Electromagnetic clutches and brakes

INTORQ 14.105 und 14.115
7.5 – 480 Nm

www.intorq.com
The INTORQ brand stands for reliable brake solutions with the highest product standards. INTORQ products are used in a very diverse range of applications, from brake motors and industrial trucks to hoists, cranes and wind turbines. We can create the right solution for you and your drive – individually and reliably.

The INTORQ module system offers numerous variants that can be used in many motors and geared motors, setting standards worldwide. We have been increasing our international presence step by step, establishing sites in Shanghai, Atlanta and Pune. So our network of sales and service staff is close at hand all over the world, ready to support you.

**INTORQ at a glance**

- Electromagnetic brakes and clutches
- Flexibility with standard options as well as customised solutions
- Centralised product development and production located in Aerzen
- Fast response and delivery times globally thanks to production and warehousing in Shanghai, Atlanta and Pune.
- Over 50 million euros a year sales volume
- 800,000 units a year
- 13,000 square metres production area
- 250 employees
- Market leader with 63 sales partners in 49 countries
VERSATILE AND REALLY RELIABLE

INTORQ electromagnetic clutches and brakes transmit the drive torque or braking torque by friction in dry running conditions. When the DC voltage is applied, torque transmission is achieved free from torsional backlash. The prestressed annular spring on the armature assembly ensures release without residual torque on de-energisation.

The clutches and brakes can be used in any mounting position and are virtually maintenance-free. Depending on the friction energy used, the working air gap only needs to be checked (and corrected if necessary) at specific time intervals. Special machining of the friction surfaces ensures that the rated torques can be achieved after very few switching operations without a run-in period.

The catalogue will help you to select and order the electromagnetic brake and/or electromagnetic clutch you need.

**This catalogue contains:**
INTORQ 14.105 and INTORQ 14.115 with transmitted torques 7.5 – 480 Nm

**Example applications**
- Packing machines
- Automation technology
- Gate drives
- Folding and printing machines

Automation technology

Printing machines
Product key

Type
14.105 electromagnetic clutch
14.115 electromagnetic brake

Size
06, 08, 10, 12, 16, 20, 25

Stator type
1 – Flange-mounting type
3 – Type with bearings

Armature assembly type
1 – With external flange hub
2 – With internal flange hub (for brakes only)
3 – Without flange hub
5 – With flange hub on bearings (for clutches only)

Variants
Supply voltage
Rotor bore
Armature assembly bore
List of abbreviations

P [W] power
PN [W] Rated coil power at rated voltage and 20 °C
JLres [kgm²] moment of inertia of the load referred to the brake shaft
UN [V DC] Rated coil voltage
Ma [Nm] deceleration torque
Merf [Nm] required braking torque
MK [Nm] Rated torque of the brake at a relative speed of 100 r/min
ML [Nm] Load torque, torque that the static load produces at the motor shaft
Δn0 [r/min] Initial relative speed of the brake
Q [J] Heat/energy
QE [J] Maximum permissible friction work per switching cycle, thermal rating of the brake
Qemax [J] maximum permissible friction work during cyclic switching, depending on the operating frequency
Sh [1/h] Operating frequency, the number of repeated operations per unit time

Shmax [1/h] Maximum permissible operating frequency, depending on the friction work per operation
Shue [1/h] transitional operating frequency, thermal rating of the brake/clutch
sLN [mm] Rated air gap
t1 [s] Engagement time, the total of the reaction delay and torque rise time

t2 [s] Disengagement time, time from switching the stator until the torque has reduced to 0.1 Mk

t3 [s] Slipping time to standstill (after t11)
t11 [s] Delay time when connecting, time from disconnecting the voltage until the torque begins to rise

t12 [s] Rise time of braking torque, time from beginning of rise of torque until braking torque is reached
Electromagnetic clutches and brakes are used wherever rapid acceleration or deceleration of masses in motion is required.

This document describes powerful and reliable mass-produced products which have already been tried and tested in numerous applications.

**A complete range**
- 7 sizes
- Clutch/braking torques from 7.5 – 480 Nm

**Versatile**
- Suitable for any mounting position
- Clutches can be supplied as flange-mounted or shaft-mounted versions
- Various armature assembly types for clutches and brakes can be supplied to suit any application case

**Torque transmission**
- Friction transmission in dry running
- Immediately ready for operation
- Special machining of the friction surfaces ensures that the rated torques are achieved after very few switching operations without a run-in period, even when the product is new.

