



## **SOLP**

### **Flat plate**

### Stepping forward together with our customers

For more than 50 years, **SANKYO OILLESS** has been one of the leading manufacturers of maintenance-free sliding elements. As a leading supplier and pioneer in the production of stamping and press tool components for the automotive industry, **SANKYO OILLESS** supplies an products for many other applications such as mold making, engineering, packaging, heavy industry, aerospace and many more.

The technologies developed by **SANKYO OILLESS** have reduced or eliminated friction, wear and tear. In addition, **SANKYO OILLESS** provides services and quality products to offer you the best possible solutions for your requirements at all times.

### The benefits of slide bearings versus roller bearings

In a variety of applications, designers are increasingly replacing roller bearings with slide bearings. In addition to ease of installation and cost effectiveness, slide bearings offer a number of distinct advantages. Slide bearings require less installation space, have a larger load bearing capacity, are maintenance-free or require little maintenance, are easier to assemble and are less susceptible to noise and vibration.

The following list gives an overview of the general advantages of bearings compared to bearings.

#### Slide bearing

- Higher load bearing capacity and reduced footprint
- Higher resistance to vibration and increased lifetime
- Easier installation
- Lower installation costs
- Increased shaft tolerances possible
- Compensates misalignment and reduces the edge load

#### Roller bearing

- sensitive to shock, vibration and edge load
- high costs for bearings, housings, counterfaces and - fixing materials
- large space required
- is prone to noise development

### Technologies for top performance

SANKYO products are manufactured in our own plants and distributed worldwide.

We offer high quality maintenance-free sliding elements acc. to international standards and standards for use in

- pressing tools
- injection molds
- general engineering

As an experienced specialist, we have the appropriate know-how in tribology to always offer the best solutions for your needs. We supply a large portfolio of lubrication-free sliding elements and also offer custom products acc. to customer drawing.

Quality and performance are our constant commitment!

## Plates, angle strips and the like

According to the case of application and the desired accuracy, between 0.02 and 0.15 mm.

In general, guide slides are made to give a clearance of 0.05 mm and a vertical clearance of 0.1 mm.

### Attention

The graphite cannot be deposited on the entire surface with very small movements. Please contact the technical department if you want to realise very small movements.

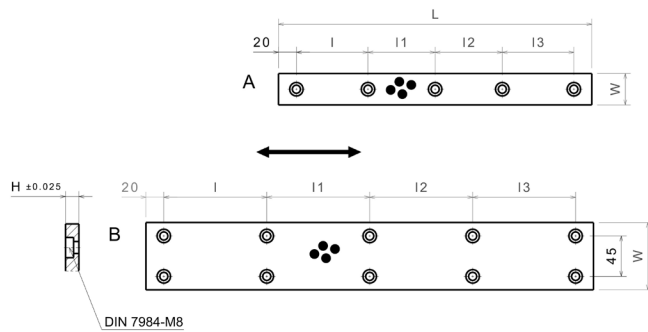
## Sliding partners

Suitable sliding partners for Sankyo Oilless Bushes and Plates are **gas nitrated or hardened steel** alloys with **HRC > 35**.

In order to ensure an optimal sliding behaviour, the difference in hardness between the sliding material and sliding partner should at least be **100 HB**.

The surface roughness of the sliding partner should be **Rz = 3...6,3 µm (grinding)**.

If guides, like in large dies of punching tools, are continuously moved apart during operation, the counterpart partner should be provided with correspondingly generous centering chamfers.



### Properties:

|                         |                               |
|-------------------------|-------------------------------|
| Base material           | Special brass (SO#50SP2)      |
| Self-lubricating        | Yes                           |
| Lubricant               | Graphite                      |
| Max. surface pressure P | 100 N/mm <sup>2</sup>         |
| Max. sliding speed v    | 30 m/min                      |
| Max. P*v-Wert           | 200 N/mm <sup>2</sup> x m/min |
| Operating temperature   | -50°C / +200°C (max. 300°C)   |
| Friction coefficient    | 0,07                          |

