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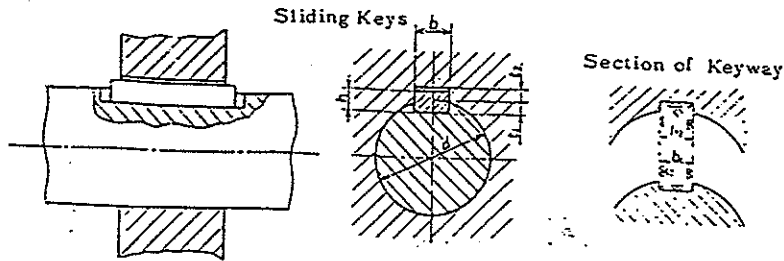
**Perencanaan Pompa Untuk Melayani Kebutuhan Air Bersih Penduduk Satu Kelurahan Di Gunung Kidul**

Insan Muhammad, Ir. Hermawan, M.Si.

Universitas Gadjah Mada, 2001 | Diunduh dari <http://etd.repository.ugm.ac.id/>

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**Lampiran 1 Tabel pemilihan ukuran pasak**



Unit: mm

| Nominal size of key<br>$b \times h$ | Dimensions of keyway |                 |            |                  |                 |                       | Informative note<br>Shaft dia. suitable for 2 |                     |                               |                       |
|-------------------------------------|----------------------|-----------------|------------|------------------|-----------------|-----------------------|---|---------------------|-------------------------------|-----------------------|
|                                     | $b_1$                |                 | $b_2$      |                  | $r_1$ and $r_2$ | Basic size of $t_1$   |   | Basic size of $t_2$ | Tolerances on $t_1$ and $t_2$ |                       |
|                                     | Basic size           | Tolerance (H 9) | Basic size | Tolerance (h 10) |                 |                       |   |                     |                               |                       |
| 2x3                                 | 2                    | +0.025          | 2          | +0.060           | 0.08 ~ 0.16     | 1.2                   | 1.0   | +0.1<br>0           | Over 6 to 8 incl.             |                       |
| 3x3                                 | 3                    | 0               | 3          | +0.020           |                 | 1.8                   | 1.4   |                     | Over 8 to 10 incl.            |                       |
| 4x4                                 | 4                    | 0               | 4          | 0                |                 | 2.5                   | 1.8   |                     | Over 10 to 12 incl.           |                       |
| 5x5                                 | 5                    | -0.030          | 5          | +0.078           | 0.16 ~ 0.25     | 3.0                   | 2.3   | +0.1<br>0           | Over 12 to 17 incl.           |                       |
| 6x6                                 | 6                    | 0               | 6          | +0.030           |                 | 3.5                   | 2.8   |                     | Over 17 to 22 incl.           |                       |
| (7x7)                               | 7                    | 0               | 7          | 0                |                 | 4.0                   | 3.5   |                     | Over 20 to 25 incl.           |                       |
| 8x7                                 | 8                    | -0.036          | 8          | +0.098           | 0.25 ~ 0.40     | 4.0                   | 3.3   | +0.2<br>0           | Over 22 to 30 incl.           |                       |
| 10x8                                | 10                   | 0               | 10         | +0.040           |                 | 5.0                   | 3.3   |                     | Over 30 to 38 incl.           |                       |
| 12x8                                | 12                   | 0               | 12         | 0                |                 | 5.0                   | 3.3   |                     | Over 38 to 44 incl.           |                       |
| 14x9                                | 14                   | +0.043          | 14         | +0.120           | 0.40 ~ 0.60     | 5.5                   | 3.8   | +0.2<br>0           | Over 44 to 50 incl.           |                       |
| (15x10)                             | 15                   |                 | 15         |                  |                 | +0.050                | 5.0   |                     | 5.5                           | Over 50 to 55 incl.   |
| 16x10                               | 16                   |                 | 16         |                  |                 | 0                     | 6.0   |                     | 4.3                           | Over 50 to 58 incl.   |
| 18x11                               | 18                   | 0               | 18         | 0                | 7.0             | 4.4                   | Over 58 to 65 incl.                           |                     |                               |                       |
| 20x12                               | 20                   | +0.052          | 20         | +0.149           | 0.70 ~ 1.00     | 7.5                   | 4.9   | +0.3<br>0           | Over 65 to 75 incl.           |                       |
| 22x14                               | 22                   |                 | 22         |                  |                 | +0.065                | 9.0   |                     | 5.4                           | Over 75 to 85 incl.   |
| (24x16)                             | 24                   |                 | 24         |                  |                 | 0                     | 8.0   |                     | 8.5                           | Over 80 to 90 incl.   |
| 25x14                               | 25                   | -0.062          | 25         | +0.180           | 0.70 ~ 1.00     | 9.0                   | 5.4   | +0.3<br>0           | Over 85 to 95 incl.           |                       |
| 28x16                               | 28                   |                 | 28         |                  |                 | +0.050                | 10.0  |                     | 6.4                           | Over 95 to 110 incl.  |
| 32x18                               | 32                   |                 | 32         |                  |                 | 0                     | 11.0  |                     | 7.4                           | Over 110 to 130 incl. |
| (35x22)                             | 35                   | 0               | 35         | +0.180           | 0.70 ~ 1.00     | 11.0                  | 12.0  | +0.3<br>0           | Over 125 to 140 incl.         |                       |
| 36x23                               | 36                   |                 | 36         |                  |                 | 0                     | 12.0  |                     | 8.4                           | Over 130 to 150 incl. |
| (38x24)                             | 38                   |                 | 38         |                  |                 | 0                     | 12.0  |                     | 13.0                          | Over 140 to 160 incl. |
| 40x22                               | 40                   | 0               | 40         | +0.180           | 0.70 ~ 1.00     | 13.0                  | 9.4   | +0.3<br>0           | Over 150 to 170 incl.         |                       |
| (42x26)                             | 42                   |                 | 42         |                  |                 | 0                     | 13.0  |                     | 14.0                          | Over 160 to 180 incl. |
| 45x25                               | 45                   |                 | 45         |                  |                 | 0                     | 15.0  |                     | 10.4                          | Over 170 to 200 incl. |
| 50x28                               | 50                   | +0.074          | 50         | +0.220           | 1.20 ~ 1.60     | 17.0                  | 11.4  | +0.3<br>0           | Over 200 to 230 incl.         |                       |
| 56x32                               | 56                   |                 | 56         |                  |                 | +0.100                | 20.0  |                     | 12.4                          | Over 230 to 260 incl. |
| 63x32                               | 63                   |                 | 63         |                  |                 | 0                     | 20.0  |                     | 12.4                          | Over 260 to 290 incl. |
| 70x36                               | 70                   | 0               | 70         | +0.260           | 2.00 ~ 2.50     | 22.0                  | 14.4  | +0.3<br>0           | Over 290 to 330 incl.         |                       |
| 80x40                               | 80                   |                 | 80         |                  |                 | +0.120                | 25.0  |                     | 15.4                          | Over 330 to 380 incl. |
| 90x45                               | 90                   |                 | 90         |                  |                 | 0                     | 28.0  |                     | 17.4                          | Over 380 to 440 incl. |
| 100x50                              | 100                  | 100             | 0          | 31.0             | 19.5            | Over 440 to 500 incl. |   |                     |                               |                       |

