

## PacDrive™ SH Servo Drives

High dynamic AC servomotors

The AC servomotors of the SH series meet the highest requirements for dynamism and accuracy. Five flange sizes with different lengths each offer the right solution for almost every application. The new winding technology based on salient poles enables a compact size and reduces the production costs compared to classical motors. Thanks to the low moment of inertia and the small cogging torque the SH motors meets all requirements regarding accuracy, dynamics and cost efficiency.

The SH servomotors are designed to be compatible to the well known SM motors and are available in five different flange sizes:

- SH-055 (March 2006)
- SH-070
- SH-100
- SH-140
- SH-205 (March 2006)

The technical data at a glance:

- designed to meet the highest requirements for dynamism and accuracy
- new winding technology based on salient poles
- compact size
- high power density
- low rotor inertia
- small cogging torque
- high resistance against winding damages



|                 |                        |    |
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|                 | Product ID Code        | 12 |

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This Technical Data Sheet does not replace the Operating manual.

For a complete description of the PacDrive Controller see the Operating manual PacDrive Controller

For planning and project activities see the PacDrive Projecting manual

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## Overview

### Overview of the motor standstill torque

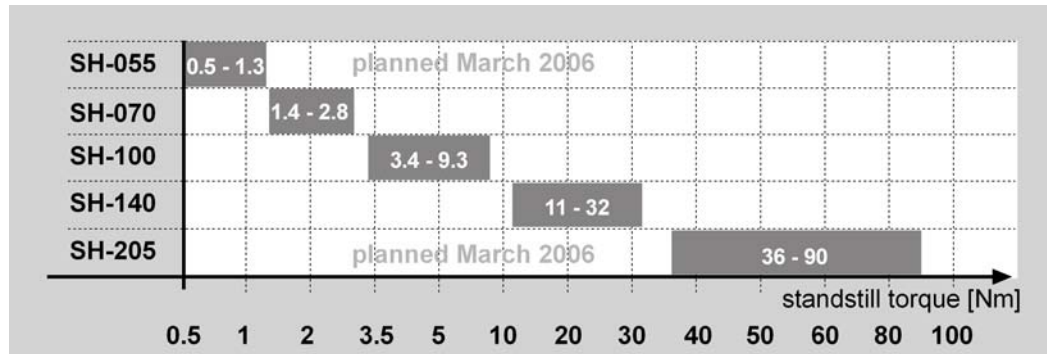


Fig. 1-1: List of the SH motor standstill torque

| Type          | Flange<br>[mm] | Bolt circle<br>diameter<br>[mm] | Pilot<br>diameter<br>[mm] | Shaft<br>diameter<br>[mm] | Standstill<br>torque<br>[Nm] | Rating<br>speed<br>[min <sup>-1</sup> ] | Rotor<br>inertia<br>[kgcm <sup>2</sup> ] |
|---------------|----------------|---------------------------------|---------------------------|---------------------------|------------------------------|-----------------------------------------|------------------------------------------|
| SH-055 80 005 | 55             | 63                              | 40                        | 9                         | 0.5                          | 8000                                    | 0.09                                     |
| SH-055 80 009 | 55             | 63                              | 40                        | 9                         | 0.9                          | 8000                                    | 0.14                                     |
| SH-055 80 013 | 55             | 63                              | 40                        | 9                         | 1.3                          | 8000                                    | 0.19                                     |
| SH-070 60 010 | 70             | 75                              | 60                        | 11/14                     | 1.4                          | 6000                                    | 0.25                                     |
| SH-070 60 020 | 70             | 75                              | 60                        | 11/14                     | 2.1                          | 6000                                    | 0.41                                     |
| SH-070 60 030 | 70             | 75                              | 60                        | 11/14                     | 2.8                          | 6000                                    | 0.58                                     |
| SH-100 50 030 | 100            | 115                             | 95                        | 19/24                     | 3.4                          | 5000                                    | 1.40                                     |
| SH-100 40 060 | 100            | 115                             | 95                        | 19/24                     | 5.5                          | 4000                                    | 2.31                                     |
| SH-100 40 080 | 100            | 115                             | 95                        | 19/24                     | 7.8                          | 4000                                    | 3.22                                     |
| SH-100 30 100 | 100            | 115                             | 95                        | 19/24                     | 9.3                          | 3000                                    | 4.22                                     |
| SH-140 30 120 | 100            | 165                             | 130                       | 24                        | 11.4                         | 3000                                    | 7.41                                     |
| SH-140 30 200 | 100            | 165                             | 130                       | 24                        | 19.2                         | 3000                                    | 12.68                                    |
| SH-140 30 270 | 100            | 165                             | 130                       | 24                        | 25.4                         | 3000                                    | 17.94                                    |
| SH-140 30 330 | 100            | 165                             | 130                       | 24                        | 32.1                         | 3000                                    | 23.70                                    |
| SH-205 30 360 | 205            | 215                             | 180                       | 38                        | 36                           | 3000                                    | 62                                       |
| SH-205 30 650 | 205            | 215                             | 180                       | 38                        | 65                           | 3000                                    | 98                                       |
| SH-205 30 900 | 205            | 215                             | 180                       | 38                        | 90                           | 3000                                    | 134                                      |

