

# KENDRION



**KENDRION** SOLUTIONS

## Servo Slim Line

Fail-safe spring-applied brake  
in a flat and space-saving design

PRECISION. SAFETY. MOTION.

# Our brakes – perfect for your safe application

KENDRION Industrial Brakes – this stands for excellent service and smart innovation, which we consistently use for the benefit of our customers:

## Strong know-how

Our specialists develop pioneering permanent magnet and spring-applied brakes. On the one hand, they use the bundled know-how in the team; on the other hand, they maintain a dialogue with customers in order to always keep trends and requirements in mind. With INTORQ as a new addition to KENDRION, we have once again consistently expanded our range of spring-applied brakes and clutches for you. So we can find the right solution for every requirement.



## Complete product portfolio

Electromagnetic brakes and clutches as well as perfectly matched accessories: With us you will find an exceptionally large selection of quickly available off-the-shelf products that can be put together in a modular system and the best expertise for customer-specific solutions.

## Dynamic innovative power

Worldwide, more than 50 specialists in our research and development department work in agile teams to create convincing product solutions for tomorrow.

## In-depth market knowledge

We are very familiar with our focus markets – thanks to in-depth experience and research, but also thanks to long-standing customer relationships based on partnership at eye level.

## International power

Committed and competent employees, production sites in Germany, United States and India as well as a large number of certified sales partners all over the world make us a strong partner for you!

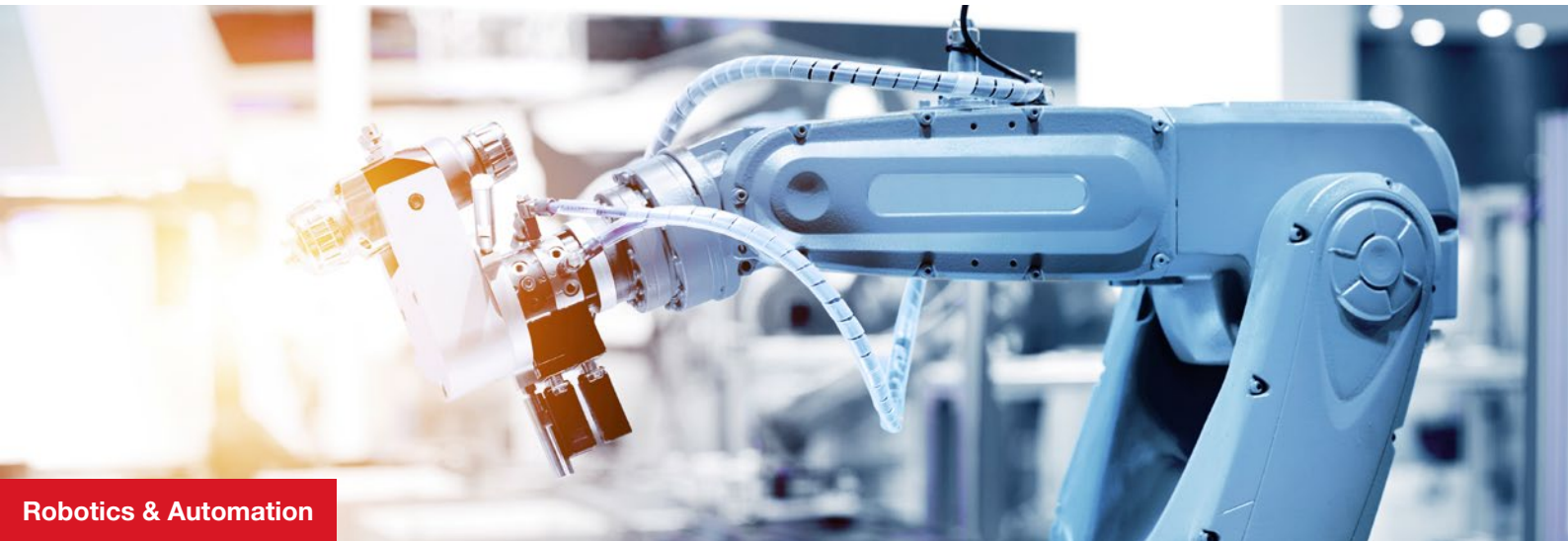
# The Servo Slim Line

## On the point

- Fail-safe spring-applied brake
- Holding brake with emergency stop function
- A total of 7 different sizes available
- Torque range from 0.27 Nm to 11 Nm
- Standard temperature range from -10°C to +100°C



## Suitable for the use of:



Robotics & Automation



Automated Guided Vehicles (AGVs)



Medical technology

# Brake types

The two standard brake versions, Type 500 and Type 502, were specially developed for integration into compact hollow-shaft motors. Type 702 is particularly well suited for use in AGV wheel drives. Thanks to its space-saving design, the Servo Slim Line is especially suitable for applications where optimal use of the installation space is essential. We would be happy to discuss your individual requirements and develop a customized solution.

