

Quest

Spherical Roller Thrust Bearings

NACHI

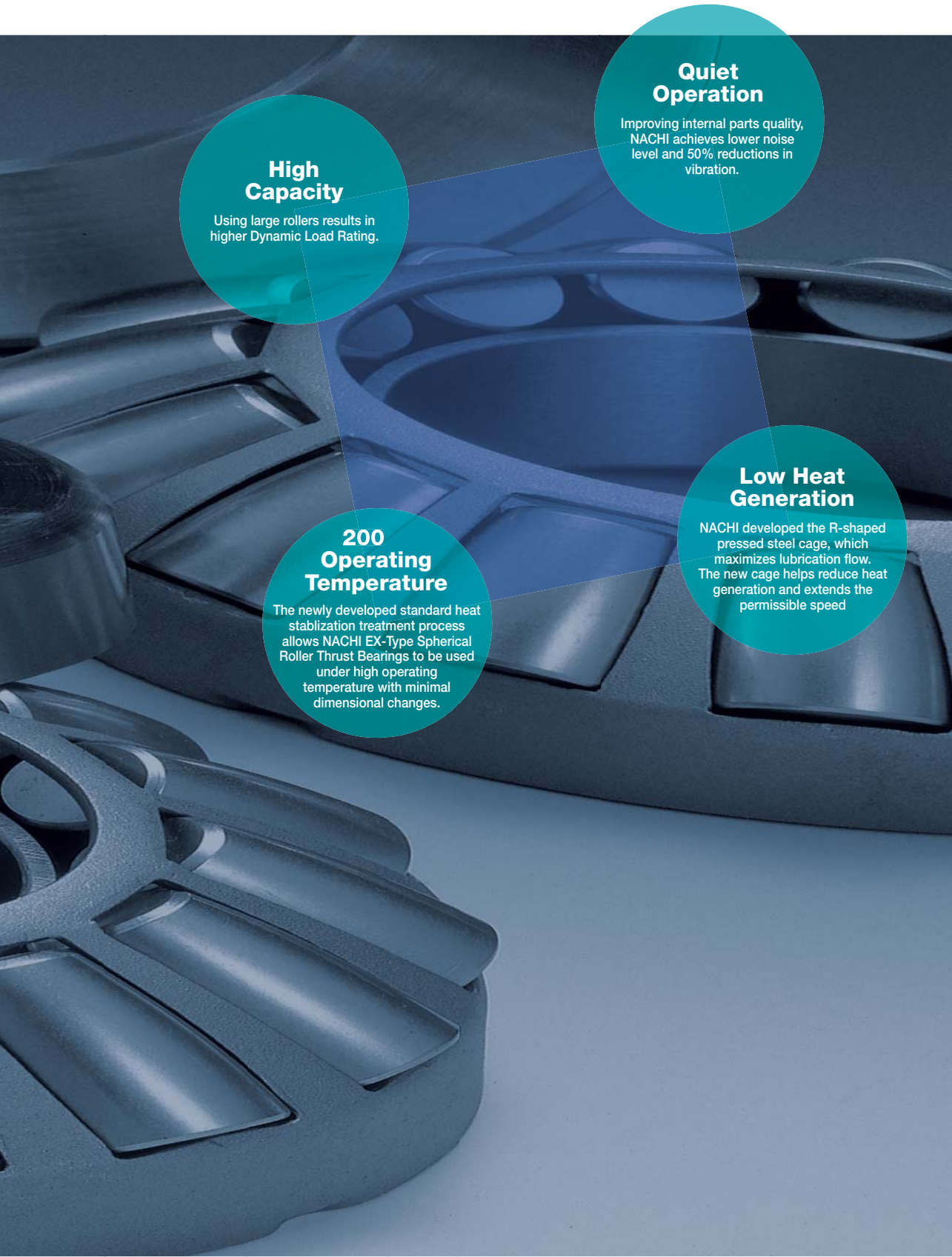
# Spherical Roller Thrust Bearings

EX Type



**High Capacity and Quiet Operation**  
**Spherical Roller Thrust Bearings** **EX Type**





## High Capacity

Using large rollers results in higher Dynamic Load Rating.

