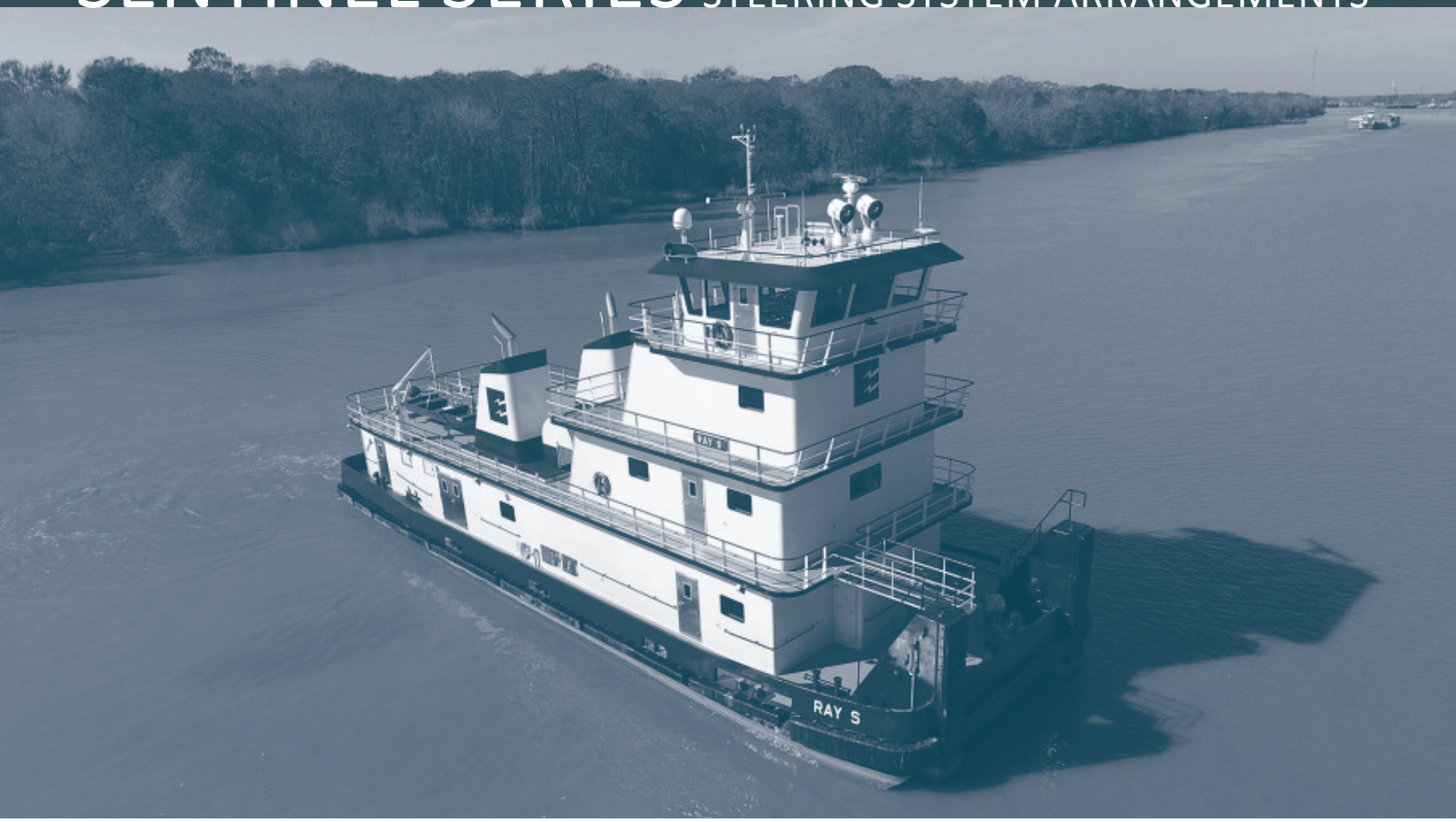
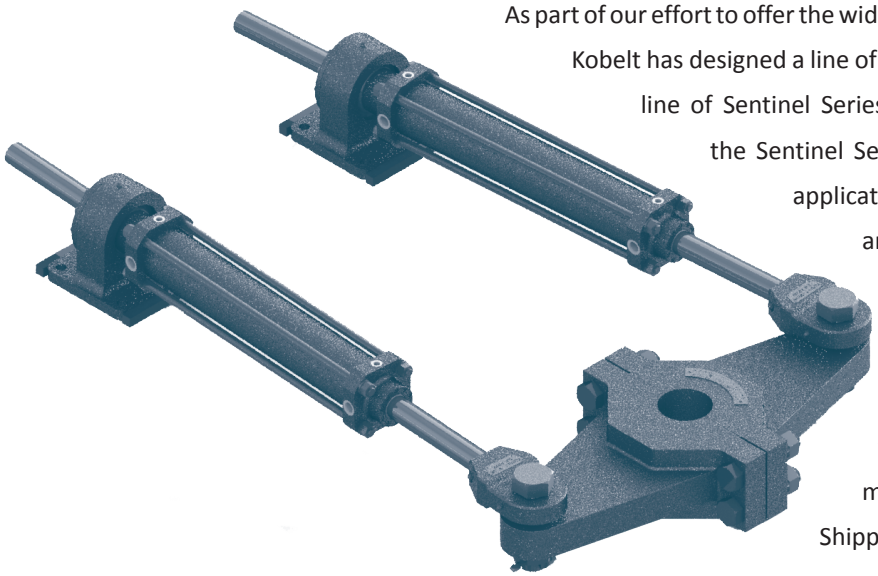
# SENTINEL SERIES STEERING SYSTEM ARRANGEMENTS