## Brake type 500

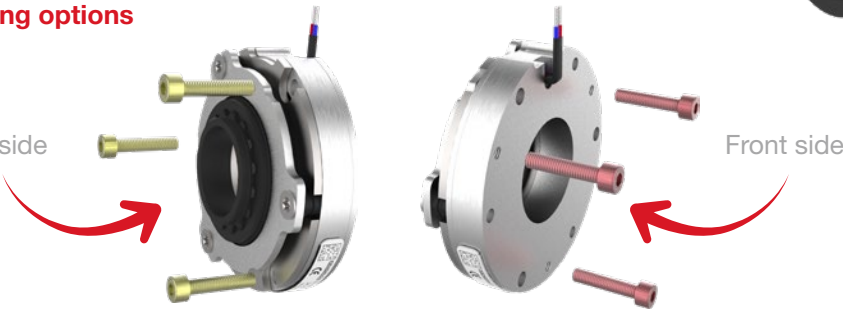
### Hub with large outside diameter

- Brake can be guided over the hub **only** on the flange side
- Mounting of the brake on the motor bearing shield is possible on the flange and front side
- Suitable for larger shaft diameters (hollow shaft)

### Mounting options

Flange side

Front side



## Brake type 502 / 702

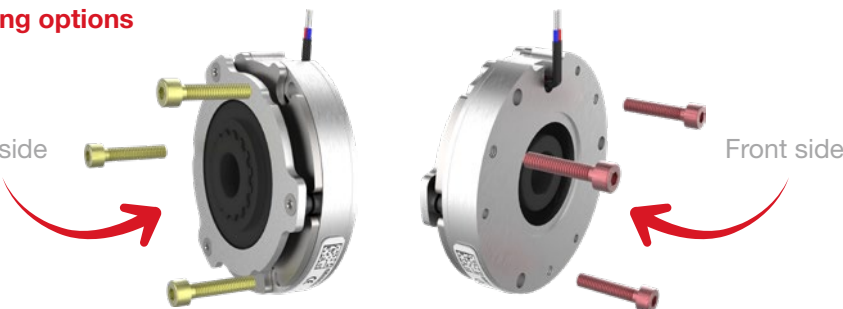
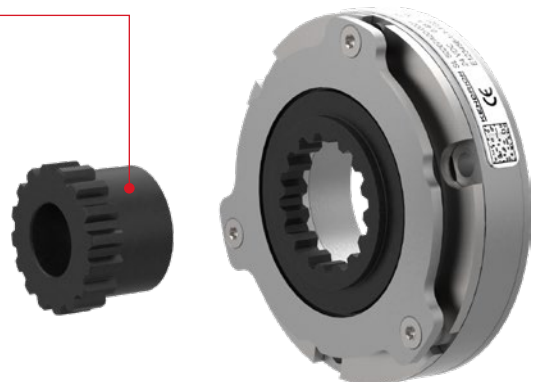
### Hub with small outside diameter

- Brake can be guided over the hub **on both** the flange and the front side
- Mounting of the brake on the motor bearing shield is possible on the flange and front side
- Suitable for small to medium shaft diameters

### Mounting options

Flange side

Front side



# Hub types

The hub is the connecting element between the motor shaft and the brake. The hubs of the Servo Slim Line offer various options in terms of hub length, hub diameter, keyway and noise reduction design. The hub type can be selected based on the specific installation conditions.

## Hub for brake type 500

### Hub with large outside diameter

- Short hub for press-fit connection
  - Large outside diameter
- 
- Short hub with keyway
  - Large outside diameter

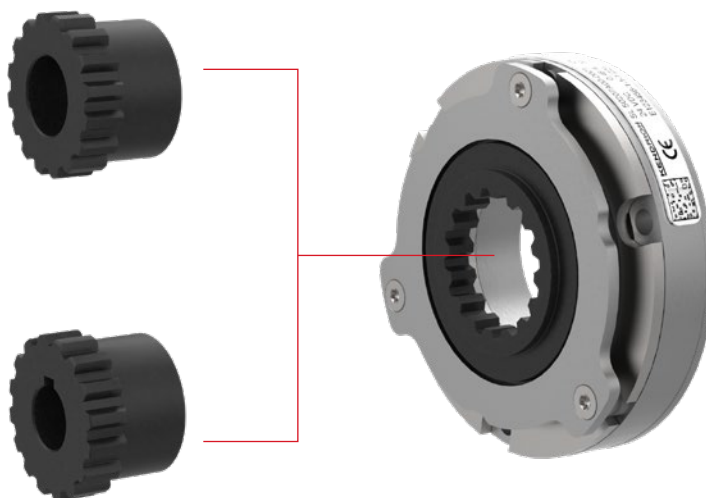


Also available with innovative noise reduction function. Get in touch with us.

## Hub for brake type 502 / 702

### Hub with small outside diameter

- Long hub for press-fit connection
  - Small outside diameter
  - Special version with set screws available on request
- 
- Long hub with keyway
  - Small outside diameter
  - Special version with set screws available on request



Also available with innovative noise reduction function. Get in touch with us.