Table 1-1: General technical data



#### NOTE

Firmware version V00.15.XX or higher is required to operate the SH motor!

# Technical Data

## General Technical Data

| Designation                                                                | Description                                                                                                                           |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Motor type                                                                 | Rotary synchr. servomotor, permanently excited                                                                                        |
| Magnetic material                                                          | Neodymium-Iron-Boron (NdFeB)                                                                                                          |
| Insulation system<br>(according to DIN VDE 0530)                           | Heat class F (155 °C)                                                                                                                 |
| Mounting orientation<br>(according to IN 42 950)                           | IM B5, IM V1, IM V3                                                                                                                   |
| Protection class<br>(according to EN 60529)                                | IP65, in IM V3 shaft sealing required<br>IP67, with optional barrier pressure system                                                  |
| Cooling                                                                    | Self-cooling, rated ambient temperature up to 40 °C                                                                                   |
| Coating<br>Approvals                                                       | two component high solid expoxid resin coating<br>USDA - Incidental food contact<br>NFPA - Class A<br>NSF Standard 61 - Potable water |
| Temperature monitoring                                                     | Three-code thermocontact (CPTC) in the stator coil,<br>switching temperature 130 °C                                                   |
| Shaft end                                                                  | Cylindrical shaft end according to DIN 748 without<br>key way                                                                         |
| Concentric accuracy,<br>coaxiality, axial run<br>(according to DIN 42 955) | Tolerance N (normal)                                                                                                                  |
| Balancing class<br>(according to VDI 2060)                                 | G 2.5                                                                                                                                 |
| Built-in measuring system                                                  | SinCos® SKS 36 or SKM 36 (single - or multiturn<br>version with Hiperface® Interface)                                                 |
| Connection system                                                          | Cylindrical Connectors (IP67) turnable                                                                                                |

Table 1-2: General technical data

| Options                  | Description                                         |
|--------------------------|-----------------------------------------------------|
| Keyed shaft              | Keyed shaft according to DIN 6885 T1                |
| Brake                    | Electromagnetic permanent-magnet holding brake      |
| Shaft in stainless steel | Shaft in stainless steel with / without keyed shaft |
| Sealing Housing          | Barrier pressure System (IP67)                      |
| Shaft Sealing            | Viton radial shaft seal on the flange side          |
| Cooling                  | air and water cooling (in preparation)              |

Table 1-3: General technical data (Options)