## Quiet Operation

Improving internal parts quality, NACHI achieves lower noise level and 50% reductions in vibration.

## 200 Operating Temperature

The newly developed standard heat stabilization treatment process allows NACHI EX-Type Spherical Roller Thrust Bearings to be used under high operating temperature with minimal dimensional changes.

## Low Heat Generation

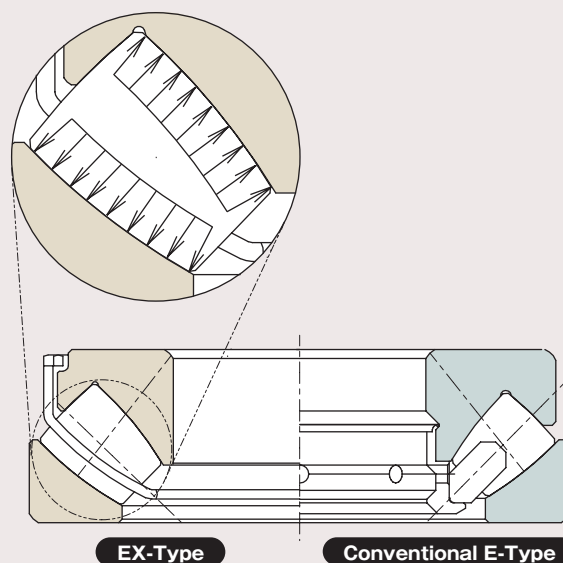
NACHI developed the R-shaped pressed steel cage, which maximizes lubrication flow. The new cage helps reduce heat generation and extends the permissible speed.

# High Capacity and Quiet Operation Spherical Roller Thrust Bearings EX Type



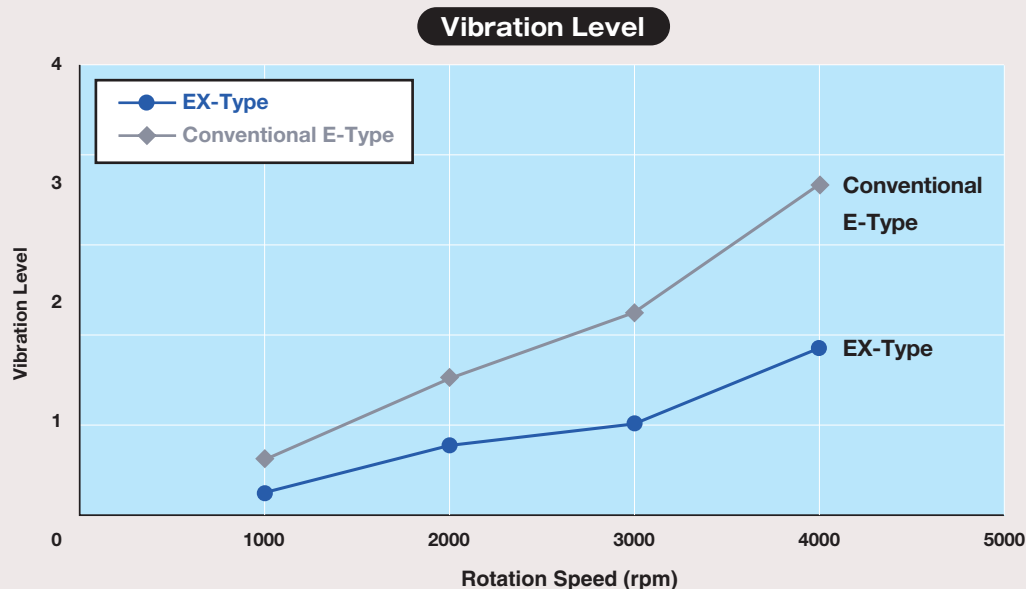
## Greater load carrying capacity

- To obtain maximum capacity of basic dynamic carrying load in the dimensionally restricted section, the diameter, quantity and effective length of roller has been maximized. The stress is distributed equally along the contact areas of outer ring/roller and inner ring /roller due to a optimized internal design.
- Due to the above improvements, bearing life has been increased by 1.5~2.0 times that of NACHI conventional E-Type.