## Maximum safety with minimum space requirements

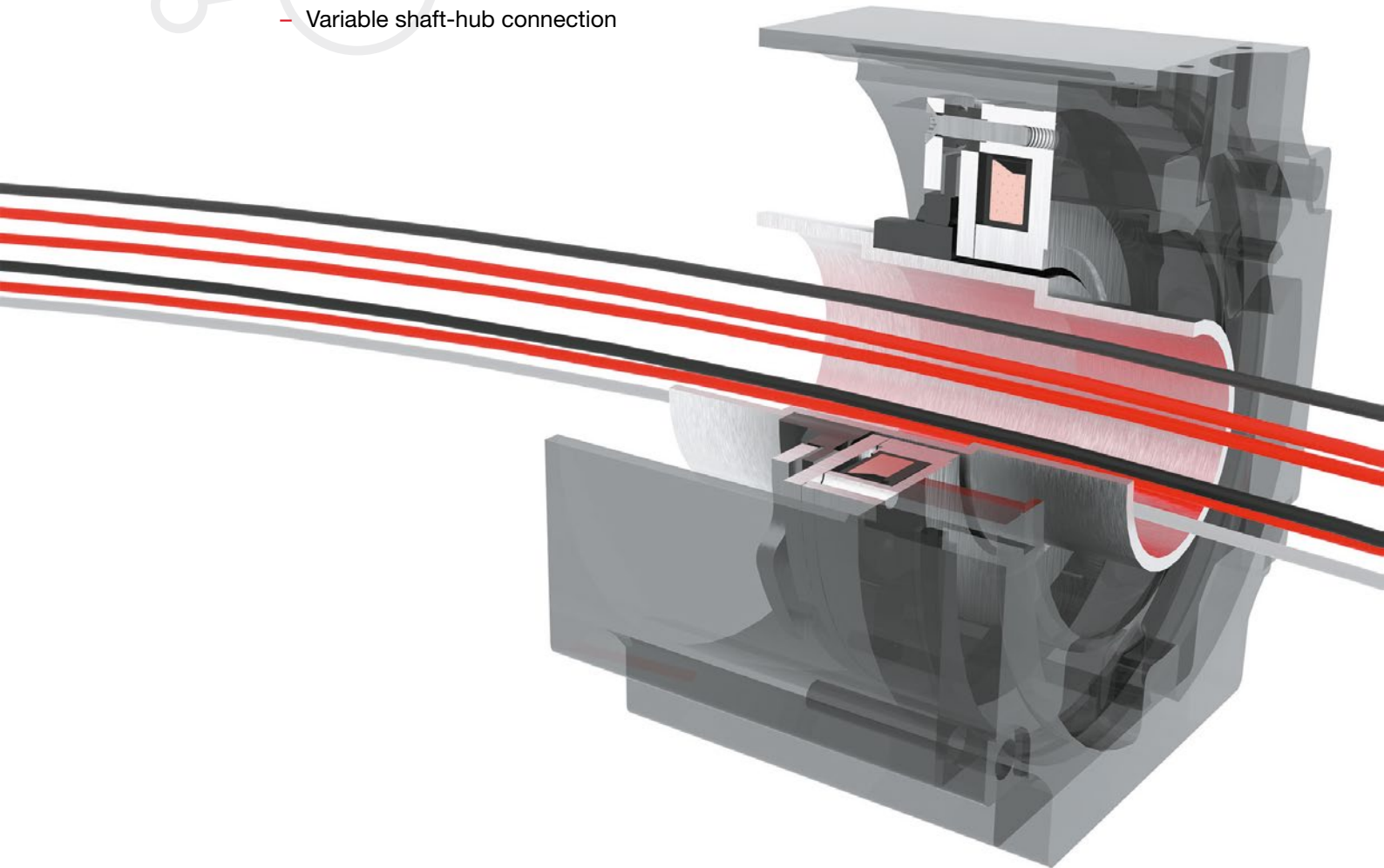
**Safety aspects are crucial issues in robot applications. After all, uncontrolled movements caused by control system or power failure must be avoided to prevent harm or damage to people and property.**

For decades Kendrion has been supplying brakes for industrial robots with loads higher than 20 kg. In order to also serve the rapidly growing market for smaller robots, Kendrion has developed the new flat spring-applied brake referred to as “Servo Slim Line”.

Kendrion’s Servo Slim Line flat spring-applied brake is perfectly tailored to the specific requirements in robotics and is designed for applications with payloads of up to about 20 kg. The slim single-disc brakes are flatter and lighter than the market standard in relation to their power density. Owing to their large inside diameter, they are ideal for hollow-shaft drives. These features make them the perfect choice for lightweight robots equipped with incorporated drives.