## SH-070



Fig. 2-2: View of the SH-070 motor

## Technical Data

Winding data for 3 phase AC 400 V

| Reference Data                  | Abbrev.    | Unit                       | SH-070<br>60 010 | SH-070<br>60 020 | SH-070<br>60 030 |
|---------------------------------|------------|----------------------------|------------------|------------------|------------------|
| Standstill torque               | $M_0$      | Nm                         | 1.4              | 2.1              | 2.8              |
| Rating speed                    | $n_N$      | $\text{min}^{-1}$          | 6000             | 6000             | 6000             |
| Peak torque                     | $M_{\max}$ | Nm                         | 3.2              | 6.8              | 10.3             |
| Rotor moment of inertia         | $J_M$      | $\text{kgcm}^2$            | 0.25             | 0.41             | 0.58             |
| Weight                          | m          | kg                         | 2.1              | 2.8              | 3.6              |
| Number polepairs                | p          |                            | 3                | 3                | 3                |
| Voltage constant Ph-Ph (120°C)  | $K_E$      | $\text{V/kmin}^{-1}$       | 46               | 46               | 47               |
| Standstill current              | $I_0$      | A                          | 1.8              | 2.9              | 3.8              |
| Maximum current                 | $I_{\max}$ | A                          | 5.6              | 11.7             | 17.6             |
| Rated torque                    | $M_N$      | Nm                         | 1.3              | 1.7              | 2.1              |
| Rated power                     | $P_N$      | kW                         | 0.81             | 1.09             | 1.33             |
| Rated current                   | $I_N$      | $A_{\text{rms}}$           | 1.3              | 2.5              | 3.0              |
| Torque constant (120°C)         | $k_T$      | $\text{Nm}/A_{\text{rms}}$ | 0.80             | 0.73             | 0.74             |
| Winding resistance Ph-Ph (20°C) | $R_{U-V}$  | $\Omega$                   | 10.4             | 4.3              | 2.7              |
| Winding inductance Ph-Ph        | $L_{U-V}$  | mH                         | 43.3             | 21.1             | 14.7             |

Table 2-4: Technical Data SH-070

## Dimensions

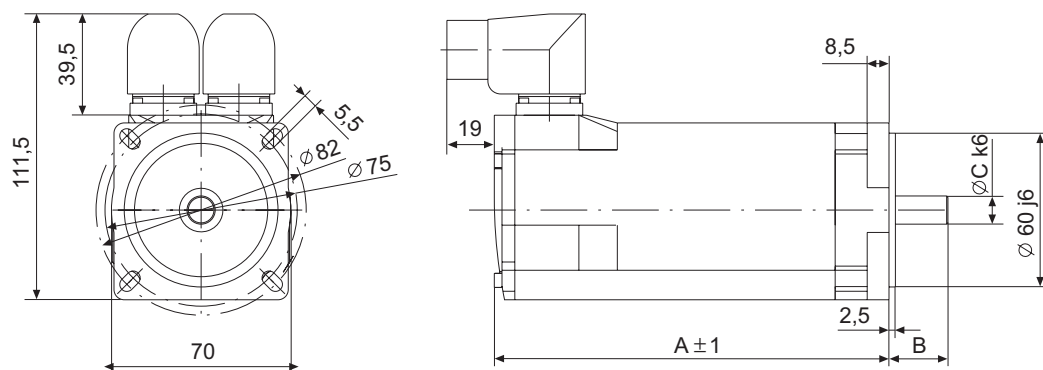


Fig. 2-3: Dimensional drawing of SH-070

| Dimensions | SH-070 60 010 | SH-070 60 020 | SH-070 60 030 |
|------------|---------------|---------------|---------------|
| A          | 154 mm        | 187 mm        | 220mm         |
| B          | 23 mm         | 23 mm         | 30 mm         |
| C          | 11 mm         | 11 mm         | 14 mm         |

Table 2-5: Dimensions of SH-070 without brake

| Dimensions | SH-070 60 010 | SH-070 60 020 | SH-070 60 030 |
|------------|---------------|---------------|---------------|
| A          | 180 mm        | 213 mm        | 254mm         |
| B          | 23 mm         | 23 mm         | 30 mm         |
| C          | 11 mm         | 11 mm         | 14 mm         |

Table 2-6: Dimensions of SH-070 with brake

**Tolerances** Shaft diameter: j6

Key way: Round end according to DIN 6885 T1, tolerance field N9.