**Reliable**
- The certified ISO 9001 and ISO 14001 quality system provides the basis for consistently high-quality products
- Manufacture and testing to VDE 0580

**Low maintenance**
- Working air gap only has to be checked in relation to the friction energy used
- Wear adjustment only required at 2.5 times the rated air gap
- Asbestos-free friction linings with a low rate of wear and nitride hardened armature plates ensure a long service life and constant torques

**Release without detent torque**
- The prestressed annular spring on the armature assembly ensures release without residual torque on de-energisation

**Short and consistent operating times**
- The prestressed, backlash-free annular spring on the armature assembly enables short and constant operating times to be achieved, even with larger working air gaps

**Options**
- Special voltages and bores are available on request
Principle of operation

To generate the drive torque or braking torque, the stator coil is supplied with DC voltage and a magnetic field is generated. The magnetic attraction force pulls the armature plate on the armature assembly against the force of the prestressed spring across the air gap and towards the friction surface of the brake armature or rotor, thereby making torque available.

If the voltage supply is interrupted, the magnetic field will collapse and the prestressed annular spring will pull the armature plate back to its initial position.

Flange-mounted brakes

The stator and flange should be mounted centrally on the shaft. Two tolerated diameters are available for this purpose.

The clutch rotor is mounted on the shaft using a keyway connection and secured against axial movement. Mounting dimension "b" under "Dimensions" must be observed exactly.

Shaft-mounted clutches

If a suitable mounting surface for the flange stator is not available, a shaft-mounted clutch should be used. The stator is supported on the rotor. A pin, which engages in the anti-rotation tag with sufficient clearance, simply has to take up the bearing friction.

Torque is transmitted via a keyway connection as on flange-mounted clutches.

Armature assemblies

Type 1, 2 and 5 armature assemblies should be mounted on the shaft and secured against axial movement following precise setting of the working air gap sLN (see Dimensions). Armature assembly type 3 should be screwed to the element to be decelerated or accelerated (e.g. belt pulley) using the annular spring. See page 22 for the screws and lock washers to be used. Please make sure that the clearing holes for the rivet heads on the armature assembly are sufficiently large, so that the axial movement of the armature assembly is not restricted.
Selection

Dimensioning

Only the power to be transmitted is known (estimate)

\[ M_{\text{art}} = 9550 \cdot \frac{P}{n} \cdot K \leq M_K \]

Dynamic load \( M_a \) (negligible static load torque \( M_{\text{load}} \))

\[ M_{\text{art}} = M_a - K \leq M_K \]

Dynamic and static load \( M_a \) and \( M_L \)

\[ M_{\text{art}} = (M_a \pm M_L) - K \leq M_K \]

\[ M_{\text{art}} = \left( \frac{J \cdot n}{9,55} \left( t_3 - \frac{t_12}{2} \right) \right) - K \leq M_K \]

\[ M_{\text{art}} = \left( \frac{J \cdot n}{9,55} \left( t_3 + \frac{t_12}{2} \right) \right) + K \leq M_K \]

+\( M_L \) = shift/accelerate
-\( M_L \) = brake/decelerate

Only when lowering a load
-\( M_L \) = shift/accelerate
+\( M_L \) = brake/decelerate

Switching energy per switching cycle:

\[ Q = \frac{J \cdot n^2}{182,5} \cdot \frac{M_K}{(M_K \pm M_L)} \]

\[ Q_{\text{zul}} = Q \cdot \left( 1 - e^{-\frac{Q}{M_K \pm M_L}} \right) \]

Permissible operating frequency when switching energy per switching cycle is known

\[ S_{\text{zul}} = \frac{\frac{Q_{\text{zul}}}{Q}}{\frac{Q_{\text{zul}}}{Q}} \]

Select a larger size \( Q_{\text{zul}} < Q \)

Select a larger size \( Q_{\text{zul}} \geq Q \)

Number of switching operations until readjustment

\[ S_{\text{NA}} = \frac{Q_{\text{NA}} \text{[kWh]} \cdot 3,6 \cdot 10^6}{Q \text{[J]}} \]

Resulting acceleration or deceleration time \( t_3 \)

\[ t_3 = 9,55 \cdot \left( M_K \pm M_L \right) \]

\[ t_3 = \frac{t_12}{2} \]

+\( M_L \) = shift/accelerate
-\( M_L \) = brake/decelerate

Only when lowering a load
-\( M_L \) = shift/accelerate
+\( M_L \) = brake/decelerate

Determining the size by specifying the required torque \( M_{\text{req}} \)

Parameters included in the calculation are moments of inertia, relative speeds and acceleration or deceleration times.