## Ideal for restricted space applications

- Designed for integrated installation in robot joints and hollow-shaft motors
- Simple and versatile installation options
- Variable shaft-hub connection



## Technical highlights

- High power density due to patented air gap adjustment
- Guaranteed minimum torque over entire life time
- Slim and space-saving design
- Flexible cable routing
- Fast opening and closing times
- Low weight

# Technical details

|                            |                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Product code / Types       | SL 500..A00 ; SL 502..A00                                                                                                                   |
| Operation mode             | Holding brake with emergency stop function                                                                                                  |
| Standard nominal voltage   | 24 VDC sizes 04 to 12<br>12 VDC size 03<br>(other ratings available on request)                                                             |
| Protection class           | IP00                                                                                                                                        |
| Thermal class              | F (155°C)                                                                                                                                   |
| Transmittable torque range | 0.27 Nm to 11 Nm                                                                                                                            |
| Duty cycle                 | 100% ED                                                                                                                                     |
| Nominal backlash           | 1°                                                                                                                                          |
| Ambient temperature        | -10°C to +100°C                                                                                                                             |
| Note                       | The general information on specification sheets and the relevant operating instructions must be observed. Subject to change without notice. |

| Brake size | Brake type |     | Min. transmittable torque <sup>1)</sup> | Static nominal torque <sup>2)</sup> | Nominal power      | Max. rotation speed <sup>3)</sup>     | Max. emergency stop rotation speed | Maximum switching energy per ES (Z=1) | Number of emergency stops | Switching times            |                     | Max. inertia friction disc incl. hub | Max. weight brake incl. hub |
|------------|------------|-----|-----------------------------------------|-------------------------------------|--------------------|---------------------------------------|------------------------------------|---------------------------------------|---------------------------|----------------------------|---------------------|--------------------------------------|-----------------------------|
|            |            |     | M <sub>4min</sub> [Nm]                  | M <sub>4N</sub> [Nm]                | P <sub>N</sub> [W] | n <sub>max</sub> [min <sup>-1</sup> ] | n [min <sup>-1</sup> ]             | W <sub>max</sub> [J]                  |                           | Closing time <sup>4)</sup> | Opening time        | J [kgcm <sup>2</sup> ]               | m [kg]                      |
|            |            |     |                                         |                                     |                    |                                       |                                    |                                       |                           | t <sub>cl</sub> [ms]       | t <sub>o</sub> [ms] |                                      |                             |
| 03         | 500        | –   | 0.27 <sup>5)</sup>                      | 0.38 <sup>5)</sup>                  | 5.8                | 8000                                  | 6000                               | 0.5                                   | 200<br>(Standard)         | 5                          | 25                  | 0.002                                | 0.1                         |
| 04         | 500        | 502 | 0.3                                     | 0.4                                 | 7.1                | 8000                                  | 6000                               | 5                                     |                           | 10                         | 30                  | 0.005                                | 0.12                        |
| 05         | 500        | 502 | 0.6                                     | 0.7                                 | 10.3               | 8000                                  | 5000                               | 20                                    |                           | 8                          | 30                  | 0.02                                 | 0.15                        |
| 07         | 500        | 502 | 1.7                                     | 2.4                                 | 11.4               | 8000                                  | 4000                               | 50                                    |                           | 9                          | 45                  | 0.09                                 | 0.32                        |
| 09         | 500        | –   | 4                                       | 5                                   | 14                 | 6000                                  | 3000                               | 250                                   |                           | 15                         | 100                 | 0.5                                  | 0.53                        |
| 10         | 500        | –   | 5                                       | 6.5                                 | 20                 | 6000                                  | 3000                               | 300                                   |                           | 15                         | 60                  | 1.3                                  | 0.68                        |
| 12         | 500        | –   | 11                                      | 15                                  | 27.2               | 5000                                  | 2500                               | 800                                   |                           | 30                         | 160                 | 2.2                                  | 1.7                         |

<sup>1)</sup> Minimum guaranteed static torque over lifetime (factory grinded-in and torque tested brakes)

<sup>2)</sup> Identification of the transmittable (static) torque level

<sup>3)</sup> Without emergency stop

<sup>4)</sup> Measured with parallel varistor (fast turn-off)