| Article no.: | Article name: | Width W: | Length L: | Height H: | I:  | I1: | I2: | I3: | Form: |     |
|--------------|---------------|----------|-----------|-----------|-----|-----|-----|-----|-------|-----|
| 21141500     | SOLP 35-100   | 35       | 100       | 10        | 60  | -   | -   | -   | A     |     |
| 21141600     | SOLP 35-150   |          | 150       |           | 55  | 55  |     |     |       |     |
| 21151700     | SOLP 35-200   |          | 200       |           | 55  | 50  |     |     |       | 55  |
| 21151800     | SOLP 35-250   |          | 250       |           | 70  | 70  | 70  |     |       |     |
| 21152300     | SOLP 35-300   |          | 300       |           | 65  | 65  | 65  |     |       | 65  |
| 21152400     | SOLP 35-350   |          | 350       |           | 80  | 75  | 75  |     |       | 80  |
| 21152500     | SOLP 50-100   | 50       | 100       |           | 60  | -   | -   | -   |       |     |
| 21152600     | SOLP 50-150   |          | 150       |           | 55  | 55  |     |     |       |     |
| 21152700     | SOLP 50-200   |          | 200       |           | 55  | 50  |     |     |       | 55  |
| 21152800     | SOLP 50-250   |          | 250       |           | 70  | 70  | 70  |     |       |     |
| 21152900     | SOLP 50-300   |          | 300       |           | 65  | 65  | 65  |     |       | 65  |
| 21153000     | SOLP 50-350   |          | 350       |           | 80  | 75  | 75  |     |       | 80  |
| 21153100     | SOLP 75-150   | 75       | 150       |           | 110 | -   | -   | -   | B     |     |
| 21153200     | SOLP 75-200   |          | 200       |           | 80  | 80  |     |     |       |     |
| 21153300     | SOLP 75-250   |          | 250       |           | 105 | 105 |     |     |       |     |
| 21153400     | SOLP 75-300   |          | 300       |           | 85  | 90  | 85  |     |       |     |
| 21153500     | SOLP 75-400   |          | 400       |           | 120 | 120 | 120 |     |       |     |
| 21153600     | SOLP 75-500   |          | 500       |           | 115 | 115 | 115 |     |       | 115 |



### Finishing

**SANKYO OILLESS** - bronze is easy to machine. Basically, there is no great difference between the machining of our products and normal steel. No special tools are required but be sure to use sharp and preferably new tools.

### Milling

The use of cooling lubricants is recommended by using HSS or carbide tools. First pre-roughing to approx. distance of 0,3mm to nominal. In general: Milling / rough machining with little effort, slow forward feed, at high rotation-speeds and small depths of cut.

### Drilling

The use of cooling lubricants is recommended by using HSS or carbide tools. Drill as with normal steel and if it's necessary increase the forward feed with same rotation-speed. Flat plates have to be drilled from backside and countersink on the sliding surface if it's necessary to drill through a solid-lubricant depot.

### Grinding

The use of cooling lubricants is recommended by working with grinding wheels.

|                       |                |
|-----------------------|----------------|
| <b>Grain size</b>     | 46 - 60        |
| <b>Material</b>       | Silicon carbid |
| <b>Rotation speed</b> | 1500 U/min     |
| <b>Working speed</b>  | 30 m/min       |

### Reaming

The use of cooling lubricants is recommended by using HSS reamers. Proceed as with normal steel and if it's necessary increase the forward feed with same rotation-speed.

### Turning

| <b>Example (up to 100mm)</b> | <b>External turning</b> | <b>Internal turning</b> |
|------------------------------|-------------------------|-------------------------|
| <b>Rotation speed</b>        | approx. 1000 U/min      | approx. 500 U/min       |
| <b>Feed rate</b>             | ca. 0,1 m/min           | approx. 0,07 m/min      |
| <b>Tool</b>                  | Carbide                 | Carbide                 |

## Custom-made products

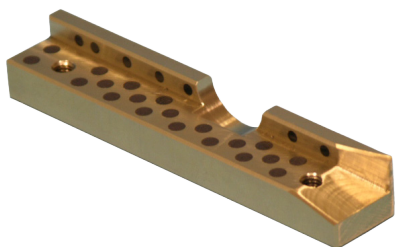
Beside to the big variety of standard products, we offer custom-made rotation- and milled-parts. We are producing these products out of steel or with our special Sankyo bronze with solid lubrication. Also, it is possible to get standard products with modifications. We only need your drawing or 3D-model with the assembly situation, like load cases and operating conditions, to prove the feasibility.

