

# Encoders for the elevator industry

Drive control and digital shaft copying systems



**Baumer**

Passion for Sensors

# Consistent quality. Maximum efficiency. Innovative technology.

## Consistent Quality

Consistently high quality standards from inquiry to development on to manufacture and throughout the entire supply chain take center stage in the Baumer quality management.

Our Quality Excellence:

- Quality preplanning by product and process FMEAs and supply chain qualification
- Quality plan with First Pass Yield evaluation, internal and external audits
- ISO9001, ISO14001 and BS OHSAS 18001 factory certifications
- Manufacturing with implemented Lean Six Sigma methodology
- ppm-measurements for continuous quality control in the field

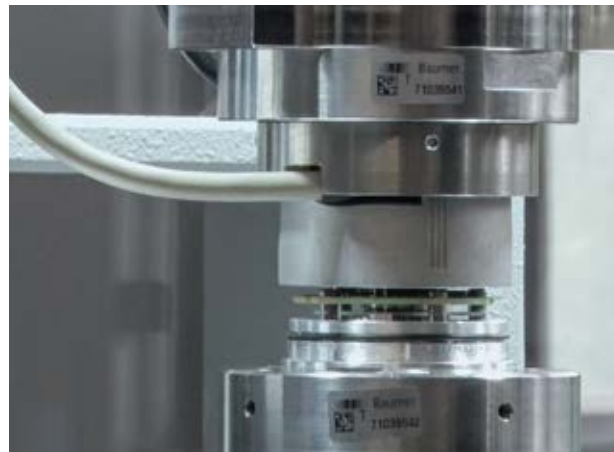
Statistical and periodical process control, proven capability as well as 100% inspections prior to delivery ensure durable and solidly performing encoders designed for continuous operation.



## Maximum efficiency

Our cutting-edge production technologies, constant investment in further automation of manufacture together with consistent value-adding analysis make sure our production facilities evolve with the ever-growing demands on efficiency. In the development of cost-efficient designs we focus on selected components to go in several product series at cross-location manufacture. In parallel, the number of components is kept to a minimum by high integration technology. Some optical encoders have their basic functionalities such as position sensing, signal processing and communication interfaces fully integrated in one single ASIC. Even more synergies provide merged purchasing volumes of international Baumer Group locations.

The benefits to our customers: reliable, high-quality products at cost-effective prices.



## Innovative technology

Baumer provides robust technologies which have proved their solid performance and longevity in decades of use under extreme conditions. Baumer as a global player with a broad product portfolio further achieves performance potential and innovative drive from synergies between most varied technologies and the brain-power of more than 250 engineers in an international network. Our corporate patent division is committed to our innovations being appropriately protected.

Based on our specialized application competence we develop tailored solutions with added value in close partnership with our customers. In doing so, Baumer has been firmly establishing as a longterm partner in the elevator industry.



## Our value excellence – your benefits at a glance

- You can rely on our quality performance to make sure you will be provided with durable encoders designed for trouble-free permanent operation.
- Backed by our profound application experience and the innovation drive of more than 250 engineers in development, we will work out your optimally matching solution with high added value.
- Highest level of efficiency in design, production and supply chain make sure you will be receiving reliable top quality products at cost-effective prices.
- Expert consultancy service, personal assistance, prompt support. We are with you when the going gets tough. On the site, around the world!
- Informative, detailed documentation for eased product selection, quick installation and commissioning. Simply efficient.



# Encoders for drive control in elevators.

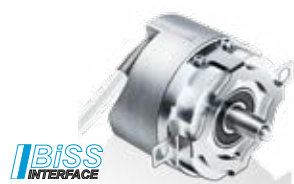
Maximum travel convenience, minimized cost and zero defect operation – in many aspects, the requirements in elevator engineering are extremely demanding. Only high-precision signals in motor feedback output by the encoder allow for the excellent control quality which is mandatory for maximum travel convenience. Even the slightest discrepancy in manufacture tolerances would significantly impair signal quality.

Consistent supervision of process capability using cpk indices, periodic (SPC) and statistical (PPC) process evaluation as well as 100 % automated inspections ensure the excellent signal quality and failsafe performance of Baumer encoders.

## Position and speed feedback

Conventionally, incremental encoders with SinCos or rectangular signals are used to acquire the speed information at lift motors. Depending on type and concept motor control also requires absolute position information of the rotor. Such position information is supplied by encoders of the EFL580 series with SSI or BiSS C interface.

## Precise speed feedback for maximum travel convenience.



Series EFL580 BiSS C  
Position and speed feedback

**Efficiency in its perfection – cost-effective absolute encoders with extremely precise optical sensing**

- Absolute optical encoders
- SSI or BiSS C interface
- Absolute information for rotor position feedback
- Additional SinCos signals with 2048 periods/turn
- Optionally with up to 21-bit resolution for all-digital speed acquisition
- Robust *ShaftLock* bearing design (Product on request)



Series ITD89H00  
Position and speed feedback

**Uncompromisingly compact and durable – bearingless encoders free from wear for easy and space saving installation**

- Incremental, magnetic encoders
- Rectangular signals up to 8192 ppr and additional zero pulse
- Alternatively with SinCos signals with 256 periods/turn
- $\pm 0.1^\circ$  accuracy
- Compact, space-saving installation
- Through hollow shafts up to 150 mm (optionally up to 180 mm)