<sup>5)</sup> Overexcitation mode 24/12 V

# Dimensions

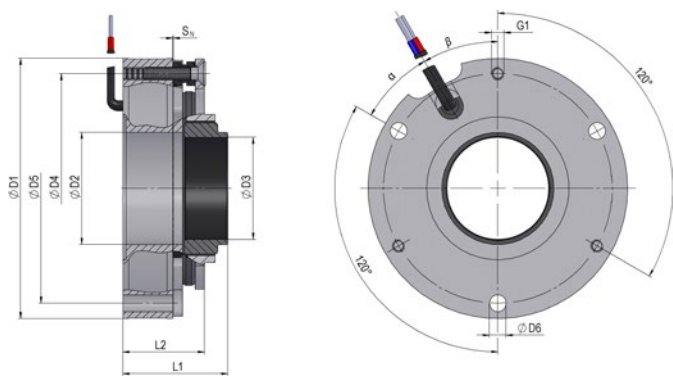
| Brake size | Brake type |     | Ø D <sub>1</sub><br>[mm] | Ø D <sub>2</sub><br>[mm] | Ø D <sub>3</sub><br>[mm] |                  |                      |                  |                         |                  |                      |                  | Ø D <sub>4</sub><br>[mm] | Ø D <sub>5</sub><br>[mm] | D <sub>6</sub><br>[mm] | G <sub>1</sub><br>[mm] | α<br>[°] | β<br>[°] | L <sub>1</sub><br>[mm] |          | L <sub>2</sub><br>[mm] | S <sub>N</sub> <sup>1)</sup><br>[mm] |
|------------|------------|-----|--------------------------|--------------------------|--------------------------|------------------|----------------------|------------------|-------------------------|------------------|----------------------|------------------|--------------------------|--------------------------|------------------------|------------------------|----------|----------|------------------------|----------|------------------------|--------------------------------------|
|            |            |     |                          |                          | Type 500                 |                  |                      |                  | Type 502                |                  |                      |                  |                          |                          |                        |                        |          |          | Type 500               | Type 502 |                        |                                      |
|            |            |     |                          |                          | Press-fit <sup>2)</sup>  |                  | Keyway <sup>3)</sup> |                  | Press-fit <sup>2)</sup> |                  | Keyway <sup>3)</sup> |                  |                          |                          |                        |                        |          |          |                        |          |                        |                                      |
|            |            |     |                          |                          | Min.                     | Max.             | Min.                 | Max.             | Min.                    | Max.             | Min.                 | Max.             |                          |                          |                        |                        |          |          |                        |          |                        |                                      |
| 03         | 500        | –   | 32                       | 9                        | 6 <sup>H7</sup>          | 8 <sup>H7</sup>  | 6 <sup>H7</sup>      | 7 <sup>H7</sup>  | –                       | –                | –                    | –                | 28                       | 28                       | 2 x 2.3                | –                      | 120      | –        | 16.3                   | –        | 16                     | 0.08 ±0.02                           |
| 04         | 500        | 502 | 38                       | 11.5                     | 6 <sup>H7</sup>          | 10 <sup>H7</sup> | 6 <sup>H7</sup>      | 9 <sup>H7</sup>  | 6 <sup>H7</sup>         | 6 <sup>H7</sup>  | –                    | –                | 32.6                     | 34.5                     | 2 x 2.3                | –                      | 60       | –        | 17                     | 16.5     | 16                     | 0.08 ±0.02                           |
| 05         | 500        | 502 | 51                       | 22                       | 8 <sup>H7</sup>          | 20 <sup>H7</sup> | 8 <sup>H7</sup>      | 13 <sup>H7</sup> | 6 <sup>H7</sup>         | 12 <sup>H7</sup> | 6 <sup>H7</sup>      | 10 <sup>H7</sup> | 45                       | 45                       | 3 x 3.3                | 3 x M2.5               | 30       | 30       | 20.6                   | 17.4     | 16                     | 0.08 ±0.02                           |
| 07         | 500        | 502 | 69                       | 30                       | 9 <sup>H7</sup>          | 25 <sup>H7</sup> | 9 <sup>H7</sup>      | 20 <sup>H7</sup> | 8 <sup>H7</sup>         | 20 <sup>H7</sup> | 8 <sup>H7</sup>      | 13 <sup>H7</sup> | 61.5                     | 61.5                     | 3 x 4.4                | 3 x M4                 | 30       | 60       | 23.8                   | 20       | 18                     | 0.09 ±0.02                           |
| 09         | 500        | –   | 86                       | 43                       | 20 <sup>H7</sup>         | 40 <sup>H7</sup> | 20 <sup>H7</sup>     | 36 <sup>H7</sup> | –                       | –                | –                    | –                | 78.5                     | 78.5                     | 3 x 4.4                | 3 x M4                 | 30       | 60       | 28                     | –        | 21                     | 0.12 ±0.02                           |
| 10         | 500        | –   | 105                      | 58                       | 30 <sup>H7</sup>         | 55 <sup>H7</sup> | 30 <sup>H7</sup>     | 44 <sup>H7</sup> | –                       | –                | –                    | –                | 97                       | 97                       | 3 x 4.4                | 3 x M4                 | 30       | 60       | 28                     | –        | 21                     | 0.15 +0.02 / -0.03                   |
| 12         | 500        | –   | 127                      | 63                       | 30 <sup>H7</sup>         | 60 <sup>H7</sup> | 30 <sup>H7</sup>     | 50 <sup>H7</sup> | –                       | –                | –                    | –                | 116                      | 116                      | 3 x 4.4                | 3 x M4                 | 45       | 30       | 35.5                   | –        | 29.3                   | 0.17 +0.02 / -0.03                   |

<sup>1)</sup> Nominal air gap

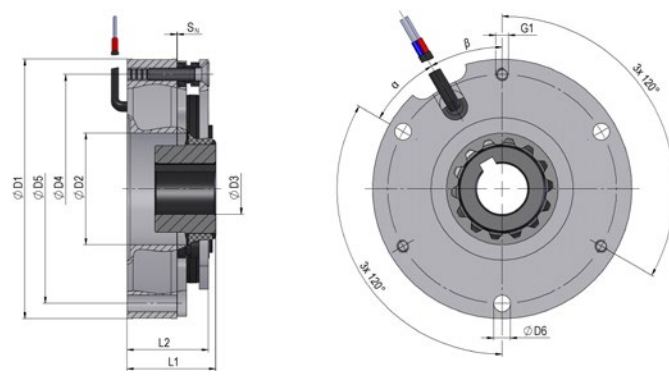
<sup>2)</sup> Press-fit connection on request

<sup>3)</sup> Keyway on request (to DIN 6885-1)

## Brake type 500



## Brake type 502



Can't find the  
right brake?  
Contact us!