## SH-100



Fig. 2-4: View of the SH-100 motor

## Technical Data

Winding data for 3 phase AC 400 V

| Reference Data                  | Abbrev     | Unit                       | SH-100<br>50 030 | SH-100<br>40 060 | SH-100<br>40 080 | SH-100<br>30 100 |
|---------------------------------|------------|----------------------------|------------------|------------------|------------------|------------------|
| Standstill torque               | $M_0$      | Nm                         | 3.4              | 5.5              | 7.8              | 9.3              |
| Rating speed                    | $n_N$      | $\text{min}^{-1}$          | 5000             | 4000             | 4000             | 3000             |
| Peak torque                     | $M_{\max}$ | Nm                         | 8.5              | 16.0             | 27.8             | 41.0             |
| Rotor moment of inertia         | $J_M$      | $\text{kgcm}^2$            | 1.40             | 2.31             | 3.22             | 4.22             |
| Weight                          | m          | kg                         | 4.3              | 5.8              | 7.5              | 9.2              |
| Number polepairs                | p          |                            | 4                | 4                | 4                | 4                |
| Voltage constant Ph-Ph (120°C)  | $K_E$      | $\text{V/kmin}^{-1}$       | 58               | 73               | 72               | 95               |
| Standstill current              | $I_0$      | A                          | 3.8              | 4.9              | 7.0              | 6.3              |
| Maximum current                 | $I_{\max}$ | A                          | 11.8             | 17.8             | 31.1             | 34.8             |
| Rated torque                    | $M_N$      | Nm                         | 2.6              | 4.4              | 5.0              | 7.6              |
| Rated power                     | $P_N$      | kW                         | 1.38             | 1.83             | 2.08             | 2.38             |
| Rated current                   | $I_N$      | $A_{\text{rms}}$           | 2.8              | 3.9              | 4.8              | 5.4              |
| Torque constant (120°C)         | $k_T$      | $\text{Nm}/A_{\text{rms}}$ | 0.92             | 1.14             | 1.12             | 1.50             |
| Winding resistance Ph-Ph (20°C) | $R_{U-V}$  | $\Omega$                   | 3.5              | 2.2              | 1.3              | 1.7              |
| Winding inductance Ph-Ph        | $L_{U-V}$  | mH                         | 18.9             | 12.9             | 8.4              | 6.7              |

Table 2-7: Technical Data SH-100

## Dimensions

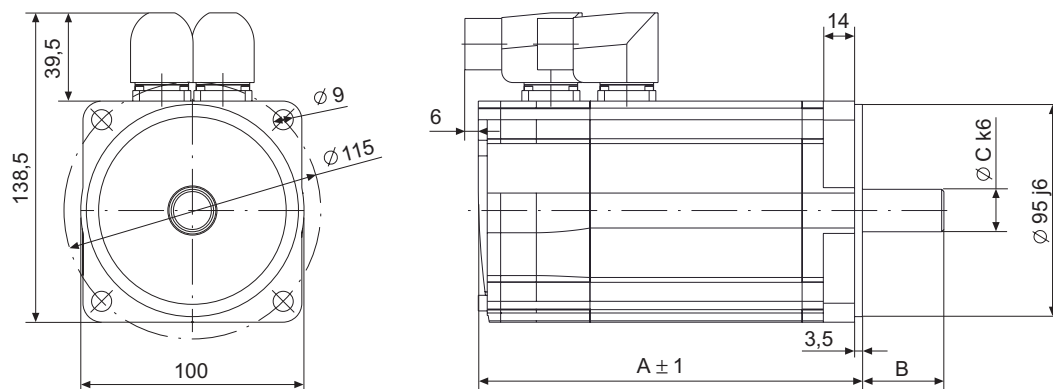


Fig. 2-5: Dimensional drawing of SH-100

| Dimensions | SH-100 50 030 | SH-100 40 060 | SH-100 30 080 | SH-100 30 100 |
|------------|---------------|---------------|---------------|---------------|
| A          | 169mm         | 205 mm        | 241 mm        | 277 mm        |
| B          | 40 mm         | 40 mm         | 40 mm         | 50 mm         |
| C          | 19 mm         | 19 mm         | 19 mm         | 24 mm         |