## *Durable, Dependable*



As part of our effort to offer the widest range of integrated steering packages in the industry, Kobelt has designed a line of tiller models to be used in conjunction with our newest line of Sentinel Series steering cylinders. In keeping with Kobelt pedigree, the Sentinel Series tillers and cylinders are built for the toughest of applications. Having both balanced and unbalanced cylinder arrangements allows us the flexibility to meet the design requirements for a variety of steering arrangements on vessels of all shapes and sizes.

All Sentinel Series cylinders and tillers are designed to meet IMO requirements and are Type Approved by major Class Societies, such as the American Bureau of Shipping, Bureau Veritas and Lloyd's Register.

ABS BUREAU VERITAS Lloyd's Register

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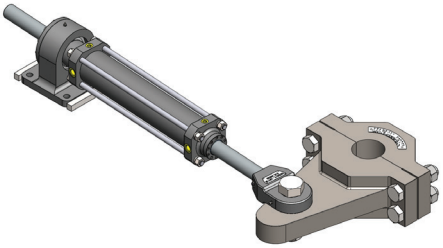
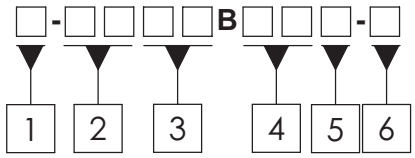
KOBELT