## Maximum endurance and precision for AGV wheel drives

**In the world of automated logistics, the efficient utilization of deployed autonomous transport systems is crucial. The technical limits are being pushed further and further. Safety brakes in wheel drives play a particularly important role in this.**

An AGV (Automated Guided Vehicle) is a driverless transport vehicle that autonomously moves goods in warehouses, production facilities, or logistics centers. It navigates using sensors and increases efficiency and precision by automating manual transport tasks. In hazardous situations, the AGV must come to a safe stop – this is where our Servo Slim Line spring-applied brake comes into play.

It is specially designed for AGV wheel drives and, thanks to its slim design, is ideal for tight installation spaces. Our brakes are tested under realistic AGV conditions and can be adapted to customer-specific load profiles. If the standard brake does not fit, we quickly and easily develop a suitable solution. Get in touch with us!

## Optimal for integration in AGV wheel drives

- Designed for integrated installation in AGV wheel drives
- Simple and versatile installation options
- Engineered for long service life under varying load profiles



## Technical highlights

- Energy-efficient and battery-friendly thanks to voltage reduction
- Slim and space-saving design
- Optimized torque for dynamic braking operations
- Extended service life due to high-performance friction lining
- Designed for load profiles with low, medium, and high intensity
- Low weight

# Technical details

|                            |                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Product code / Types       | SL 702..A00                                                                                                                                 |
| Operation mode             | Holding brake with emergency stop function                                                                                                  |
| Standard nominal voltage   | 48 VDC (Over excitation voltage)<br>24 VDC (Holding voltage)<br>(other ratings available on request)                                        |
| Protection class           | IP00                                                                                                                                        |
| Thermal class              | F (155°C)                                                                                                                                   |
| Transmittable torque range | 0.8 Nm to 4.4 Nm                                                                                                                            |
| Duty cycle                 | 100% ED                                                                                                                                     |
| Nominal backlash           | 1°                                                                                                                                          |
| Ambient temperature        | -10°C to +100°C                                                                                                                             |
| Note                       | The general information on specification sheets and the relevant operating instructions must be observed. Subject to change without notice. |

| Brake size | Brake type | Static nominal torque <sup>1)</sup> | Dynamic nominal torque <sup>2)</sup> | Nominal power      | Max. rotation speed <sup>3)</sup>     | Max. emergency stop rotation speed <sup>5)</sup> | Maximum switching energy per ES p (Z=1) <sup>5)</sup> | Number of emergency stops <sup>5)</sup> | Switching times            |              | Max. inertia friction disc incl. hub | Max. weight brake incl. hub |
|------------|------------|-------------------------------------|--------------------------------------|--------------------|---------------------------------------|--------------------------------------------------|-------------------------------------------------------|-----------------------------------------|----------------------------|--------------|--------------------------------------|-----------------------------|
|            |            | M <sub>4N</sub> [Nm]                | M <sub>2N</sub> [Nm]                 | P <sub>N</sub> [W] | n <sub>max</sub> [min <sup>-1</sup> ] | n [min <sup>-1</sup> ]                           | W <sub>max</sub> [J]                                  |                                         | Closing time <sup>4)</sup> | Opening time | J [kgcm <sup>2</sup> ]               | m [kg]                      |
| 05         | 702        | 0.8                                 | 0.8                                  | 10.3               | 8000                                  | 5000                                             | 500                                                   | 840                                     | 8                          | 30           | 0.02                                 | 0.15                        |
| 07         | 702        | 2.4                                 | 2.4                                  | 11.4               | 8000                                  | 5000                                             | 1000                                                  |                                         | 9                          | 45           | 0.09                                 | 0.32                        |
| 09         | 702        | 4.4                                 | 4.4                                  | 14                 | 6000                                  | 5000                                             | 2000                                                  |                                         | 15                         | 50           | 0.5                                  | 0.53                        |

<sup>1)</sup> Identification of the transmittable (static) torque level

<sup>2)</sup> Identification of the switching torque level (dynamic torque)

<sup>3)</sup> Without emergency stop

<sup>4)</sup> Measured with parallel varistor (fast turn-off)