Remark: Those in nominal sizes given in parentheses should not be used, as possible



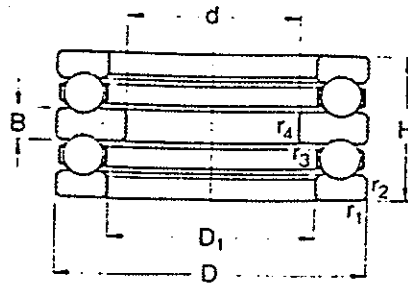
Lampiran 2 Tabel penentuan harga X, Y dan V pada bantalan bola

| Jenis bantalan           |                     | Beban putar pd cincin dalam | Beban putar pada cincin luar | Baris tunggal  |      | Baris ganda       |      |      |      | e    | Baris tunggal  |                | Baris ganda    |                |     |  |
|--------------------------|---------------------|-----------------------------|------------------------------|----------------|------|-------------------|------|------|------|------|----------------|----------------|----------------|----------------|-----|--|
|                          |                     |                             |                              | $F_a/VF_r > e$ |      | $F_a/VF_r \leq e$ |      |      |      |      | X <sub>0</sub> | Y <sub>0</sub> | X <sub>0</sub> | Y <sub>0</sub> |     |  |
|                          |                     |                             |                              | V              | X    | Y                 | X    | Y    | X    |      |                |                |                |                | Y   |  |
| Bantalan bola alur dalam | $F_a/C_0 = 0,014$   | 1                           | 1,2                          |                | 2,30 |                   |      |      | 2,30 | 0,19 |                |                |                |                |     |  |
|                          | $= 0,028$           |                             |                              |                | 1,99 |                   |      |      | 1,90 | 0,22 |                |                |                |                |     |  |
|                          | $= 0,056$           |                             |                              |                | 1,71 |                   |      |      |      | 1,71 | 0,26           |                |                |                |     |  |
|                          | $= 0,084$           |                             |                              |                | 1,55 |                   |      |      |      | 1,55 | 0,28           |                |                |                |     |  |
|                          | $= 0,11$            |                             |                              |                | 1,45 | 1                 | 0    | 0,56 |      | 1,45 | 0,30           | 0,6            | 0,5            | 0,6            | 0,5 |  |
|                          | $= 0,17$            |                             |                              |                | 1,31 |                   |      |      |      | 1,31 | 0,34           |                |                |                |     |  |
|                          | $= 0,28$            |                             |                              |                | 1,15 |                   |      |      |      | 1,15 | 0,38           |                |                |                |     |  |
|                          | $= 0,42$            |                             |                              |                | 1,04 |                   |      |      |      | 1,04 | 0,42           |                |                |                |     |  |
|                          | $= 0,56$            |                             |                              |                | 1,00 |                   |      | 1,00 | 0,44 |      |                |                |                |                |     |  |
| Bantalan bola sudut      | $\alpha = 20^\circ$ | 1                           | 1,2                          | 0,43           | 1,00 | 1,09              | 0,70 | 1,63 | 0,57 |      | 0,42           |                | 0,84           |                |     |  |
|                          | $= 25^\circ$        |                             |                              | 0,41           | 0,87 | 0,92              | 0,67 | 1,41 | 0,68 |      | 0,38           |                | 0,76           |                |     |  |
|                          | $= 30^\circ$        |                             |                              | 0,39           | 0,76 | 1                 | 0,78 | 0,63 | 1,24 | 0,80 | 0,5            | 0,33           | 1              | 0,66           |     |  |
|                          | $= 35^\circ$        |                             |                              | 0,37           | 0,66 |                   | 0,66 | 0,60 | 1,07 | 0,95 |                | 0,29           |                | 0,58           |     |  |
|                          | $= 40^\circ$        |                             |                              | 0,35           | 0,57 |                   | 0,55 | 0,57 | 0,93 | 1,14 |                | 0,26           |                | 0,52           |     |  |

Untuk bantalan baris tunggal, bila  $F_a/VF_r \leq e$ ,  $X = 1$ ,  $Y = 0$



Lampiran 3 Tabel bantalan bola baris ganda

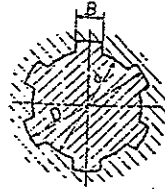