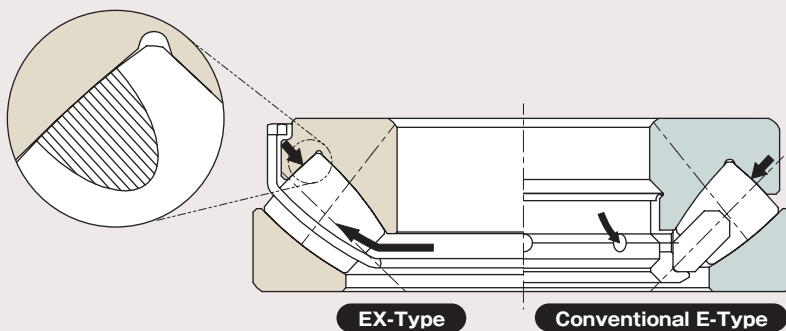
## Achievement of Quiet Operation

- Improving internal parts quality, NACHI achieves lower noise level and 50% reductions in vibration.



## Low heat generation even during the high speed operation

- In order to maximize a lubrication flow, NACHI developed R shape pressed steel cage.
- Most of the heat generated is caused by the sliding motion between inner ring flange and roller end at high speed operation. NACHI analyzes this critical area by using Hertz & Lubrication theory and have optimized the design to reduce heat build up.
- Due to the above improvements, the heat generation of EX-Type bearings can be reduced by over 10% and the permissible speed can be extended by over 10% compared with the conventional design.



## High Speed Rotating Test

- The above test results show that the high speed capability of EX-series bearings have improved.

- Tested Bearings

NACHI EX Design : 29414EX

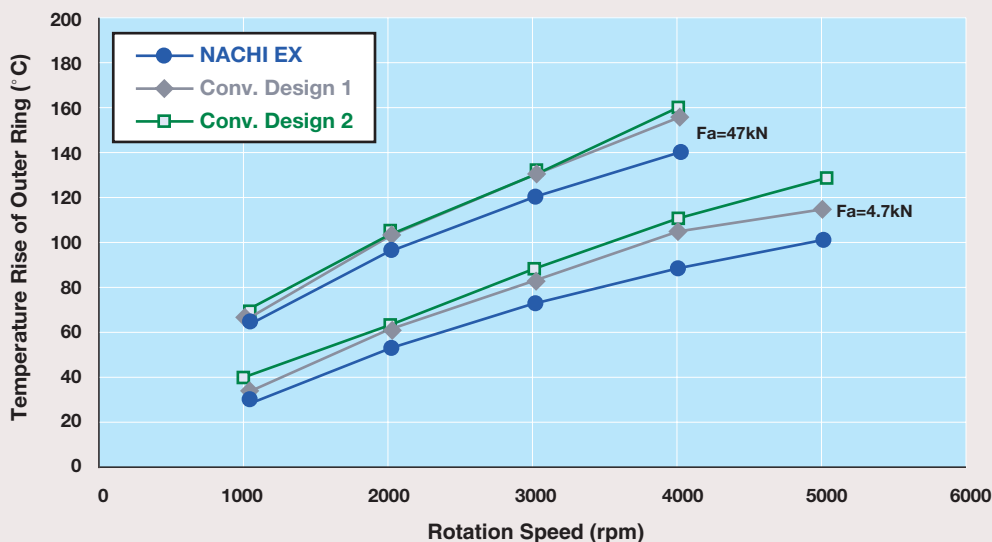
Conventional Design 1 : 29414 with Pressed Steel Cage