Our expert team will gladly advise you, also at your side. You can contact the department „Engineering“ by:

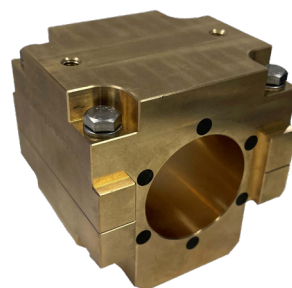
Tel.: [+49 2103 584 800](tel:+492103584800)

E-Mail: [technik@de.sankyo-oilless.com](mailto:technik@de.sankyo-oilless.com)

## Examples



Custom-made products



Prefabricated deidable bush set to add a thread at the customer's site



Special design of a special spindle nut



Large bushings for all applications

## Material data

| Material                                           |                      | SO#50SP2*                           | SO#50SP5                            | SO#50SP7                            | SO#50SP8                            | SO#50SP13                       | SO#50B                             |
|----------------------------------------------------|----------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------|------------------------------------|
|                                                    |                      | <i>Hard brass<br/>with graphite</i> | <i>Alu-bronze<br/>with graphite</i> | <i>Alu-bronze<br/>with graphite</i> | <i>Hard brass<br/>with graphite</i> | <i>Bronze<br/>with graphite</i> | <i>Red brass<br/>with graphite</i> |
| Self-lubricating                                   |                      | Yes                                 | Yes                                 | Yes                                 | Yes                                 | Yes                             | Yes                                |
| Lubricant                                          |                      | Graphite                            | Graphite                            | Graphite                            | Graphite                            | Graphite                        | Graphite                           |
| Max. surface pressure<br>[ N/mm <sup>2</sup> ]     |                      | 100                                 | 100                                 | 120                                 | 130                                 | 120                             | 50                                 |
| Max. sliding speed<br>[ m/min ]                    |                      | 30                                  | 10                                  | 10                                  | 15                                  | 10                              | 50                                 |
| Max. P*v-Wert<br>[ N/mm <sup>2</sup> * m/min ]     |                      | 200                                 | 150                                 | 200                                 | 200                                 | 200                             | 100                                |
| Temperature<br>[ °C ]                              | Standard<br>Max      | -50 / +200<br>+300                  | -50 / +200<br>+300                  | -50 / +200<br>+300                  | -50 / +200<br>+300                  | -50 / +200<br>+300              | -50 / +200<br>+400                 |
| Friction<br>coefficient**                          | initial<br>long term | 0,15<br>0,07                        | 0,15<br>0,07                        | 0,15<br>0,07                        | 0,15<br>0,07                        | 0,2<br>0,15                     | 0,15<br>0,07                       |
| Brinell hardness<br>[ HB ]                         |                      | >210                                | >210                                | >260                                | 220 ~ 260                           | >280                            | >60                                |
| Further information                                |                      |                                     |                                     |                                     |                                     |                                 |                                    |
| Elongation<br>[ % ]                                |                      | >12                                 | >18                                 | >2                                  | >3                                  | >0,5                            | >15                                |
| Density<br>[ kg/dm <sup>3</sup> ]                  |                      | 7,9                                 | 7,7                                 | 7,8                                 | 7,8                                 | 7,2                             | 8,7                                |
| Tensile strength<br>[ N/mm <sup>2</sup> ]          |                      | >755                                | >686                                | >833                                | >700                                | >550                            | >195                               |
| Yield strength<br>[ N/mm <sup>2</sup> ]            |                      | >412                                | >372                                | >509                                | -                                   | -                               | >105                               |
| E-Module<br>[ N/mm <sup>2</sup> ]                  |                      | 97000                               | 108000                              | 123600                              | 108000                              | 145000                          | 96000                              |
| Thermal expansion<br>[ 10 <sup>-5</sup> * grd.-1 ] |                      | 1,9                                 | 1,6                                 | 1,6                                 | 1,9                                 | 1,71                            | 1,8                                |