| Principal dimensions |     |     | Basic load ratings |                | Minimum load factor<br>A | Limiting speeds |       | Mass  | Designation |
|----------------------|-----|-----|--------------------|----------------|--------------------------|-----------------|-------|-------|-------------|
| d                    | D   | H   | C                  | C <sub>0</sub> |                          | Lubrication     |       |       |             |
| mm                   |     |     | N                  |                | -                        | r/min           |       | kg    | -           |
| 10                   | 32  | 22  | 13 800             | 16 000         | 2.1                      | 5 300           | 7 000 | 0,085 | 52202       |
| 15                   | 40  | 26  | 19 900             | 25 000         | 5.1                      | 4 500           | 6 000 | 0,15  | 52204       |
| 20                   | 47  | 28  | 24 700             | 34 000         | 9.4                      | 4 000           | 5 300 | 0,23  | 52205       |
|                      | 52  | 34  | 33 800             | 44 000         | 16                       | 3 400           | 4 500 | 0,33  | 52305       |
|                      | 70  | 52  | 67 600             | 90 000         | 66                       | 2 000           | 3 000 | 1,00  | 52406       |
| 25                   | 52  | 29  | 25 500             | 37 500         | 11                       | 3 600           | 4 800 | 0,28  | 52206       |
|                      | 60  | 38  | 40 300             | 57 000         | 27                       | 2 800           | 3 800 | 0,49  | 52306       |
|                      | 80  | 59  | 80 600             | 112 000        | 100                      | 1 800           | 2 600 | 1,45  | 52407       |
| 30                   | 62  | 34  | 35 100             | 53 000         | 23                       | 3 000           | 4 000 | 0,54  | 52207       |
|                      | 68  | 36  | 39 700             | 64 000         | 33                       | 2 800           | 3 800 | 0,62  | 52208       |
|                      | 68  | 44  | 49 400             | 69 500         | 39                       | 2 400           | 3 400 | 0,71  | 52307       |
|                      | 78  | 49  | 65 000             | 98 000         | 78                       | 2 000           | 3 000 | 1,05  | 52308       |
|                      | 90  | 65  | 104 000            | 146 000        | 170                      | 1 700           | 2 400 | 2,05  | 52408       |
| 35                   | 73  | 37  | 41 000             | 68 000         | 38                       | 2 600           | 3 600 | 0,62  | 52209       |
|                      | 85  | 52  | 71 500             | 110 000        | 99                       | 1 900           | 2 800 | 1,30  | 52309       |
|                      | 100 | 72  | 121 000            | 173 000        | 240                      | 1 600           | 2 200 | 2,70  | 52409       |
| 40                   | 78  | 39  | 41 600             | 73 500         | 44                       | 2 400           | 3 400 | 0,71  | 52210       |
|                      | 95  | 58  | 87 100             | 137 000        | 150                      | 1 800           | 2 600 | 1,85  | 52310       |
|                      | 110 | 78  | 138 000            | 204 000        | 340                      | 1 500           | 2 000 | 3,55  | 52410       |
| 45                   | 90  | 45  | 63 700             | 110 000        | 99                       | 1 900           | 2 800 | 1,10  | 52211       |
|                      | 105 | 64  | 112 000            | 180 000        | 260                      | 1 600           | 2 200 | 2,50  | 52311       |
|                      | 120 | 87  | 156 000            | 232 000        | 440                      | 1 300           | 1 800 | 4,70  | 52411       |
| 50                   | 95  | 46  | 65 000             | 118 000        | 110                      | 1 900           | 2 800 | 1,25  | 52212       |
|                      | 110 | 64  | 117 000            | 196 000        | 310                      | 1 600           | 2 200 | 2,70  | 52312       |
|                      | 130 | 93  | 186 000            | 285 000        | 660                      | 1 100           | 1 600 | 6,35  | 52412       |
|                      | 140 | 101 | 216 000            | 355 000        | 1 000                    | 1 000           | 1 500 | 8,05  | 52413       |
| 55                   | 100 | 47  | 66 300             | 127 000        | 130                      | 1 800           | 2 600 | 1,35  | 52213       |
|                      | 105 | 47  | 65 000             | 127 000        | 130                      | 1 800           | 2 600 | 1,50  | 52214       |
|                      | 115 | 65  | 114 000            | 196 000        | 310                      | 1 500           | 2 000 | 2,90  | 52313       |
|                      | 125 | 72  | 133 000            | 232 000        | 440                      | 1 400           | 1 900 | 3,90  | 52314       |