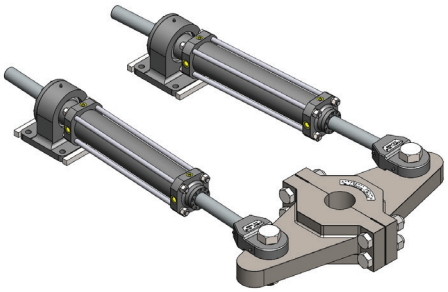
# BALANCED CYLINDERS: SPECIFICATIONS

## Balanced Cylinder Steering Gear Model Code:





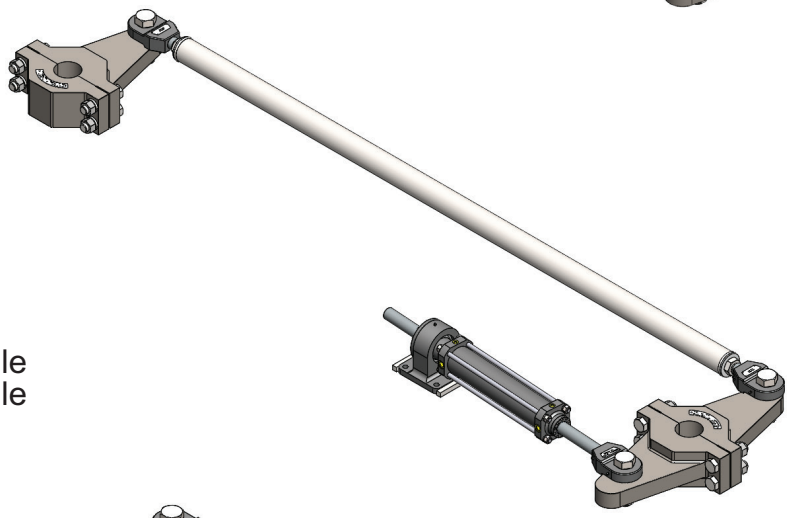

1 Number of Cylinder(s)



2 Cylinder Model
- **25** 2.5" bore diameter
- **35** 3.5" bore diameter

3 Cylinder Stroke

25
- **10** 10.0" Stroke
- **12** 12.0" Stroke
- **14** 14.0" Stroke

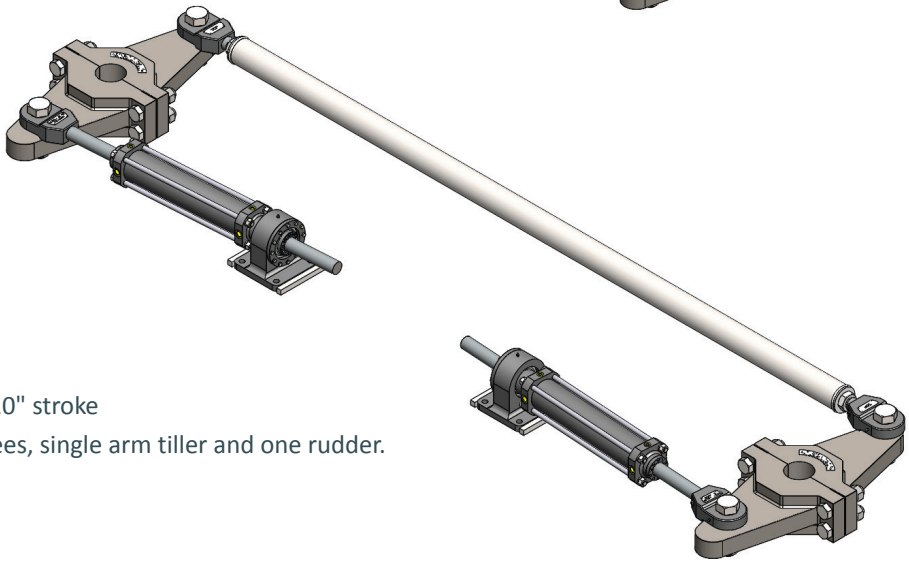


35
- **12** 12.0" Stroke
- **15** 15.0" Stroke
- **18** 18.0" Stroke

4 Maximum Angle

- **37** 35 degree Working Angle
- **47** 45 degree Working Angle

5 Tiller Model
- **S** Single Arm Tiller
- **T** Twin Arm Tiller



6 Number of Rudder(s)

example:

1-2510B37S-1

one balanced cylinder with 2.5" bore and 10" stroke

with maximum hard over angle of 37 degrees, single arm tiller and one rudder.