Table 2-8: Dimensions of SH-100 without brake

| Dimensions | SH-100 50 030 | SH-100 40 060 | SH-100 30 080 | SH-100 30 100 |
|------------|---------------|---------------|---------------|---------------|
| A          | 200mm         | 236 mm        | 272 mm        | 308 mm        |
| B          | 40 mm         | 40 mm         | 40 mm         | 50 mm         |
| C          | 19 mm         | 19 mm         | 19 mm         | 24 mm         |

Table 2-9: Dimensions of SH-100 with brake

**Tolerances** Shaft diameter: j6  
Key way: Round end according to DIN 6885 T1, tolerance field N9

## SH-140



Fig. 2-6: View of the SH-140 motor

## Technical Data

Winding data for 3 phase AC 400 V

| Reference Data                  | Abbrev     | Unit                       | SH-140<br>30 120 | SH-140<br>30 200 | SH-140<br>30 270 | SH-140<br>30 330 |
|---------------------------------|------------|----------------------------|------------------|------------------|------------------|------------------|
| Standstill torque               | $M_0$      | Nm                         | 11.4             | 19.2             | 24.4             | 32.1             |
| Rating speed                    | $n_N$      | $\text{min}^{-1}$          | 3000             | 3000             | 3000             | 3000             |
| Peak torque                     | $M_{\max}$ | Nm                         | 26.0             | 59.0             | 92.0             | 132.0            |
| Rotor moment of inertia         | $J_M$      | $\text{kgcm}^2$            | 7.41             | 12.68            | 17.94            | 23.70            |
| Weight                          | m          | kg                         | 11.9             | 16.6             | 21.3             | 26               |
| Number polepairs                | p          |                            | 5                | 5                | 5                | 5                |
| Voltage constant Ph-Ph (120°C)  | $K_E$      | $\text{V/kmin}^{-1}$       | 97               | 98               | 104              | 112              |
| Standstill current              | $I_0$      | A                          | 7.8              | 12.9             | 16.0             | 18.6             |
| Maximum current                 | $I_{\max}$ | A                          | 21.6             | 48.5             | 71.3             | 95.0             |
| Rated torque                    | $M_N$      | Nm                         | 8.4              | 11.6             | 12.4             | 12.5             |
| Rated power                     | $P_N$      | kW                         | 2.64             | 3.64             | 3.89             | 3.91             |
| Rated current                   | $I_N$      | $A_{\text{rms}}$           | 5.7              | 7.9              | 8.0              | 7.7              |
| Torque constant (120°C)         | $k_T$      | $\text{Nm/A}_{\text{rms}}$ | 1.46             | 1.48             | 1.58             | 1.71             |
| Winding resistance Ph-Ph (20°C) | $R_{U-V}$  | $\Omega$                   | 1.3              | 0.6              | 0.4              | 0.3              |
| Winding inductance Ph-Ph        | $L_{U-V}$  | mH                         | 14.7             | 7.2              | 5.0              | 4.0              |