Sumber : SKF General Katalog, 1981



Lampiran 4 Tabel pemilihan ukuran spline



Unit: mm

| Type<br>No. of<br>grooves | Type 1             |            |                    |            |                    |            | Type 2             |            |                    |            |                    |            |
|---------------------------|--------------------|------------|--------------------|------------|--------------------|------------|--------------------|------------|--------------------|------------|--------------------|------------|
|                           | 6                  |            | 8                  |            | 10                 |            | 6                  |            | 8                  |            | 10                 |            |
|                           | Major<br>dia.<br>D | Width<br>B | Major<br>dia.<br>D | Width<br>B | Major<br>dia.<br>D | Width<br>B | Major<br>dia.<br>D | Width<br>B | Major<br>dia.<br>D | Width<br>B | Major<br>dia.<br>D | Width<br>B |
| 11                        | —                  | —          | —                  | —          | —                  | —          | 14                 | 3          | —                  | —          | —                  | —          |
| 13                        | —                  | —          | —                  | —          | —                  | —          | 15                 | 3.5        | —                  | —          | —                  | —          |
| 16                        | —                  | —          | —                  | —          | —                  | —          | 20                 | 4          | —                  | —          | —                  | —          |
| 18                        | —                  | —          | —                  | —          | —                  | —          | 22                 | 5          | —                  | —          | —                  | —          |
| 21                        | —                  | —          | —                  | —          | —                  | —          | 25                 | 5          | —                  | —          | —                  | —          |
| 23                        | 25                 | 6          | —                  | —          | —                  | —          | 25                 | 6          | —                  | —          | —                  | —          |
| 26                        | 30                 | 6          | —                  | —          | —                  | —          | 32                 | 6          | —                  | —          | —                  | —          |
| 28                        | 32                 | 7          | —                  | —          | —                  | —          | 34                 | 7          | —                  | —          | —                  | —          |
| 32                        | 36                 | 8          | 36                 | 6          | —                  | —          | 38                 | 8          | 38                 | 6          | —                  | —          |
| 36                        | 40                 | 8          | 40                 | 7          | —                  | —          | 42                 | 8          | 42                 | 7          | —                  | —          |
| 42                        | 46                 | 10         | 46                 | 8          | —                  | —          | 48                 | 10         | 48                 | 8          | —                  | —          |
| 46                        | 50                 | 12         | 50                 | 9          | —                  | —          | 54                 | 12         | 54                 | 9          | —                  | —          |
| 52                        | 58                 | 14         | 58                 | 10         | —                  | —          | 60                 | 14         | 60                 | 10         | —                  | —          |
| 56                        | 62                 | 14         | 62                 | 10         | —                  | —          | 65                 | 14         | 65                 | 10         | —                  | —          |
| 62                        | 68                 | 16         | 68                 | 12         | —                  | —          | 72                 | 16         | 72                 | 12         | —                  | —          |
| 72                        | 78                 | 18         | —                  | —          | 78                 | 12         | 82                 | 18         | —                  | —          | 82                 | 12         |
| 82                        | 88                 | 20         | —                  | —          | 88                 | 12         | 92                 | 20         | —                  | —          | 92                 | 12         |
| 92                        | 98                 | 22         | —                  | —          | 98                 | 14         | 102                | 22         | —                  | —          | 102                | 14         |
| 102                       | —                  | —          | —                  | —          | 108                | 16         | —                  | —          | —                  | —          | 112                | 16         |
| 112                       | —                  | —          | —                  | —          | 120                | 18         | —                  | —          | —                  | —          | 125                | 18         |