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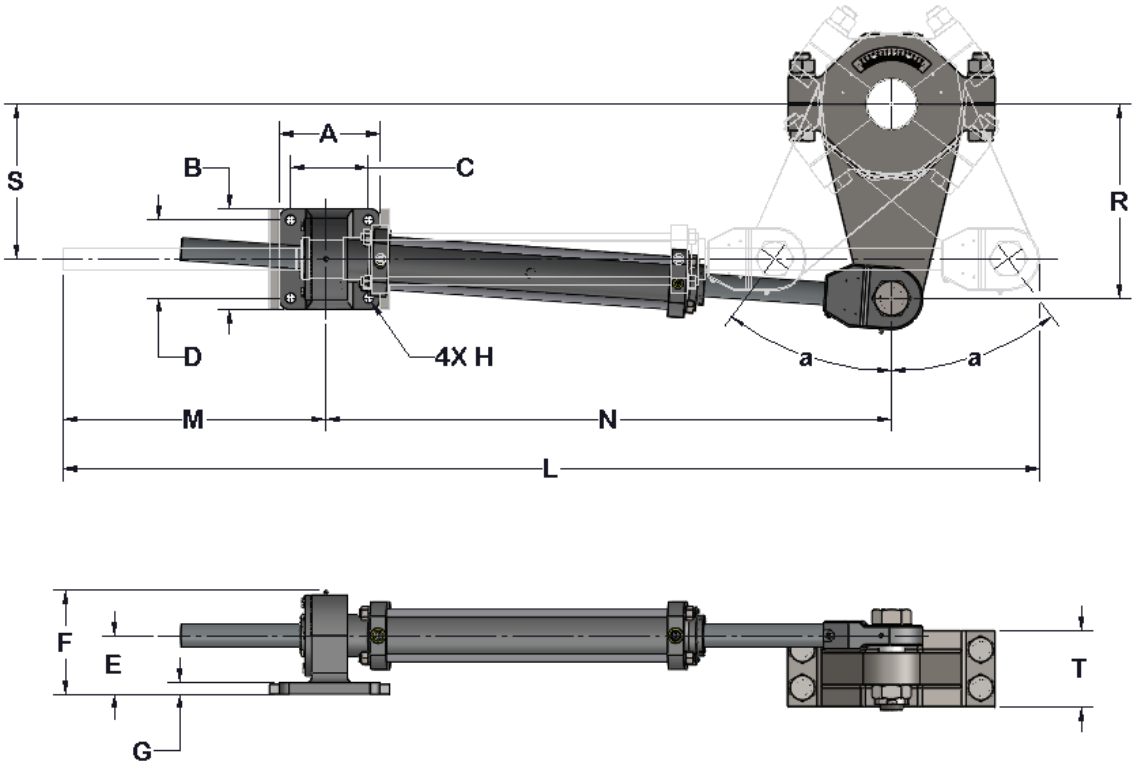
## Generic Steering Gear Arrangement




| All Dimensions in Inches (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MODEL | A | B | C | D | E | F | G | H |
| 2510B | 5.75 (146.0) | 6.38 (162.0) | 4.50 (114.3) | 5.00 (127.0) | 3.75 (95.3) | 6.60 (167.6) | 0.75 (19.1) | 0.66 (16.7) |
| 2512B | | | | | | | | |
| 2514B | | | | | | | | |
| 3512B | 7.75 (196.9) | 7.75 (196.9) | 6.00 (152.4) | 6.00 (152.4) | 4.50 (114.3) | 7.98 (202.7) | 0.88 (22.2) | 0.78 (19.8) |
| 3515B | | | | | | | | |
| 3518B | | | | | | | | |

# BALANCED CYLINDERS: SPECIFICATIONS

| All Dimensions in Inches (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL | a | L | M | N | R | S | T |
| 2510B | 37° | 46.99 (1193.5) | 11.73 (297.9) | 28.15 (715.0) | 8.308 (211.02) | 6.635 (168.53) | 3.88 (98.4) |
| 2512B | 37° | 53.48 (1358.4) | 13.73 (348.7) | 31.15 (791.2) | 9.970 (253.24) | 7.962 (202.23) | 4.38 (111.1) |
| 2514B | 37° | 58.63 (1489.1) | 15.73 (399.5) | 34.15 (867.4) | 11.631 (295.43) | 9.289 (235.94) | 4.38 (111.1) |
| 2514B | 47° | 58.63 (1489.1) | 15.73 (399.5) | 34.15 (867.4) | 9.571 (243.10) | 6.528 (165.81) | 3.88 (98.4) |
| 3512B | 37° | 58.31 (1481.1) | 14.30 (363.2) | 34.60 (878.8) | 9.970 (253.24) | 7.962 (202.23) | 5.25 (133.4) |
| 3515B | 37° | 67.69 (1719.3) | 17.30 (439.4) | 39.10 (993.1) | 12.462 (316.53) | 9.953 (252.81) | 5.88 (149.2) |
| 3518B | 37° | 75.31 (1912.9) | 20.30 (515.6) | 43.60 (1107.4) | 14.955 (379.86) | 11.943 (303.35) | 5.88 (149.2) |
| 3518B | 47° | 75.31 (1912.9) | 20.30 (515.6) | 43.60 (1107.4) | 12.306 (312.57) | 8.393 (213.18) | 5.25 (133.4) |