<sup>5)</sup> Overexcitation mode 48/24 V according load profile

| Brake size | Brake type | Ø D <sub>1</sub><br>[mm] | Ø D <sub>2</sub><br>[mm] | Typ 702                 |                  |                      |                  | Ø D <sub>4</sub><br>[mm] | Ø D <sub>5</sub><br>[mm] | D <sub>6</sub><br>[mm] | G <sub>1</sub><br>[mm] | α<br>[°] | β<br>[°] | L <sub>1</sub><br>[mm] | L <sub>2</sub><br>[mm] | S <sub>N</sub> <sup>1)</sup><br>[mm] |
|------------|------------|--------------------------|--------------------------|-------------------------|------------------|----------------------|------------------|--------------------------|--------------------------|------------------------|------------------------|----------|----------|------------------------|------------------------|--------------------------------------|
|            |            |                          |                          | Press-fit <sup>2)</sup> |                  | Keyway <sup>3)</sup> |                  |                          |                          |                        |                        |          |          |                        |                        |                                      |
|            |            |                          |                          | Min.                    | Max.             | Min.                 | Max.             |                          |                          |                        |                        |          |          |                        |                        |                                      |
| 05         | 702        | 51                       | 22                       | 6 <sup>H7</sup>         | 12 <sup>H7</sup> | 6 <sup>H7</sup>      | 10 <sup>H7</sup> | 45                       | 45                       | 3 x 3.3                | 3 x M2.5               | 30       | 30       | 20.6                   | 16                     | 0.08 ±0.02                           |
| 07         | 702        | 69                       | 30                       | 8 <sup>H7</sup>         | 20 <sup>H7</sup> | 8 <sup>H7</sup>      | 13 <sup>H7</sup> | 61.5                     | 61.5                     | 3 x 4.4                | 3 x M4                 | 30       | 60       | 23.8                   | 18                     | 0.09 ±0.02                           |
| 09         | 702        | 86                       | 42                       | 14 <sup>H7</sup>        | 25 <sup>H7</sup> | 12 <sup>H7</sup>     | 20 <sup>H7</sup> | 78.5                     | 78.5                     | 3 x 4.4                | 3 x M4                 | 30       | 60       | 28                     | 22                     | 0.12 ±0.02                           |

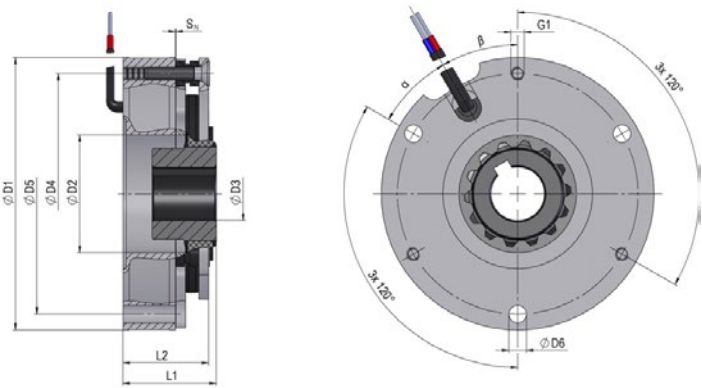
<sup>1)</sup> Nominal air gap

<sup>2)</sup> Press-fit connection on request

<sup>3)</sup> Keyway on request (to DIN 6885-1)

# Dimensions and load profile

## Brake type 702

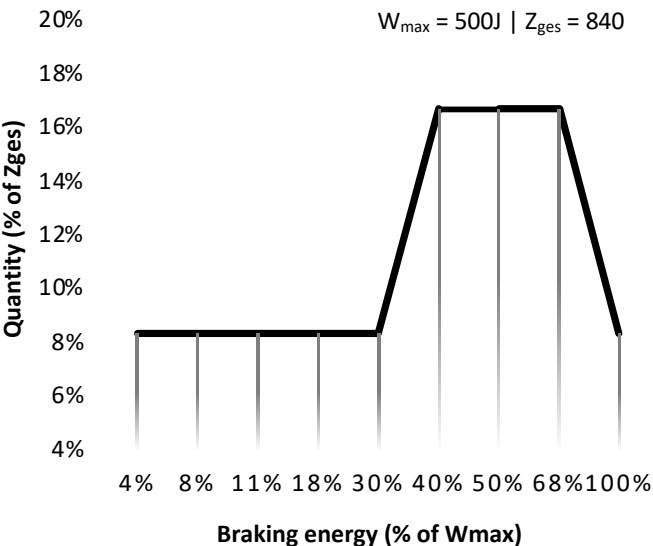


## It all depends on the brake

Depending on the size and maximum permitted load unpredictable situations can occur over the lifetime of the vehicle in which the vehicle and its load must be stopped safely. Our brakes ensure that the AGV does not get out of control when braking. They are designed in such a way that a maximum dynamic braking torque is not exceeded. In accordance with our specification the user can plan the design of the braking times and distances very precisely. Of course the important holding torques of the brake are designed in such a way that a minimum value is always maintained and the AGV is held securely in the parked position.