Lampiran 5 Tabel ukuran ulir standar DIN 13

| Diameter terpakai ulir<br>$d$ | Kenaikan<br>$P$ | Diameter sisi<br>$d_1$ | Diameter Inti<br>$d_2$ | Penampang melintang inti<br>$A_1$ | Penampang melintang tegangan<br>$A_2$ |
|-------------------------------|-----------------|------------------------|------------------------|-----------------------------------|---------------------------------------|
| <b>Ulir kasar</b>             |                 |                        |                        |                                   |                                       |
| 3                             | 0,5             | 2,675                  | 2,387                  | 4,47                              | 5,03                                  |
| (3,5)                         | 0,6             | 3,110                  | 2,764                  | 6,00                              | 6,78                                  |
| 4                             | 0,7             | 3,545                  | 3,141                  | 7,75                              | 8,78                                  |
| (4,5)                         | 0,75            | 4,013                  | 3,580                  | 10,1                              | 11,3                                  |
| 5                             | 0,8             | 4,480                  | 4,019                  | 12,7                              | 14,2                                  |
| 6                             | 1               | 5,350                  | 4,773                  | 17,9                              | 20,1                                  |
| (7)                           | 1               | 6,350                  | 5,773                  | 26,2                              | 28,9                                  |
| 8                             | 1,25            | 7,188                  | 6,466                  | 32,8                              | 36,6                                  |
| 10                            | 1,5             | 9,026                  | 8,160                  | 52,3                              | 58,0                                  |
| 12                            | 1,75            | 10,863                 | 9,853                  | 76,2                              | 84,3                                  |
| (14)                          | 2               | 12,701                 | 11,546                 | 105                               | 115                                   |
| 16                            | 2               | 14,701                 | 13,546                 | 144                               | 157                                   |
| (18)                          | 2,5             | 16,376                 | 14,933                 | 175                               | 192                                   |
| 20                            | 2,5             | 18,376                 | 16,933                 | 225                               | 245                                   |
| (22)                          | 2,5             | 20,376                 | 18,933                 | 282                               | 303                                   |
| 24                            | 3               | 22,051                 | 20,319                 | 324                               | 353                                   |
| (27)                          | 3               | 25,051                 | 23,319                 | 427                               | 459                                   |
| 30                            | 3,5             | 27,727                 | 25,706                 | 519                               | 561                                   |
| (33)                          | 3,5             | 30,727                 | 28,706                 | 647                               | 694                                   |
| 36                            | 4               | 33,403                 | 31,093                 | 759                               | 817                                   |
| 39                            | 4               | 36,402                 | 34,093                 | 912                               | 976                                   |
| <b>ulir halus</b>             |                 |                        |                        |                                   |                                       |
| 8                             | 1               | 7,350                  | 6,773                  | 36,0                              | 39,2                                  |
| 10                            | 1,25            | 9,188                  | 8,466                  | 56,3                              | 61,2                                  |
| 12                            | 1,25            | 11,188                 | 10,466                 | 86,0                              | 92,1                                  |
| (12)                          | 1,5             | 11,026                 | 10,160                 | 81,1                              | 88,1                                  |
| (14)                          | 1,5             | 13,026                 | 12,160                 | 116                               | 125                                   |
| 16                            | 1,5             | 15,026                 | 14,160                 | 157                               | 167                                   |
| (18)                          | 1,5             | 17,026                 | 16,160                 | 205                               | 216                                   |
| 20                            | 1,5             | 19,026                 | 18,160                 | 259                               | 272                                   |
| (22)                          | 1,5             | 21,026                 | 20,160                 | 319                               | 333                                   |
| 24                            | 2               | 22,701                 | 21,546                 | 364                               | 354                                   |
| (27)                          | 2               | 25,701                 | 24,546                 | 473                               | 496                                   |
| 30                            | 2               | 28,701                 | 27,546                 | 596                               | 621                                   |
| (33)                          | 2               | 31,701                 | 30,546                 | 732                               | 761                                   |
| 36                            | 3               | 34,051                 | 32,319                 | 820                               | 865                                   |
| (39)                          | 3               | 37,051                 | 35,319                 | 979                               | 1030                                  |