| System Specification for Balanced Cylinder | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MODEL | a | QTY | DISPLACEMENT | | TORQUE* @ 1600 psi | | RUDDER STOCK | |
| | | | $In^3$ | $cm^3$ | lb.ft | T.m. | In(mm) Min | In(mm) Max |
| 2510B | 37° | 1 | 35.1 | 575 | 3,340 | 0.46 | 2.75 (69.9) | 4.00 (101.6) |
| | | 2 | 70.2 | 1150 | 6,680 | 0.92 | | |
| 2512B | 37° | 1 | 42.1 | 690 | 4,010 | 0.55 | 3.00 (76.2) | 4.50 (114.3) |
| | | 2 | 84.2 | 1380 | 8,020 | 1.11 | | |
| 2514B | 37° | 1 | 49.1 | 805 | 4,675 | 0.64 | 3.00 (76.2) | 4.50 (114.3) |
| | | 2 | 98.2 | 1610 | 9,350 | 1.29 | | |
| 2514B | 47° | 1 | 49.8 | 817 | 3,320 | 0.46 | 2.75 (69.9) | 4.00 (101.6) |
| | | 2 | 99.7 | 1633 | 6,645 | 0.92 | | |
| 3512B | 37° | 1 | 82.5 | 1352 | 7,850 | 1.08 | 3.50 (88.9) | 5.25 (133.4) |
| | | 2 | 165.1 | 2705 | 15,700 | 2.17 | | |
| 3515B | 37° | 1 | 103.2 | 1690 | 9,820 | 1.36 | 4.00 (101.6) | 6.00 (152.4) |
| | | 2 | 206.3 | 3381 | 19,640 | 2.71 | | |
| 3518B | 37° | 1 | 123.8 | 2028 | 11,790 | 1.63 | 4.00 (101.6) | 6.00 (152.4) |
| | | 2 | 247.6 | 4057 | 23,580 | 3.26 | | |
| 3518B | 47° | 1 | 125.6 | 2058 | 8,375 | 1.16 | 3.50 (88.9) | 5.25 (133.4) |
| | | 2 | 251.2 | 4116 | 16,750 | 2.31 | | |

* Torque value shown for steering angle of 35 degrees and 45 degrees. Dimensions are given for classification required hard stops.

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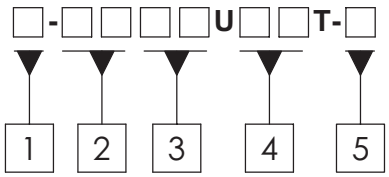
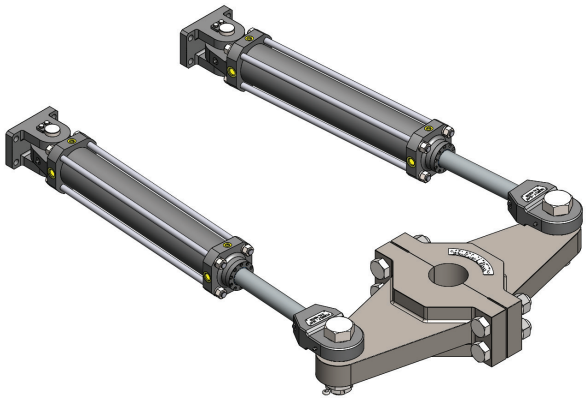
# BALANCED CYLINDERS: SPECIFICATIONS

| Standard Available System and Drawing Number | |
|---|---|
| **SYSTEM MODEL** | **DRAWING NUMBER** |
| 1-2510B37S-1 | 7502-0001 |
| 1-2514B47S-1 | 7502-0002 |
| 1-2512B37S-1 | 7502-0003 |
| 1-2514B37S-1 | 7502-0004 |
| 2-2510B37T-1 | 7502-0005 |
| 2-2514B47T-1 | 7502-0006 |
| 2-2512B37T-1 | 7502-0007 |
| 2-2514B37T-1 | 7502-0008 |
| 2-2510B37T-2 | 7502-0013 |
| 2-2514B47T-2 | 7502-0014 |
| 2-2512B37T-2 | 7502-0015 |
| 2-2514B37T-2 | 7502-0016 |
| 1-2510B37T-2 | 7502-0049 |
| 1-2514B47T-2 | 7502-0050 |
| 1-2512B37T-2 | 7502-0051 |
| 1-2514B37T-2 | 7502-0052 |
| 1-3512B37S-1 | 7502-0021 |
| 1-3518B47S-1 | 7502-0022 |
| 1-3515B37S-1 | 7502-0023 |
| 1-3518B37S-1 | 7502-0024 |
| 2-3512B37T-1 | 7502-0025 |
| 2-3518B47T-1 | 7502-0026 |
| 2-3515B37T-1 | 7502-0027 |
| 2-3518B37T-1 | 7502-0028 |
| 2-3512B37T-2 | 7502-0033 |
| 2-3518B47T-2 | 7502-0034 |
| 2-3515B37T-2 | 7502-0035 |
| 2-3518B37T-2 | 7502-0036 |
| 1-3512B37T-2 | 7502-0053 |
| 1-3518B47T-2 | 7502-0054 |
| 1-3515B37T-2 | 7502-0055 |
| 1-3518B37T-2 | 7502-0056 |