Table 2-10: Technical Data SH-140

## Dimensions

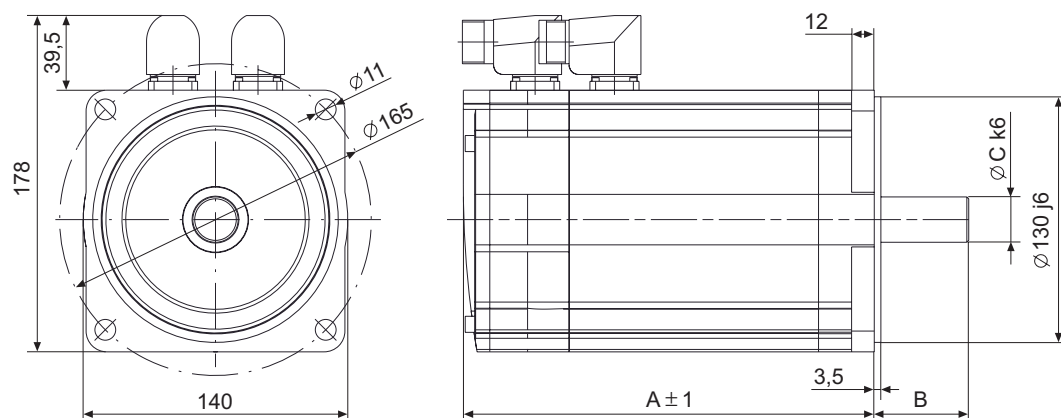


Fig. 2-7: Dimensional drawing of SH-140

| Dimensions | SH-140 30 120 | SH-140 30 200 |
|------------|---------------|---------------|
| A          | 218 mm        | 273 mm        |
| B          | 50 mm         | 50 mm         |
| C          | 24 mm         | 24 mm         |

Table 2-11: Dimensions of SH-140 without brake

| Dimensions | SH-140 30 120 | SH-140 30 200 |
|------------|---------------|---------------|
| A          | 256 mm        | 311 mm        |
| B          | 50 mm         | 50 mm         |
| C          | 24 mm         | 24 mm         |

Table 2-12: Dimensions of SH-140 with brake

**Tolerances** Shaft diameter: j6  
Key way: Round end according to DIN 6885 T1, tolerance field N9.

## Dimensions

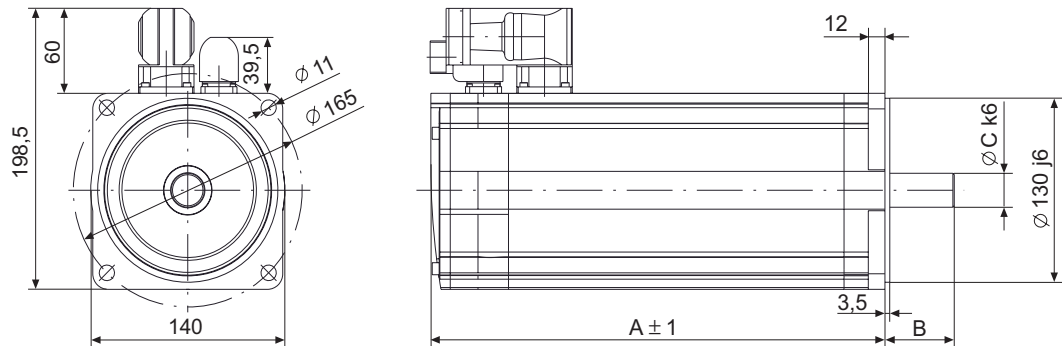


Fig. 2-8: Dimensional drawing of SH-140

| Dimensions | SH-140 30 270 | SH-140 30 330 |
|------------|---------------|---------------|
| A          | 328 mm        | 383 mm        |
| B          | 50 mm         | 50 mm         |
| C          | 24 mm         | 24 mm         |

Table 2-13: Dimensions of SH-140 without brake

| Dimensions | SH-140 30 270 | SH-140 30 330 |
|------------|---------------|---------------|
| A          | 366 mm        | 421 mm        |
| B          | 50 mm         | 50 mm         |
| C          | 24 mm         | 24 mm         |