\( K \) is a safety factor to ensure transmission security even in extreme operating conditions. \( K \) is dependent on the prevailing operating conditions. \( K \) is always \( \geq 2 \)

Checking the thermal load

The switching energy per switching cycle \( Q \) and the operating frequency \( S_h \) determine the thermal load of the clutch or brake. The values calculated or plotted on a graph must not exceed the permissible values for the specific sizes.

Parameters \( Q_E \) and \( S_{\text{hue}} \) are indicated in the Technical data.

\[ Q_{\text{zul}} \leq Q \]

\[ S_{\text{zul}} \leq S_h \]

\[ Q_{\text{zul}} \geq Q \]

\[ S_{\text{zul}} \geq S_h \]

Operating data calculation

\( Q_{\text{NA}} \) is indicated in the Technical data
Selection

Permissible switching energy/operating frequency

Electromagnetic clutches
INTORQ 14.105 (7.5 – 480 Nm)
Electromagnetic brakes
INTORQ 14.115 (7.5 – 480 Nm)

Calculation example

Default parameters:
\[ J = 0.01 \text{ kgm}^2 \]
\[ M_L = 6 \text{ Nm} \]
\[ n = 700 \text{ min}^{-1} \]
\[ t_3 = 0.15 \text{ s} \]

\[ \frac{t_{12}}{2} \text{ assumed to be } 0.03 \text{ s} \]
\[ S_H = 5000 \text{ switching operations per hour} \]

Calculation of the required torque:
\[ M_a = \frac{J \cdot n}{9.55 \cdot \left( t_3 - \frac{t_{12}}{2} \right)} = \frac{0.01 \cdot 700}{9.55 \cdot (0.15 - 0.03)} \]
\[ M_a = 6.1 \text{ Nm} \]
\[ M_{erf} = (M_a + M_L) \cdot K = (6.1 + 6) \cdot 2 \]
\[ M_{erf} = 24.2 \text{ Nm} \]

Calculation of the switching energy per switching cycle:
\[ Q = \frac{J \cdot n^2}{182.5} \cdot \frac{M_K}{M_K - M_L} \]
\[ Q = \frac{0.01 \cdot 700^2}{182.5} \cdot \frac{30}{30 - 6} \]
\[ Q = 33.6 \text{ J} \]

Check of the permissible operating frequency:
See the diagram (above) for \( S_{zuu} \) depending on the calculated switching energy.

For the selected size (10), the required operating frequency is permissible at the calculated switching energy.

Result:
The selected electromagnetic clutch (INTORQ 14.105.10.1.1, \( M_K = 30 \text{ Nm} \)) can be used for this application.
## Technical data

### Selection table

**Electromagnetic clutches INTORQ 14.105.□□□ □**

<table>
<thead>
<tr>
<th>Size</th>
<th>$M_k$</th>
<th>$n_{max}$</th>
<th>$P_{20} , ^\circ \mathrm{C}$</th>
<th>Operating times</th>
<th>$Q_d$</th>
<th>$Q_{max}$</th>
<th>$S_{max}$</th>
<th>J $\times 10^5 , \text{kgm}^2$</th>
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<th>Armature assembly, types</th>
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**Electromagnetic brakes INTORQ 14.115.□□□ □**

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<th>Operating times</th>
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1) In relation to relative speed $n = 100 \, \text{rpm}$
2) Mean values for DC switching with rated air gap and warm coil.
3) Standard voltage 24 V $\pm 5\%$ to VDE 0580
4) Temperature class B (130°C)
## Technical data

### Flange-mounted clutches

INTORQ 14.105.