# UNBALANCED CYLINDERS: SPECIFICATIONS

## Unbalanced Cylinder Steering Gear Model Code:



1 Number of Cylinder(s)

2 Cylinder Model
- **25** 2.5" bore diameter
- **35** 3.5" bore diameter
- **45** 4.5" bore diameter

3 Cylinder Stroke

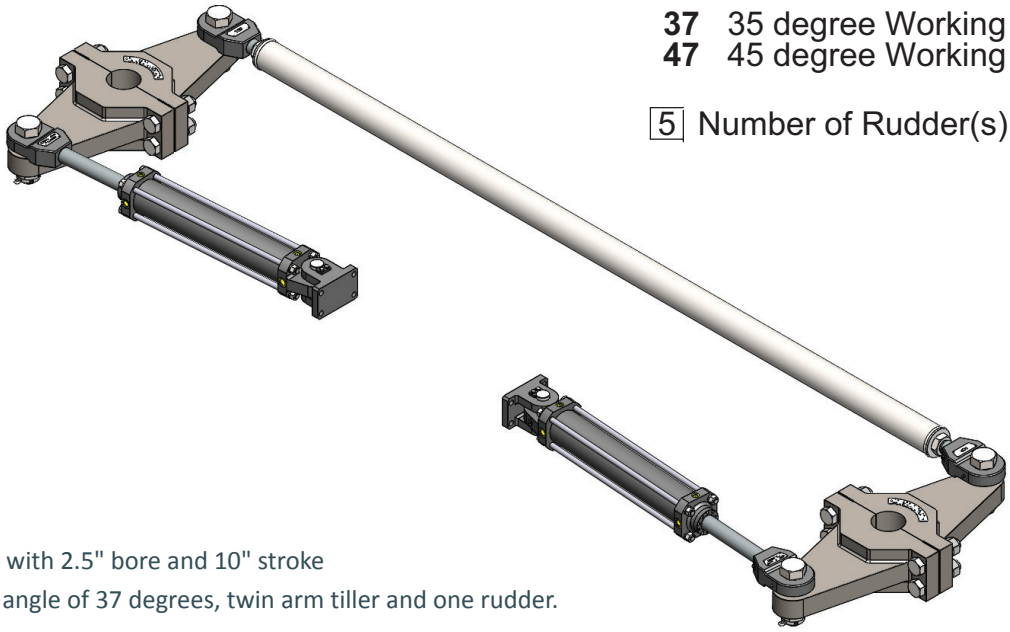
25
- **10** 10.0" Stroke
- **12** 12.0" Stroke
- **14** 14.0" Stroke

35
- **12** 12.0" Stroke
- **15** 15.0" Stroke
- **18** 18.0" Stroke

45
- **16** 16.0" Stroke
- **20** 20.0" Stroke
- **24** 24.0" Stroke

4 Maximum Angle
- **37** 35 degree Working Angle
- **47** 45 degree Working Angle

5 Number of Rudder(s)



example:
2-2510U37T-1
two unbalanced cylinders with 2.5" bore and 10" stroke
with maximum hard over angle of 37 degrees, twin arm tiller and one rudder.

