -0.6245  | -4.3547   | -0.7840   |
| $N_\xi$           | -0.0245 | -0.0530 | -0.1003 | 0.0000  | 0.0000  | 0.0000  | -0.0516 | -0.2933 | -0.1396 | -0.1431 | -0.4085 | -0.8674  | -0.4754  | -12.8446  | -1.7311   |
| $N_\zeta$         | -0.3551 | -0.7514 | -1.0615 | -0.3831 | -0.8737 | -1.1614 | -0.0928 | -0.4587 | -0.2145 | -1.1502 | -4.1151 | -7.7038  | -1.8631  | -18.6219  | -4.5699   |