\*: Material used according to SANKYO OILLESS standards

\*\*: against steel, hardened and grinded



| Tin bronze         | Sinter-bronze | SO#50PB            | CuSn8                    | SO#50S45C                  | SO#50F                              | Polyacetal            |
|--------------------|---------------|--------------------|--------------------------|----------------------------|-------------------------------------|-----------------------|
|                    |               | <i>Ton bronze</i>  | <i>acc. to DIN 17662</i> | <i>Steel with graphite</i> | <i>Grey cast iron with graphite</i> | <i>Plastic</i>        |
| No                 | Yes           | No                 | No                       | Yes                        | Yes                                 | No                    |
| -                  | Oil           | -                  | -                        | Graphite                   | Graphite                            | Graphite              |
| 80                 | 50            | 80                 | 40                       | 30                         | 5                                   | 25<br>35 (with oil)   |
| 20                 | 300           | 50                 | 120                      | 10                         | 10                                  | 50<br>200 (with oil)  |
| -                  | 96            | 100                | -                        | 80                         | 50                                  | 100<br>200 (with oil) |
| -50 / +200<br>+300 | -12 / +90     | -50 / +200<br>+300 | -200 / +200              | -50 / +150                 | -50 / +150                          | -50 / +80             |
| 0,16               | 0,09          | 0,15<br>0,07       | -                        | 0,01                       | -                                   | -                     |
| >80                | >25           | >80                | -                        | >375                       | 160 ~ 220                           | 115 (HRR)             |
| n                  |               |                    |                          |                            |                                     |                       |
| >6                 | -             | >5                 | -                        | 19                         | -                                   | 73                    |
| 8,7                | 6,5 ~ 7,0     | 8,2                | 8,8                      | 7,8                        | 7,1 ~ 7,3                           | 1,4                   |
| >295               | -             | >295               | -                        | >690                       | >250                                | 69                    |
| >161               | -             | >161               | -                        | -                          | -                                   | -                     |
| 108000             | -             | 108000             | 115000                   | -                          | -                                   | -                     |
| 1,8                | -             | 1,8                | -                        | 1,1                        | 1                                   | 7,7                   |

## Chemical resistance

### Water

| Material           | SO#50SP2<br>SO#50SP8                   | SO#50B           | SO#50SP5<br>SO#50SP7<br>SO#50SP13<br>SO#50AIB | SO#50F           | SO#50S45C    | Polyacetal                   |
|--------------------|----------------------------------------|------------------|-----------------------------------------------|------------------|--------------|------------------------------|
|                    | <i>High strength<br/>brass casting</i> | <i>Red brass</i> | <i>Alu-bronze</i>                             | <i>Grey cast</i> | <i>Steel</i> | <i>Red brass<br/>mit FSS</i> |
| <b>Fresh Water</b> | ○                                      | ◎                | ◎                                             | X                | ◎            | ○                            |
| <b>Sea Water</b>   | △                                      | ○                | ○                                             | X                | ◎            | ○                            |