### INTORQ 14.105.

<table>
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<tr>
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<th>d H7</th>
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<th>d2</th>
<th>d3</th>
<th>d5</th>
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### Dimensions in mm

- Keyway to DIN 6885/1-P9
- \( d \) J7 predrilled, without slot
- \( d \) J7 predrilled, without slot

### Recommended ISO tolerances for shafts:

- Up to Ø 50 mm: \( k_6 \)
- Above Ø 50 mm: \( m_6 \)

---

| Size | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | t | \( \text{m [kg]} \) |
|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----------------|
| 06   | 3,5| 5,5| 400| 31,5| 43 | 15 | 22 | 5  | 4x4,5 | 0,2 | 0,2 | 0,1 | 0,53 |
| 08   | 6,5| 400| 35 | 51  | 29 | 24 | 6  | 4x5,5 | 0,2 | 0,2 | 0,1 | 0,96 |
| 10   | 9  | 400| 40,9| 60,9| 25 | 27 | 6  | 4x6,6 | 0,2 | 0,2 | 0,1 | 1,84 |
| 12   | 11  | 400| 46,5| 70,5| 30 | 30 | 10 | 4x6,6 | 0,3 | 0,3 | 0,1 | 3,24 |
| 16   | 14  | 400| 53,5| 84,5| 38 | 34 | 10 | 4x9  | 0,3 | 0,3 | 0,1 | 5,79 |
| 20   | 17  | 400| 64,4| 103,4| 48 | 40 | 15 | 4x9  | 0,5 | 0,5 | 0,2 | 11,4 |
| 25   | 19  | 400| 74,9| 118,9| 55 | 47 | 20 | 4x11 | 0,5 | 0,5 | 0,2 | 20,4 |
Technical data

Flange-mounted clutches
INTORQ 14.105.□□.1.3

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<th>d₂</th>
<th>d₃</th>
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<th>s₂</th>
<th>s₃</th>
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Dimensions in mm
Keyway to DIN 6885/1-P9
**d₁₁ lattice J7 predrilled, without slot

Recommended ISO tolerances for shafts: Up to Ø 50 mm: k₆
Above Ø 50 mm: m₆

bore diameter on request
## Technical data

### Shaft-mounted clutches

**INTORQ 14.105.4.3.1**

### Dimensions in mm
- **Keyway to DIN 6885/1-P9
- **d J7** predrilled, without slot
- **d11 J7** predrilled, without slot

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- \(\*\) bore diameter on request
- \(\ddagger\) bore diameter on request
- \(\ddagger\) bore diameter on request

### Recommended ISO tolerances for shafts:
- Up to \(\phi 50\) mm: \(k_6\)
- Above \(\phi 50\) mm: \(m_6\)
Technical data

Shaft-mounted clutches

INTORQ 14.105.

### Technical Data Table

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*bore diameter on request

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- Dimensions in mm
- Keyway to DIN 6885/1-P9
- ⚠⚠⚠ d11 J7 predrilled, without slot
- Recommended ISO tolerances for shafts: Up to Ø 50 mm: k6
  Above Ø 50 mm: m6

---

![View Z](image)
## Technical data

**Flange-mounted clutches with flange hub on bearings INTORQ 14.105.□□.1.5**

### Technical Specifications

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| bore diameter on request |

### Dimensions

- **Dimensions in mm**
- **Rotor assembly: Keyway to DIN 6885/1-P9**
- **Armature assembly: Keyway to DIN 6885/3-P9**
- **d11 J7 predrilled, without slot**

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**Recommendation ISO tolerances for shafts:**
- Up to Ø 50 mm: k6
- Above Ø 50 mm: m6

---

**bore diameter on request**
### Technical data

**Shaft-mounted clutches with flange hub on bearings INTORQ 14.105.00.3.5**

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* Bore diameter on request

#### Rotor and armature assembly

- **Dimensions in mm**
- **Rotor assembly:** Keyway to DIN 6885/1-P9
- **Armature assembly:** Keyway to DIN 6885/3-P9
- ***** \(d_{11} J7\) predrilled, without slot**

#### Recommended ISO tolerances for shafts

- Up to Ø 50 mm: \(k_6\)
- Above Ø 50 mm: \(m_6\)
**Technical data**

**Electromagnetic brakes**

INTORQ 14.115.

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**Dimensions in mm**
- **bore diameter on request**

**Recommended ISO tolerances for shafts:**
- Up to Ø 50 mm: k6
- Above Ø 50 mm: m6

---

**Notes:**
- **d J7** predrilled, without slot
- Keyway to DIN 6885/1-P9
- Dimensions in mm
- **φtw A oder B**
# Technical data

**Electromagnetic brakes** INTORQ 14.115.□.1.2 and INTORQ 14.115.□.1.3

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Dimensions in mm
Keyway to DIN 6885/1-P9
**d J7** predrilled, without slot

---

Recommended ISO tolerances for shafts:
- Up to Ø 50 mm: k6
- Above Ø 50 mm: m6
**Accessories**

Transformer switch TS 48 INTORQ 14.6 10.11.048

**Features**
- Transformer switch TS 48 contains the entire current supply for a 24 V DC coil with transformer, rectifier and switching transistor with suppressor circuit
- A transistor is used for switching; there is no contact wear
- The high induced voltage enables the release times indicated in the catalogue for DC switching to be achieved.