Conventional Design 2 : 29414 with Machined Brass Cage

- Test Machine : Vertical shaft & Inner ring rotation

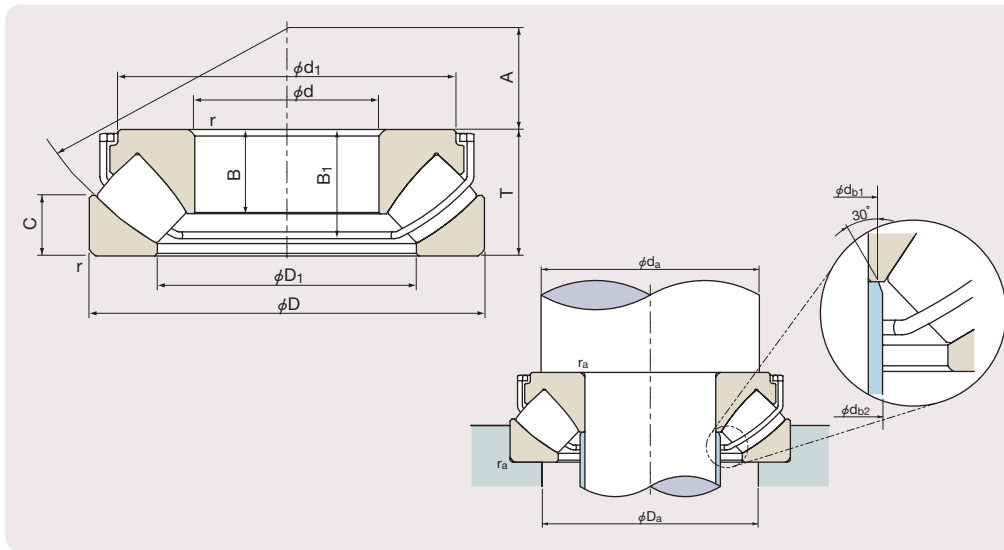
- Lubrication : Oil bath (Turbin oil #68)

Temperature Rise vs Rotation Speed



# High Capacity and Quiet Operation

## Spherical Roller Thrust Bearings EX Type



- Dynamic equivalent axial load  
 $P_a = F_a + 1.2F_r$
- Static equivalent axial load  
 $P_{0a} = F_a + 2.7F_r$   
where,  $F_a$  : Axial load  
 $F_r$  : Radial load
- However  $\frac{F_r}{F_a} \leq 0.55$  must be satisfied
- In case of applied radial load, not exceed 50% of axial load.

### 29300EX Series

1N=0.102kgf

| Bearing No. | Boundary dimensions (mm) |     |    |         | Basic dynamic load rating $C_a$ (N) | Basic static load rating $C_{0a}$ (N) | Limiting speed (rpm) |                 |
|-------------|--------------------------|-----|----|---------|-------------------------------------|---------------------------------------|----------------------|-----------------|
|             | d                        | D   | T  | r (min) |                                     |                                       | Grease lubrication   | Oil lubrication |
| 29317EX     | 85                       | 150 | 39 | 1.5     | 365,000                             | 1,060,000                             | 1,600                | 2,700           |
| 29318EX     | 90                       | 155 | 39 | 1.5     | 355,000                             | 1,070,000                             | 1,600                | 2,700           |
| 29320EX     | 100                      | 170 | 42 | 1.5     | 435,000                             | 1,400,000                             | 1,500                | 2,500           |
| 29322EX     | 110                      | 190 | 48 | 2       | 550,000                             | 1,730,000                             | 1,300                | 2,100           |
| 39324EX     | 120                      | 210 | 54 | 2.1     | 670,000                             | 2,160,000                             | 1,100                | 1,900           |
| 29326EX     | 130                      | 225 | 58 | 2.1     | 770,000                             | 2,440,000                             | 1,000                | 1,800           |
| 29328EX     | 140                      | 240 | 60 | 2.1     | 860,000                             | 2,840,000                             | 950                  | 1,600           |
| 29332EX     | 160                      | 270 | 67 | 3       | 1,040,000                           | 3,500,000                             | 850                  | 1,400           |