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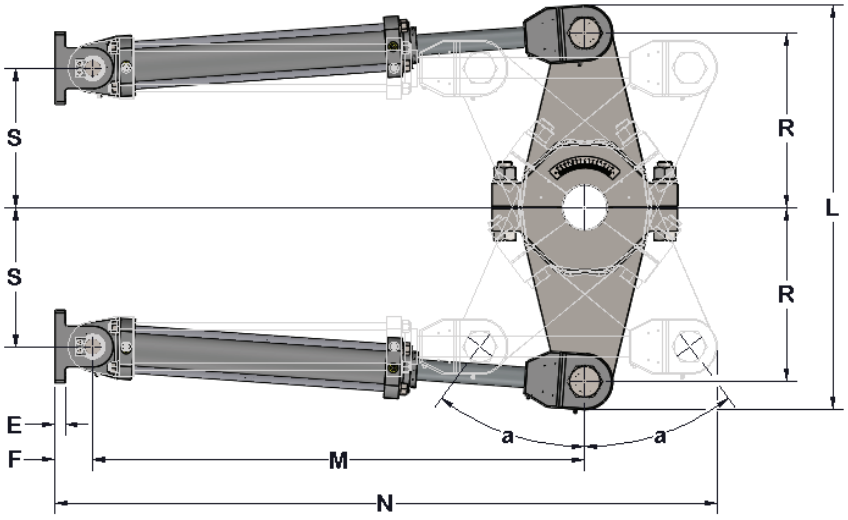
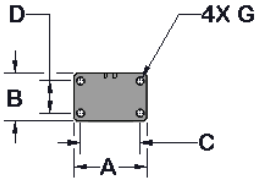
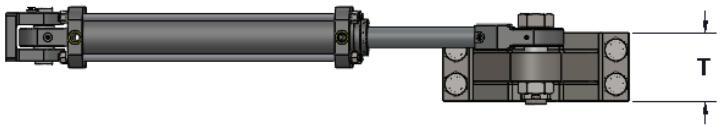
## Generic Steering Gear Arrangement




| All Dimensions in Inches (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL | A | B | C | D | E | F | G |
| 2510 | 4.50 (114.3) | 2.88 (73.0) | 3.56 (90.5) | 1.88 (47.6) | 0.63 (15.9) | 2.25 (57.2) | 0.53 (13.5) |
| 2512 | | | | | | | |
| 2514 | | | | | | | |
| 3512 | 6.25 (158.8) | 4.13 (104.8) | 5.12 (130.0) | 2.75 (69.9) | 0.88 (22.2) | 3.25 (82.6) | 0.66 (16.7) |
| 3515 | | | | | | | |
| 3518 | | | | | | | |
| 4516 | 7.38 (187.3) | 5.19 (131.8) | 6.00 (152.4) | 3.50 (88.9) | 1.00 (25.4) | 3.94 (100.0) | 0.78 (19.8) |
| 4520 | | | | | | | |
| 4524 | | | | | | | |

# UNBALANCED CYLINDERS: SPECIFICATIONS

| All Dimensions in Inches (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL | a | L | M | N | R | S | T |
| 2510 | 37° | 21.90 (556.2) | 27.19 (690.6) | 36.55 (928.4) | 8.308 (211.02) | 6.635 (168.53) | 3.88 (98.4) |
| 2512 | 37° | 26.52 (673.7) | 30.19 (766.8) | 41.04 (1042.4) | 9.970 (253.24) | 7.962 (202.23) | 4.38 (111.1) |
| 2514 | 37° | 26.76 (679.8) | 33.19 (843.0) | 44.19 (1122.4) | 11.631 (295.43) | 9.289 (235.94) | 4.38 (111.1) |
| 2514 | 47° | 22.64 (575.1) | 33.19 (843.0) | 44.19 (1122.4) | 9.571 (243.10) | 6.528 (165.81) | 3.88 (98.4) |
| 3512 | 37° | 28.77 (730.8) | 33.28 (845.3) | 45.93 (1166.7) | 9.970 (253.24) | 7.962 (202.23) | 5.25 (133.4) |
| 3515 | 37° | 34.52 (876.8) | 37.78 (959.6) | 52.31 (1328.8) | 12.462 (316.53) | 9.953 (252.81) | 5.88 (149.2) |
| 3518 | 37° | 34.72 (882.0) | 42.28 (1073.9) | 56.94 (1446.2) | 14.955 (379.86) | 11.943 (303.35) | 5.88 (149.2) |
| 3518 | 47° | 29.43 (747.4) | 42.28 (1073.9) | 56.94 (1446.2) | 12.306 (312.57) | 8.393 (213.18) | 5.25 (133.4) |
| 4516 | 37° | 39.02 (991.1) | 42.38 (1076.3) | 59.25 (1504.9) | 13.293 (337.64) | 10.616 (269.65) | 6.88 (174.6) |
| 4520 | 37° | 46.27 (1175.3) | 48.38 (1228.7) | 67.48 (1714.0) | 16.616 (422.05) | 13.270 (337.06) | 7.88 (200.0) |
| 4524 | 37° | 46.27 (1175.3) | 54.38 (1381.1) | 73.48 (1866.4) | 19.940 (506.48) | 15.925 (404.50) | 7.88 (200.0) |
| 4524 | 47° | 39.02 (991.1) | 54.38 (1381.1) | 73.39 (1864.0) | 16.408 (416.76) | 11.190 (284.23) | 6.88 (174.6) |