| $P$         | Kenaikan Kedalaman Pembuatan sisi terpakai |        |
|-------------|--|--------|
|             | $H_1$                                      | $R$    |
| secara umum |  |        |
| 0,5         | 0,2706                                     | 0,0721 |
| 0,6         | 0,3247                                     | 0,0866 |
| 0,7         | 0,3789                                     | 0,1010 |
| 0,75        | 0,4059                                     | 0,1082 |
| 0,8         | 0,4330                                     | 0,1154 |
| 1           | 0,5412                                     | 0,1443 |
| 1,25        | 0,6765                                     | 0,1804 |
| 1,5         | 0,8119                                     | 0,2165 |
| 1,75        | 0,9472                                     | 0,2525 |
| 2           | 1,0825                                     | 0,2886 |
| 2,5         | 1,3531                                     | 0,3608 |
| 3           | 1,6238                                     | 0,4330 |
| 3,5         | 1,8944                                     | 0,5051 |
| 4           | 2,1650                                     | 0,5773 |

$$D_1 = d - 2 H_1$$

$$h_2 = (17/24) H$$



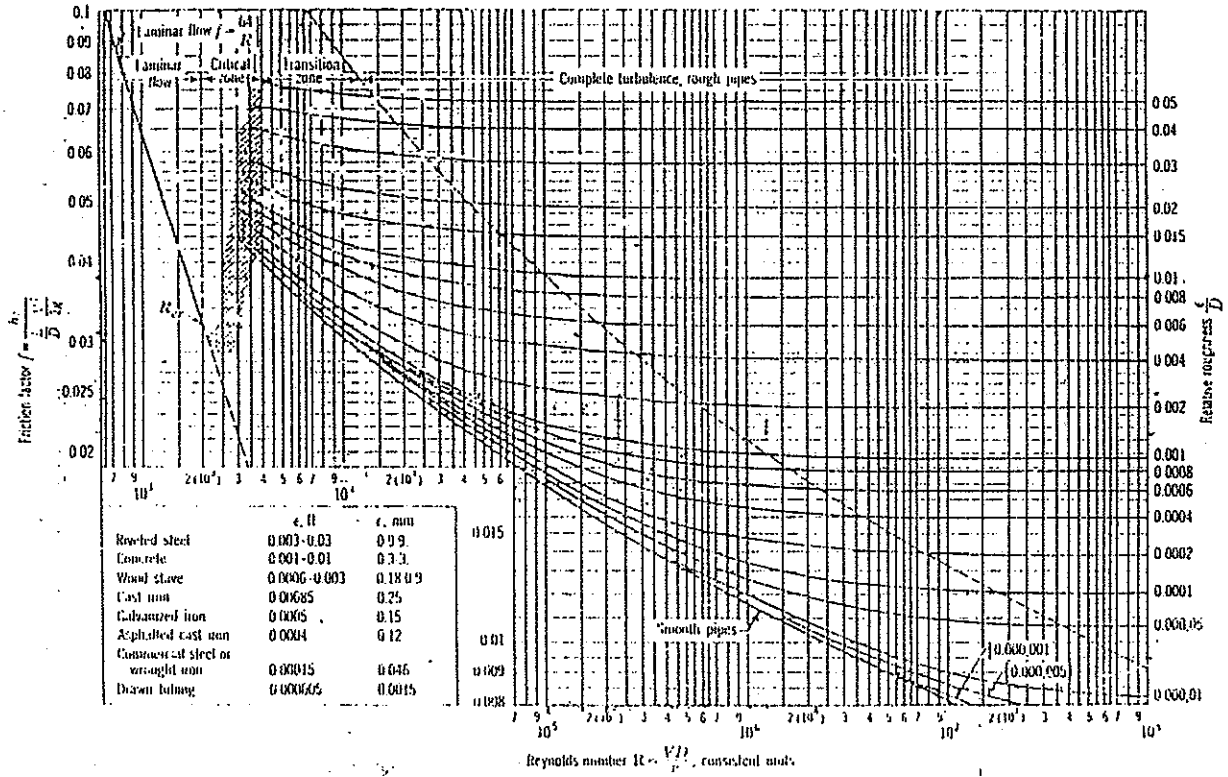
Lampiran 6 Tabel koefisien gesek berbagai bantalan

Table 1 Coefficient of friction

| Bearing type                       | $\mu$  |
|------------------------------------|--------|
| Deep groove ball bearings          | 0,0015 |
| Self-aligning ball bearings        | 0,0010 |
| Angular contact ball bearings      |        |
| single row                         | 0,0020 |
| double row                         | 0,0024 |
| Cylindrical roller bearings        |        |
| with cage                          | 0,0011 |
| full complement (without seals)    | 0,0020 |
| Spherical roller bearings          | 0,0018 |
| Taper roller bearings              | 0,0018 |
| Thrust ball bearings               | 0,0013 |
| Cylindrical roller thrust bearings | 0,0050 |
| Spherical roller thrust bearings   | 0,0018 |