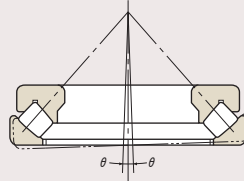
### 29400EX Series

| Bearing No. | Boundary dimensions (mm) |     |    |         | Basic dynamic load rating $C_a$ (N) | Basic static load rating $C_{0a}$ (N) | Limiting speed (rpm) |                 |
|-------------|--------------------------|-----|----|---------|-------------------------------------|---------------------------------------|----------------------|-----------------|
|             | d                        | D   | T  | r (min) |                                     |                                       | Grease lubrication   | Oil lubrication |
| 29412EX     | 60                       | 130 | 42 | 1.5     | 350,000                             | 915,000                               | 1,800                | 2,800           |
| 29413EX     | 65                       | 140 | 45 | 2       | 410,000                             | 1,110,000                             | 1,700                | 2,700           |
| 29414EX     | 70                       | 150 | 48 | 2       | 490,000                             | 1,350,000                             | 1,600                | 2,400           |
| 29415EX     | 75                       | 160 | 51 | 2       | 525,000                             | 1,470,000                             | 1,600                | 2,300           |
| 29416EX     | 80                       | 170 | 54 | 2.1     | 580,000                             | 1,630,000                             | 1,500                | 2,100           |
| 29417EX     | 85                       | 180 | 58 | 2.1     | 640,000                             | 1,810,000                             | 1,300                | 2,000           |
| 29418EX     | 90                       | 190 | 60 | 2.1     | 710,000                             | 2,080,000                             | 1,300                | 1,900           |
| 29420EX     | 100                      | 210 | 67 | 3       | 870,000                             | 2,530,000                             | 1,100                | 1,700           |
| 29422EX     | 110                      | 230 | 73 | 3       | 1,060,000                           | 3,150,000                             | 950                  | 1,500           |
| 29424EX     | 120                      | 250 | 78 | 4       | 1,210,000                           | 3,750,000                             | 900                  | 1,400           |
| 29426EX     | 130                      | 270 | 85 | 4       | 1,400,000                           | 4,300,000                             | 850                  | 1,200           |
| 29428EX     | 140                      | 280 | 85 | 4       | 1,410,000                           | 4,350,000                             | 850                  | 1,200           |
| 29430EX     | 150                      | 300 | 90 | 4       | 1,630,000                           | 5,150,000                             | 800                  | 1,100           |
| 29432EX     | 160                      | 320 | 95 | 5       | 1,820,000                           | 5,750,000                             | 750                  | 1,000           |

Because there are many sliding surfaces in Spherical Roller Thrust Bearings (cage-to-guide-sleeve and roller-ends-to-rib), oil lubricant (not grease) should be used.

● **Aligning angle**

Maximum permissible misalignment angle is about 2° under general service conditions. If the aligning advantages of this bearing type are to be realized, care must be taken to provide clearance for parts in the surrounding structure.



● The safety-factor "So" must be over 4.

● **Minimum axial load**

To prevent damage caused by sliding motion between the rollers and raceway, spherical roller thrust bearings must be subjected to a load more than the minimum load, Fa min.

$$F_{a \min} = \frac{C_{0a}}{1000}$$

|  | Reference dimensions (mm) |                |      |                |    |    | Abutment and fillet dimensions (mm) |                      |                      | Spacer dimensions (mm) |                       | Mass (kg) (Reference) | Bearing No.    |
|--|---------------------------|----------------|------|----------------|----|----|-------------------------------------|----------------------|----------------------|------------------------|-----------------------|-----------------------|----------------|
|  | d <sub>1</sub>            | D <sub>1</sub> | B    | B <sub>1</sub> | C  | A  | d <sub>a</sub> (min)                | D <sub>a</sub> (max) | r <sub>a</sub> (max) | db <sub>1</sub> (max)  | db <sub>2</sub> (max) |                       |                |
|  | 134                       | 110.5          | 25   | 35             | 19 | 50 | 115                                 | 135                  | 1.5                  | 90                     | 90                    | 2.67                  | <b>29317EX</b> |
|  | 135.2                     | 116            | 23.8 | 35.1           | 19 | 52 | 120                                 | 140                  | 1.5                  | 95                     | 95                    | 2.75                  | <b>29318EX</b> |
|  | 146.9                     | 126            | 27   | 38.2           | 21 | 58 | 130                                 | 150                  | 1.5                  | 105                    | 107                   | 3.61                  | <b>29320EX</b> |
|  | 165.1                     | 140.6          | 30.9 | 44             | 23 | 64 | 145                                 | 165                  | 2                    | 116                    | 117                   | 5.22                  | <b>29322EX</b> |
|  | 184.5                     | 155            | 34.5 | 48.7           | 26 | 70 | 160                                 | 180                  | 2                    | 127                    | 128                   | 7.30                  | <b>39324EX</b> |
|  | 197.4                     | 165.8          | 36.8 | 52.7           | 28 | 76 | 170                                 | 195                  | 2                    | 136                    | 138                   | 8.82                  | <b>29326EX</b> |
|  | 218.4                     | 179            | 38.5 | 54.8           | 29 | 82 | 185                                 | 205                  | 2                    | 147.5                  | 149                   | 10.5                  | <b>29328EX</b> |
|  | 243.4                     | 199.8          | 44   | 61.4           | 32 | 92 | 210                                 | 235                  | 2.5                  | 166                    | 174                   | 14.5                  | <b>29332EX</b> |