### Acid

| Material                                  | SO#50SP2<br>SO#50SP8                   | SO#50B           | SO#50SP5<br>SO#50SP7<br>SO#50SP13<br>SO#50AIB | SO#50F           | SO#50S45C    | Polyacetal |
|-------------------------------------------|----------------------------------------|------------------|-----------------------------------------------|------------------|--------------|------------|
|                                           | <i>High strength<br/>brass casting</i> | <i>Red brass</i> | <i>Alu-bronze</i>                             | <i>Grey cast</i> | <i>Steel</i> |            |
| <b>Alcohol</b>                            | ◎                                      | ◎                | ◎                                             | -                | ◎            | -          |
| <b>Formic acid</b>                        | -                                      | -                | -                                             | -                | -            | X          |
| <b>Chlorine (dry)</b>                     | ◎                                      | ◎                | ◎                                             | -                | ◎            | -          |
| <b>Chlorine (wet)</b>                     | X                                      | △                | △                                             | -                | -            | -          |
| <b>Chromic acid</b>                       | X                                      | X                | X                                             | X                | -            | -          |
| <b>Acetic acid</b>                        | X                                      | X                | ◎ (20°C)<br>△ (118°C)                         | X                | ◎            | ○          |
| <b>Hydrochloric acid</b>                  | -                                      | ○                | ○                                             | X                | -            | X          |
| <b>Concentrated<br/>hydrochloric acid</b> | X                                      | X                | △                                             | X                | X            | -          |
| <b>Lactic acid</b>                        | X                                      | X                | X                                             | X                | ○            | X          |
| <b>Phenol</b>                             | -                                      | -                | -                                             | -                | -            | X          |
| <b>Phosphoric acid</b>                    | X                                      | ○                | ○                                             | X                | △            | X          |
| <b>Nitric acid</b>                        | X                                      | X                | X                                             | X                | ○            | -          |
| <b>Sulfuric acid (40-80%)</b>             | X                                      | △                | △                                             | X                | △            | X*<br>△**  |
| <b>Sulfuric acid (80-95%)</b>             | X                                      | ○                | ○                                             | X                | △            | X*<br>△**  |
| <b>Diluted hydrochloric acid</b>          | △                                      | -                | -                                             | -                | -            | X          |
| <b>Hydrogen peroxide</b>                  | △                                      | ○                | ○                                             | X                | ○            | -          |

\*: High concentration

\*\* : Low concentration

| Explanation            |                      |             |
|------------------------|----------------------|-------------|
| ◎: Preferred           | ○: no problem in use | △: Affected |
| X: Not allowed for use | -: unknown           |             |

## Chemical resistance

### Alkali

| Material            | SO#50SP2<br>SO#50SP8                   | SO#50B           | SO#50SP5<br>SO#50SP7<br>SO#50SP13<br>SO#50AIB | SO#50F           | SO#50S45C           | Polyacetal |
|---------------------|----------------------------------------|------------------|-----------------------------------------------|------------------|---------------------|------------|
|                     | <i>High strength<br/>brass casting</i> | <i>Red brass</i> | <i>Alu-bronze</i>                             | <i>Grey cast</i> | <i>Steel</i>        |            |
| Ammonia (dry)       | ◎                                      | ◎                | ◎                                             | O                | ◎ (20°C)<br>X (Gas) | X          |
| Ammonia (wet)       | X                                      | X                | X                                             | O                | ◎ (20°C)<br>X (Gas) | X          |
| Ammonia (liquid)    | X                                      | X                | X                                             | -                | ◎                   | X          |
| Iron chloride       | X                                      | O                | O                                             | X                | △                   | -          |
| Potassium hydroxide | O                                      | O                | O                                             | -                | -                   | -          |
| Calcium chloride    | X                                      | O                | O                                             | △                | O                   | -          |
| Calcium hydroxide   | O                                      | ◎                | ◎                                             | O                | -                   | O          |
| Sodium hydroxide    | O                                      | O                | O                                             | -                | ◎                   | -          |
| Sulfur (dry)        | ◎                                      | O                | O                                             | △                | -                   | O          |
| Sulfur (wet)        | X                                      | X                | X                                             | △                | -                   | O          |

### Solvent

| Material                      | SO#50SP2<br>SO#50SP8                   | SO#50B           | SO#50SP5<br>SO#50SP7<br>SO#50SP13<br>SO#50AIB | SO#50F           | SO#50S45C    | Polyacetal |
|-------------------------------|----------------------------------------|------------------|-----------------------------------------------|------------------|--------------|------------|
|                               | <i>High strength<br/>brass casting</i> | <i>Red brass</i> | <i>Alu-bronze</i>                             | <i>Grey cast</i> | <i>Steel</i> |            |
| Acetone                       | ◎                                      | ◎                | ◎                                             | O                | ◎            | △          |
| Benzene                       | -                                      | -                | -                                             | -                | -            | △          |
| Ethylene glycol               | O                                      | ◎                | ◎                                             | △                | -            | -          |
| Carbon tetrachloride<br>(dry) | ◎                                      | ◎                | ◎                                             | X                | ◎            | -          |
| Carbon tetrachloride<br>(wet) | X                                      | O                | O                                             | X                | -            | -          |
| Methyl alcohol                | ◎                                      | ◎                | ◎                                             | O                | O            | △          |
| Toluene                       | ◎                                      | ◎                | ◎                                             | O                | -            | -          |

| Explanation            |                      |             |
|------------------------|----------------------|-------------|
| ◎: Preferred           | O: no problem in use | △: Affected |
| X: Not allowed for use | -: unknown           |             |