Table 2-14: Dimensions of SH-140 with brake

**Tolerances** Shaft diameter: j6  
Key way: Round end according to DIN 6885 T1, tolerance field N9.

## Product ID code

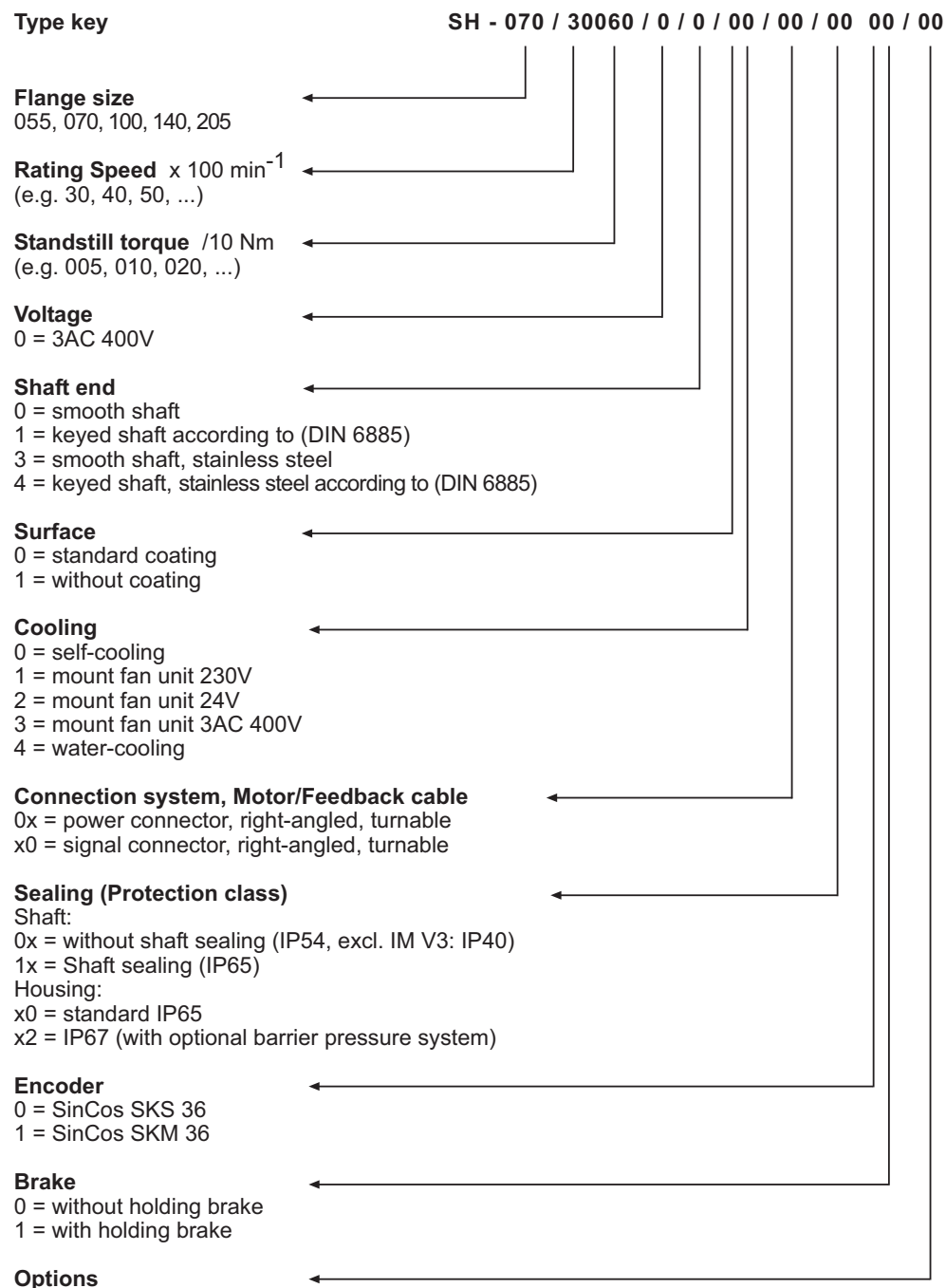


Fig. 2-9: Type key for SH motor