|  | Reference dimensions (mm) |                |      |                |    |    | Abutment and fillet dimensions (mm) |                      |                      | Spacer dimensions (mm) |                       | Mass (kg) (Reference) | Bearing No.    |
|--|---------------------------|----------------|------|----------------|----|----|-------------------------------------|----------------------|----------------------|------------------------|-----------------------|-----------------------|----------------|
|  | d <sub>1</sub>            | D <sub>1</sub> | B    | B <sub>1</sub> | C  | A  | d <sub>a</sub> (min)                | D <sub>a</sub> (max) | r <sub>a</sub> (max) | db <sub>1</sub> (max)  | db <sub>2</sub> (max) |                       |                |
|  | 113                       | 87             | 27   | 37.1           | 20 | 38 | 91                                  | 108                  | 1.5                  | 66                     | 66                    | 2.50                  | <b>29412EX</b> |
|  | 123                       | 93.5           | 29.5 | 40             | 21 | 42 | 99                                  | 115                  | 2                    | 72                     | 72                    | 3.20                  | <b>29413EX</b> |
|  | 128.3                     | 98.4           | 32   | 42.7           | 23 | 44 | 106                                 | 125                  | 2                    | 75.5                   | 77.5                  | 3.82                  | <b>29414EX</b> |
|  | 140                       | 105.6          | 34.5 | 45.6           | 24 | 47 | 113                                 | 132                  | 2                    | 82.5                   | 82.5                  | 4.70                  | <b>29415EX</b> |
|  | 149                       | 113            | 36   | 48.2           | 26 | 50 | 120                                 | 140                  | 2                    | 88                     | 88                    | 5.60                  | <b>29416EX</b> |
|  | 158.2                     | 120.5          | 37   | 50.6           | 28 | 54 | 130                                 | 150                  | 2                    | 94                     | 94                    | 6.69                  | <b>29417EX</b> |
|  | 162                       | 127            | 40.5 | 53             | 29 | 56 | 135                                 | 157                  | 2                    | 99                     | 99                    | 7.83                  | <b>29418EX</b> |
|  | 181                       | 139            | 44.5 | 59.6           | 32 | 62 | 150                                 | 175                  | 2.5                  | 108                    | 110                   | 10.6                  | <b>29420EX</b> |
|  | 199.6                     | 153.4          | 48   | 64.4           | 35 | 69 | 165                                 | 190                  | 2.5                  | 119.5                  | 120                   | 14                    | <b>29422EX</b> |
|  | 218                       | 166.5          | 54   | 70.9           | 37 | 74 | 180                                 | 205                  | 3                    | 131                    | 132                   | 17.6                  | <b>29424EX</b> |
|  | 236.4                     | 181            | 56   | 75             | 41 | 81 | 195                                 | 255                  | 3                    | 141.5                  | 143                   | 22.3                  | <b>29426EX</b> |
|  | 246                       | 196            | 53.6 | 74.4           | 41 | 86 | 205                                 | 235                  | 3                    | 153                    | 160                   | 22.8                  | <b>29428EX</b> |
|  | 264.4                     | 207.5          | 58.5 | 80.8           | 44 | 92 | 220                                 | 250                  | 3                    | 163                    | 169                   | 27.8                  | <b>29430EX</b> |
|  | 283.8                     | 222            | 62.5 | 85.7           | 45 | 99 | 230                                 | 265                  | 4                    | 174.5                  | 181                   | 33.4                  | <b>29432EX</b> |

# Quest

The new NACHI brand "Quest" in Japanese means "Tankyu (in pursuit)" of high performance and reliability. A brand new high performance bearing by NACHI for industrial machinery use. Concentration of material, machining, and lubrication technology of NACHI-Fujikoshi, NACHI offers world's top class quality meeting all demands in bearing like rigidity, durability, quietness and environmental burden.



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