## Chemical resistance

### Grease and others

| Material      | SO#50SP2<br>SO#50SP8                   | SO#50B           | SO#50SP5<br>SO#50SP7<br>SO#50SP13<br>SO#50AIB | SO#50F           | SO#50S45C    | Polyacetal |
|---------------|----------------------------------------|------------------|-----------------------------------------------|------------------|--------------|------------|
|               | <i>High strength<br/>brass casting</i> | <i>Red brass</i> | <i>Alu-bronze</i>                             | <i>Grey cast</i> | <i>Steel</i> |            |
| Gasoline      | ◎                                      | ◎                | ◎                                             | ○                | ◎            | ○          |
| Diesel        | -                                      | -                | -                                             | -                | -            | ○          |
| Crude oil     | △                                      | ○                | ○                                             | ○                | ○            | -          |
| Lacquer       | ◎                                      | ◎                | ◎                                             | △                | -            | -          |
| Kerosene      | ◎                                      | ◎                | ◎                                             | ○                | ◎            | -          |
| Vegetable oil | ◎                                      | ◎                | ◎                                             | △                | -            | -          |
| Lubricants    | ◎                                      | ◎                | ◎                                             | ◎                | ◎            | ○          |
| Heavy oil     | ○                                      | ◎                | ◎                                             | ○                | ○            | -          |
| Animal oil    | ◎                                      | ◎                | ◎                                             | -                | -            | -          |

| Explanation            |                      |             |
|------------------------|----------------------|-------------|
| ◎: Preferred           | ○: no problem in use | △: Affected |
| X: Not allowed for use | -: unknown           |             |

## Maintenance and lubrication

Before inserting the sliding elements, clear the mounting surfaces of the housing. An oil film on the back surface will make it easier to mount the bearing. Before mounting the axle, lubricate the sliding surfaces with a light greasy film to avoid wear of the inlet and to activate the solid lubricant.

The following greases should be preferred:

|                               |         |       |                                        |
|-------------------------------|---------|-------|----------------------------------------|
| ELKALUB GLS 364               | ELKALUB | 120°C | For the food industry                  |
| ELKALUB GLS 595/N2            | ELKALUB | 300°C | For the food industry                  |
| ELKALUB GLS 993 H1            | ELKALUB | 150°C | For the food industry                  |
| GLEITMO 805                   | FUCHS   | 110°C |                                        |
| ALTEMP QNB 50                 | KLÜBER  | 150°C |                                        |
| Klüberalfa DH 3-350           | KLÜBER  | 230°C |                                        |
| Klüberfood NH1 CH 2-150       | KLÜBER  | 250°C | For the food & pharmaceutical industry |
| Klübertemp GR AR 555          | KLÜBER  | 250°C |                                        |
| PARALIQ P 68                  | KLÜBER  | 100°C | For the food & pharmaceutical industry |
| Gadus S2 V100 2               | SHELL   | 130°C |                                        |
| Gadus S3 V100 2               | SHELL   | 160°C |                                        |
| Multi-purpose grease Nr.12511 | PRESSOL | 80°C  |                                        |

**The greases have to be free of Additives like MoS2 (molybdenum disulfide) and EP.**

The work to be carried out is usually limited to an inspection of the wear in the period from ½ to 2 years, depending on the duration of use and load. After each disassembly, a single re-greasing should be carried out, but the sintered sliding film of solid lubricant should not be removed. Continuous introduction of lubricant is not necessary, as the parts are maintenance-free under consideration of the application criteria for sliding elements made of bronze with solid lubricant.

## Transport and storage

The parts are to be stored dust-free and dry, mechanical damages during transport and storage are to be avoided. Contact with organic and inorganic solvents must also be prevented, as this may destroy the solid lubricant.