Lampiran 7 Diagram Moody



Sumber : Streeter, 1981



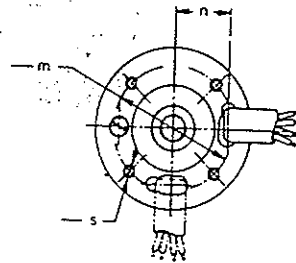
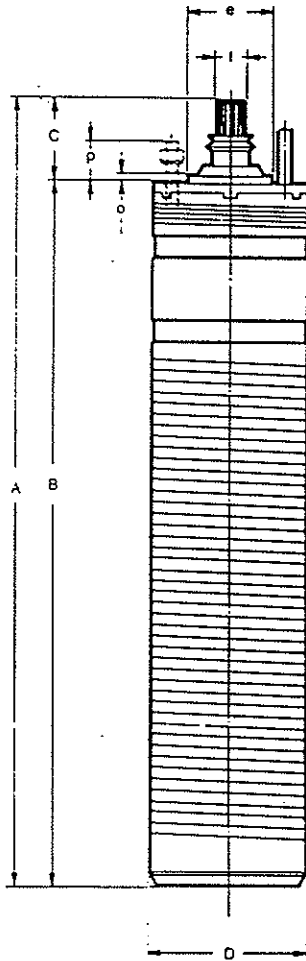
**Perencanaan Pompa Untuk Melayani Kebutuhan Air Bersih Penduduk Satu Kelurahan Di Gunung Kidul**

Insan Muhammad, Ir. Hermawan, M.Si.

Universitas Gadjah Mada, 2001 | Diunduh dari <http://etd.repository.ugm.ac.id/>

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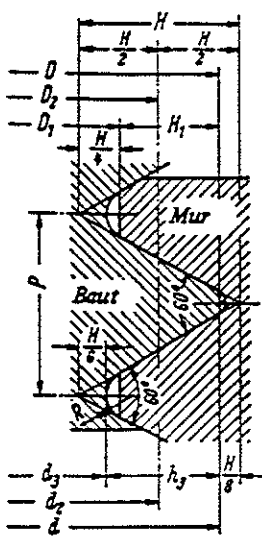
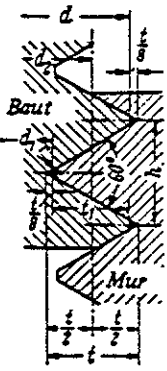
**Lampiran 8. Dimensi motor listrik**



| Tipo motore<br>Motor type | Potenza<br>Power |     | Dimensioni in mm<br>Dimensions in mm |      |   |   |   |   |   |   |   |   |   |  |  | Peso - Weight<br>kg. |     |
|---------------------------|------------------|-----|--------------------------------------|------|---|---|---|---|---|---|---|---|---|--|--|----------------------|-----|
|                           | kW               | HP  | a                                    | b    | c | d | e | f | m | n | o | p | s |  |  |                      |     |
| CS6 400 T53               | 3                | 4   | 697                                  | 624  |   |   |   |   |   |   |   |   |   |  |  |                      | 38  |
| CS6 500 T53               | 3,7              | 5   | 697                                  | 624  |   |   |   |   |   |   |   |   |   |  |  |                      | 38  |
| CS6 750 T53               | 5,5              | 7,5 | 777                                  | 704  |   |   |   |   |   |   |   |   |   |  |  |                      | 46  |
| CS6 1000 T53              | 7,5              | 10  | 827                                  | 754  |   |   |   |   |   |   |   |   |   |  |  |                      | 56  |
| CS6 1500 T53              | 11               | 15  | 934                                  | 861  |   |   |   |   |   |   |   |   |   |  |  |                      | 65  |
| CS6 2000 T53              | 15               | 20  | 1024                                 | 951  |   |   |   |   |   |   |   |   |   |  |  |                      | 77  |
| CS6 2500 T53              | 18,5             | 25  | 1114                                 | 1041 |   |   |   |   |   |   |   |   |   |  |  |                      | 89  |
| CS6 3000 T53              | 22               | 30  | 1024                                 | 1131 |   |   |   |   |   |   |   |   |   |  |  |                      | 100 |
| CS6 4000 T53              | 30               | 40  | 1314                                 | 1241 |   |   |   |   |   |   |   |   |   |  |  |                      | 113 |