| System Specification for Unbalanced Cylinder | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MODEL | a | QTY | DISPLACEMENT | | TORQUE* @ 1600 psi | | RUDDER STOCK | |
| | | | $In^3$ | $cm^3$ | lb.ft | T.m. | In(mm) Min | In(mm) Max |
| 2510 | 37° | 2 | 81.9 | 1342 | 7,800 | 1.08 | 2.75 (69.9) | 4.00 (101.6) |
| 2512 | 37° | 2 | 98.2 | 1610 | 9,350 | 1.29 | 3.00 (76.2) | 4.50 (114.3) |
| 2514 | 37° | 2 | 114.6 | 1878 | 10,920 | 1.51 | 3.00 (76.2) | 4.50 (114.3) |
| 2514 | 47° | 2 | 116.3 | 1905 | 7,750 | 1.07 | 2.75 (69.9) | 4.00 (101.6) |
| 3512 | 37° | 2 | 192.6 | 3155 | 18,335 | 2.53 | 3.50 (88.9) | 5.25 (133.4) |
| 3515 | 37° | 2 | 240.7 | 3944 | 22,950 | 3.17 | 4.00 (101.6) | 6.00 (152.4) |
| 3518 | 37° | 2 | 288.8 | 4733 | 27,500 | 3.80 | 4.00 (101.6) | 6.00 (152.4) |
| 3518 | 47° | 2 | 293.0 | 4802 | 19,535 | 2.70 | 3.50 (88.9) | 5.25 (133.4) |
| 4516 | 37° | 2 | 424.4 | 6955 | 40,435 | 5.59 | 4.75 (120.7) | 7.00 (177.8) |
| 4520 | 37° | 2 | 530.5 | 8694 | 50,515 | 6.98 | 5.25 (133.4) | 7.75 (196.9) |
| 4524 | 37° | 2 | 636.6 | 10433 | 60,615 | 8.38 | 5.25 (133.4) | 7.75 (196.9) |
| 4524 | 47° | 2 | 645.8 | 10583 | 43,060 | 5.95 | 4.75 (120.7) | 7.00 (177.8) |

* Torque value shown for steering angle of 35 degrees and 45 degrees. Dimensions are given for classification required hard stops.

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# UNBALANCED CYLINDERS: SPECIFICATIONS

| Standard Available System and Drawing Number | |
|---|---|
| **SYSTEM MODEL** | **DRAWING NUMBER** |
| 2-2510U37T-1 | 7502-0009 |
| 2-2514U47T-1 | 7502-0010 |
| 2-2512U37T-1 | 7502-0011 |
| 2-2514U37T-1 | 7502-0012 |
| 2-2510U37T-2 | 7502-0017 |
| 2-2514U47T-2 | 7502-0018 |
| 2-2512U37T-2 | 7502-0019 |
| 2-2514U37T-2 | 7502-0020 |
| 2-3512U37T-1 | 7502-0029 |
| 2-3518U47T-1 | 7502-0030 |
| 2-3515U37T-1 | 7502-0031 |
| 2-3518U37T-1 | 7502-0032 |
| 2-3512U37T-2 | 7502-0037 |
| 2-3518U47T-2 | 7502-0038 |
| 2-3515U37T-2 | 7502-0039 |
| 2-3518U37T-2 | 7502-0040 |
| 2-4516U37T-1 | 7502-0041 |
| 2-4524U47T-1 | 7502-0042 |
| 2-4520U37T-1 | 7502-0043 |
| 2-4524U37T-1 | 7502-0044 |
| 2-4516U37T-2 | 7502-0045 |
| 2-4524U47T-2 | 7502-0046 |
| 2-4520U37T-2 | 7502-0047 |
| 2-4524U37T-2 | 7502-0048 |