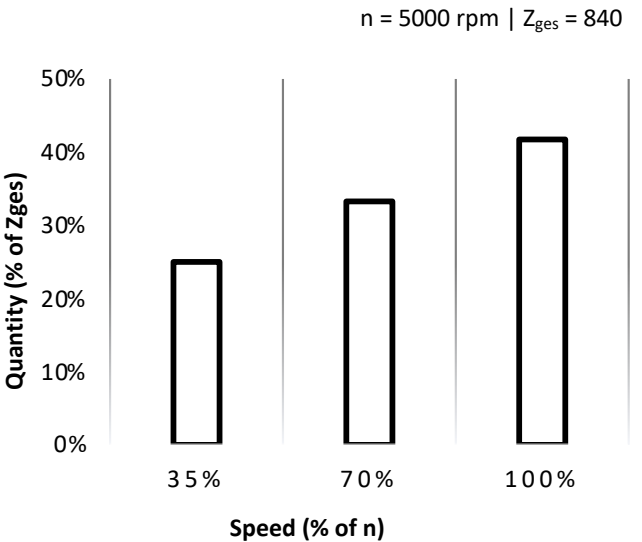
## Load profile with exemplary calculation

The two diagrams show a typical load profile of an AGV. The brake must be able to handle a high number of emergency stops ( $Z_{ges}$ ) with different braking energies ( $W$ ). Depending on the situation, the the AGV moves at different speeds, which has a direct influence on the rotational speed ( $n$ ) of the brake rotor. The used brake lining must meet the highest requirements. The magnet system and the control of the brake must also be designed in such a way that the maximum possible air gap can be achieved, as this is directly related to the achievable service life.



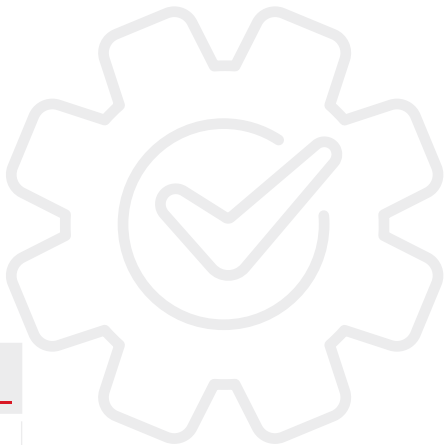
| Total energy [kJ] | Braking energy [J] | Quantity | n [rpm] |
|-------------------|--------------------|----------|---------|
| 1.4               | 20                 | 70       | 1750    |
| 6.3               | 90                 | 70       | 3517    |
| 10.5              | 150                | 70       | 3517    |
| 28                | 200                | 140      | 5000    |
| 35                | 250                | 140      | 3517    |
| 47.6              | 340                | 140      | 5000    |
| 35                | 500                | 70       | 5000    |
| 3.85              | 55                 | 70       | 1750    |
| 2.8               | 40                 | 70       | 1750    |

$\Sigma = 170 \text{ kJ}$



# Order code

Our order code helps you specify the desired brake variant.  
The code is composed of the hub type, brake size and brake version.



|            |    |   |                                       |                                 |    |   |    |                               |   |
|------------|----|---|---------------------------------------|---------------------------------|----|---|----|-------------------------------|---|
|            | SL | _ | 0                                     | _                               | _  | _ | A  | _                             | _ |
| Version    |    | 5 | Brake for compact drives and robotics |                                 |    |   |    |                               |   |
|            |    | 7 | Brake for AGV wheel drives            |                                 |    |   |    |                               |   |
| Hub type   |    |   | 0                                     | Hub with large outside diameter |    |   |    |                               |   |
|            |    |   | 2                                     | Hub with small outside diameter |    |   |    |                               |   |
| Brake size |    |   |                                       |                                 | 03 |   |    |                               |   |
|            |    |   |                                       |                                 | 04 |   |    |                               |   |
|            |    |   |                                       |                                 | 05 |   |    |                               |   |
|            |    |   |                                       |                                 | 07 |   |    |                               |   |
|            |    |   |                                       |                                 | 09 |   |    |                               |   |
|            |    |   |                                       |                                 | 10 |   |    |                               |   |
|            |    |   |                                       |                                 | 12 |   |    |                               |   |
| Version    |    |   |                                       |                                 |    |   | 00 | Standard series               |   |
|            |    |   |                                       |                                 |    |   | XY | Customized version on request |   |

## Example

SL 5 0 2 0 5 A 0 0

Servo Slim Line with small hub, size 05, standard series

# Customized solutions – tailored exactly to your needs

**Automation solutions have become an indispensable part of industry and everyday life. In this context, it is often the brakes that ensure safety: They hold loads and brake reliably in an emergency.**

Just as automation continues to evolve, brakes must also face higher demands – forward-looking products are in demand. At the same time, quality and safety must be unconditionally guaranteed. This is a challenge that Kendrion Industrial Brakes meets with passion and care.



When it comes to developing customer-specific solutions, we have three aces up our sleeves:

- With our **new agile organization**, we respond much faster to customer requests.
- Our **modularly developed products** enable new configurations without complete redevelopment.
- The **global structure of our organization** bundles competencies and ensures valuable knowledge transfer.

This makes us a competent and reliable partner for our customers – starting with industry-savvy consulting, through product development with practical experience, to uncompromising quality assurance.



We will find the  
solution that suits  
you best!



**KENDRION**

**Kendrion (Villingen) GmbH**

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**PRECISION. SAFETY. MOTION.**