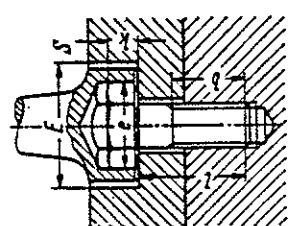
Sumber : Lowara Katalog

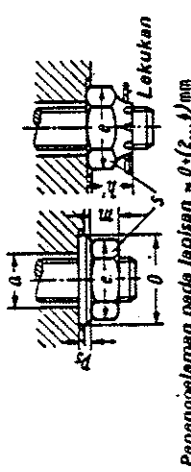
Lampiran 9. Profil ulir ISO metris menurut DIN 13

| Profil   | Bentuk  | Ukuran  |
|--|---|---|
| Ulir-ISO metris dan<br>Ulir halus-ISO metris                       |   | $H = 0,86603 P$ $H_1 = 0,54127 P = \frac{5}{8} H$ $h_2 = 0,61343 P = \frac{17}{24} H$ $R = 0,14434 P = \frac{H}{6}$ $D = d = \varnothing\text{-terpakai}$ $D_2 = d_2 = d - 0,64953 P$ $D_1 = d - 2H_1$ $d_2 = d - 1,22687 P$ $A_K = \frac{\pi}{4} d_2^2$ $A_S = \frac{\pi}{4} \left( \frac{d_2 + d_1}{2} \right)^2$ |
| Ulir-DIN metris sebelumnya dan<br>Ulir halus-DIN metris sebelumnya |  | $t = 0,8660 \cdot h$ $t_1 = 0,6495 \cdot h$ $d_2 = d - t_1$ $d_1 = d - 2t_1$ $r = 0,1082 \cdot h = \frac{t}{8}$   |

Sumber : G. Niemann, 1994

Lampiran 10. Ukuran sekrup dan mur segi enam

| Bentuk sekrup  | M 3 M4 M5 M6 M8 M10 M12 M16 M20 M24 M30 M36 DIN |        |        |        |        |        |        |        |        |        |        |        |          |          |
|--|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|----------|
| <p>  </p> | 2   | 2,8    | 3,5    | 4      | 5      | 6,5    | 8      | 10     | 13     | 16     | 19     | 24     | 20       | 665, 934 |
| Tinggi kepala  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Ukuran tepi  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Lebar kunci  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Tinggi mur   | 2,4   | 3,2    | 4      | 5      | 6,5    | 8      | 10     | 13     | 16     | 19     | 24     | 20     | 665, 934 |          |
| Ukuran datar   | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Tinggi mur normal  | 2,5   | 3      | 4      | 5      | 6,5    | 8      | 10     | 13     | 16     | 19     | 24     | 20     | 665, 934 |          |
| Ukuran datar normal  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Tinggi mur mahkota   | 6   | 7,5    | 9,5    | 12     | 15     | 19     | 22     | 27     | 33     | 38     | 45     | 55     | 65       | 94       |
| Ukuran datar mahkota   | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| phi Badan x Panjang  | 1 x 10  | 1 x 12 | 1 x 15 | 1 x 20 | 1 x 25 | 1 x 30 | 1 x 35 | 1 x 40 | 1 x 45 | 1 x 50 | 1 x 55 | 1 x 60 | 1 x 65   | 1 x 70   |
| phi  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Panjang ulir* minimal  | 12  | 14     | 16     | 18     | 22     | 26     | 30     | 38     | 40     | 54     | 66     | 78     | 93       | 93       |
| Panjang sekrup* minimal  | 4   | 5      | 6      | 6      | 8      | 8      | 10     | 12     | 10     | 16     | 16     | 35     | 35       | 933      |
| Panjang sekrup* minimal  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Penanggalan untuk kunci sok DIN 896  | —   | —      | 14     | 17     | 23     | 27     | 30     | 36     | 44     | 51     | 65     | 78     | 896      | 896      |
| Penanggalan untuk kunci sok DIN 896  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| phi cincin pengaman  | 7   | 9      | 10     | 12     | 17     | 21     | 24     | 30     | 37     | 44     | 50     | 60     | 125      | 125      |
| Tebal cincin pengaman  | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |
| Lubang dibor   | 0,5   | 0,8    | 1      | 1,0    | 1,0    | 2      | 2,5    | 3      | 4      | 4      | 4      | 4      | 5        | 5        |
| Penembusan dituang   | 3,6   | 4,8    | 5,8    | 7      | 9,5    | 11,5   | 14     | 18     | 23     | 27     | 33     | 36     | 69       | 69       |
| Penembusan dituang   | mm  | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm     | mm       | mm       |



\* Untuk panjang sampai 125 mm.  
 \*\* Panjang minimal menurut DIN 933; Panjang minimal yang tertera di pasaran menurut DIN 933: 10(M5) 10(M6), 16(M8), 16(M10), 16(M12); Ulirnya sampai mendekati kepala sekrup.  
 Sumber: G. Nieman, 1994.