**Dimensions**

**Applications**
- Current supply for 24 V coils on AC mains
- Normal excitation with rated coil voltage
- Switching of coil current via PLC, proximity switch, contacts, control voltage 5 – 24 V

**Technical data**
- Normal excitation 24 V
- Mains voltage 230 V, 50/60 Hz
- Coil voltage 24 V –
- Max. coil load 50 W
- Max. operating frequency:
  - Up to 35 W 5 switching operations/s
  - Up to 50 W 2 switching operations/s
- Connectable coils 1 x
- Switching of coil current: Transistor
- The entire switching operation is potential-free.
- Control current at 24 V Approx. 1 mA
- Weight: 1.5 kg

**Connection examples**

Control via PLC

![Connection diagram for PLC](image)

Control via contact

![Connection diagram for contact](image)

Control via 2-wire proximity switch

![Connection diagram for 2-wire proximity switch](image)
Accessories

Spark suppressor INTORQ 14.198.00.01/02/03

Features
The INTORQ spark suppressor protects the coil and contact against impermissibly high induced voltages with DC switching. In the absence of a suppressor circuit, the induced voltage may exceed the permissible values specified in VDE 0580 and cause coils to fail.

The spark suppressor comprises an induction-free pulse capacitor which takes up the high-speed current peaks which occur during switching. This significantly reduces the spark at the contact (contact wear).

Application
Suppressor circuit for coil and contact:
- Limitation of induced voltage at coils
- Spark suppression at switching contacts
- Increase in service life of coils and contacts

Dimensions

Technical data

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<th>Max. coil power</th>
<th>Capacitor voltage</th>
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<th>b₂ approx.</th>
<th>d</th>
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Connection examples

Parallel to contact

Parallel to coil
Accessories

SEGC high-speed switchgear INTORQ 14.611

Features
INTORQ-SEGC high-speed switchgear is used for the high-speed excitation of DC voltage coils and reduces engagement times to as little as 10% of the values indicated in the Technical data.

Switching is wear-free via semiconductors. This makes simple activation with auxiliary contacts, control voltages or proximity switches possible. Following overexcitation, the coil operating voltage is automatically reduced to the holding voltage.

For more detailed technical information, see the “Electronic switchgear” manual.

Application
High-speed excitation of DC voltage coils with a rated voltage of 24 to 205 V.

You can use INTORQ-SEGC high-speed switchgear on electromagnetic clutches/electromagnetic brakes to achieve:
- Shorter acceleration/deceleration times
- Higher operating frequencies
- Improved operating accuracy
- Reduced wear
- Improved stopping accuracy

SEGC-Electronic INTORQ. 14.611.12.  ❙  ❙  ❙
- Structure: 220 x 150 mm PCB
- Connection via 10-pin terminal strip
- Max. connected load 100 W
- Required accessories: MP capacitor

- In terms of electronics, design is identical to that of the SEGC-Electronic
- Constructed with European standard board dimensions 160 x 100 mm
- Connection via 31-pin DIN plug connector
- Max. connected load 40 W/100 W
- Required accessories: MP capacitor, plug-in rack
General information for assembly

- Assembly and maintenance work may only be carried out by specialist personnel with appropriate training, and only in accordance with the specifications in the Operating and Mounting Instructions.
- Grease or oil on friction surfaces reduces the drive/braking torque. For this reason, friction surfaces must be kept free of grease and oil.
- The regulations set out in the machine safety law for rotary drive elements must be observed.
- If units with large diameters are switched in at high speeds, the high relative speed at the friction surfaces can cause sparking. The use of a suitable cover is recommended.
- The air gap $S_{\text{Lue}}$ must be checked at regular intervals and readjusted no later than $2.5 \times S_{\text{Lue}}$ (see Technical data).

Screws, screw locking element and tapped hole for fastening type 3 armature assembly

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* Available from:
Adolf Schnorr GmbH & Co. KG
PO Box 60 01 62 · 71050 Sindelfingen, Germany
Tel. +49 (0) 70 31 30 20 · Fax +49 (0) 70 31 38 26 00
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Fax: +49 5154 70534-200

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