Series *OptoPulse*® EIL680  
Position and speed feedback

**Easily installed – precise optical incremental encoders for quick rear installation**

- Incremental, optical encoders
- Rectangular signals up to 8192 ppr
- Tangential cable outlet
- Shaft mount with self-locking center screw
- Easy rear installation
- Blind hollow shaft 12 mm (Product on request)



Series *OptoPulse*® EIL580/EIL580P  
Position and speed feedback

**Robust, flexible, precise – benchmarking efficiency in incremental encoders at cost-effective price**

- Incremental, optical encoders
- Up to 5000 ppr resp. high-resolution with user-specific configuration (resolution, output circuit and zero pulse width) up to 65 536 ppr
- Robust *ShaftLock* bearing design
- Blind or through hollow shaft up to 15 mm

# Robust encoders for absolute reliability.

## Digital shaft copying systems.

### Position feedback

Typically high shaft loads and situation-induced axial impact or overloads in floor selectors present a real challenge to the encoder. The *ShaftLock* bearing design proven in practice for more than 15 years and large high-quality ball bearings prevent the bearing pack from unwanted misalignment. The optimally protected code disc or sensing unit prevents expensive downtime and repair.

Specialized CANopen Lift protocol DSP 417 Lift simplifies setup and minimises configuration efforts.



Series *MAGRES* BMV 58 CANopen or SSI  
Position feedback

#### Robust magnetic multiturn encoders resisting high shaft loads

- Absolute multiturn encoder with robust magnetic sensing
- Up to 4096 steps per turn (12 bits)
- Up to 262 144 turns (18 bits)
- CANopen or SSI interface
- Easy system integration by profile conformity to CiA DSP 406 or CiA DSP 417 Lift
- Compensating high shaft loads
- Shock and vibration proof up to 500 g/30 g
- Robust *ShaftLock* bearing design



Series *GBP5W* CANopen  
Position feedback

#### High-precision optical multiturn encoders

- Absolute multiturn encoder with precise optical sensing
- Up to 262 144 steps per turn (18 bits)
- Up to 16 384 turns (14 bits)
- Very high precision down to  $\pm 0.01^\circ$
- Easy system integration by profile conformity to CiA DSP 406 or optionally CiA DSP 417 Lift
- Robust *ShaftLock* bearing design
- Optionally with SSI interface, series GM400



Series *OptoPulse*® EIL580/EIL580P  
Position feedback

#### Robust, flexible, precise – benchmarking efficiency in incremental encoders at cost-effective price

- Incremental optical encoders
- Up to 5000 ppr resp. high-resolution with user-specific configuration (resolution, output circuit and zero pulse width) up to 65 536 ppr
- Innovative optical sensing by Opto-ASIC and high integration density for ultimate robustness and reliability thanks to the limited number of discrete components
- Robust *ShaftLock* bearing design

## *ShaftLock* – outstanding longevity

The metal collar support protects the bearings and sensing unit against impacts by axial shocks and loads. The *ShaftLock* bearing design by Baumer is made of high-end materials and precision mechanics optimizes radial runout and ensures maximum product service life.





# Baumer technology highlights.

## Uncompromising compact and durable – bearingless encoders with robust magnetic sensing

### Excellent signal quality for maximum travel convenience

High-resolution encoders output consistent high-quality signals to ensure ultimate travel convenience, smooth acceleration and slowdown. Low motor speed in conjunction with synchro drives apply particularly demanding requirements on sensor technology. Any error in radial and axial runout or sensor interpolation, an improperly polarized magnet rotor or insufficient signal alignment during manufacture would impair speed regulation and hence the emotional perception of travel convenience. Worst case, incurred resonance may produce vibrations or unwanted noise in the elevator cabin.

Magnetic bearingless encoders by Baumer integrate components which are optimally harmonized in manufacture and design to ensure high-precision signals for continuous operation.



### A competitive edge by quality and competence

Three Baumer production and development sites implement and further enhance the bearingless magnetic sensing technology. For many years, the Baumer in-house production and technology experts have been providing the customers with most innovative approaches and added value. Optimized designs and manufacturing concepts developed in close cooperation with our customers allow for largest possible tolerances and yet outstanding encoder precision in the application.

Compared to other methods, the magnetic sensing technology enables a wide air gap between sensing head and magnetic rotor. Extremely high quality standards throughout the entire supply chain and our consistent competencies in design and manufacture ensure our customers of absolutely reliable products with high reserve capacity - in continuous operation even at temperature fluctuations or where to compensate high material tolerances. Such reserve capacity is up to the demanding requirements on signal quality throughout the entire product service life and solid performance and functionality even under extreme conditions.

Innovative solutions, such as integrated signal processing and continuous control of offset, phase and amplitude ensure constantly high travel convenience throughout the entire encoder lifetime.



## Ultra precise and cost efficient – optical encoders with highly integrated Opto-ASIC

### Every micro meter counts

By virtue of their high-precision mechanics and accurately aligned sensing elements down to the  $\mu\text{m}$  range, the Baumer optical encoders ensure excellent signal quality. Hence position resolutions with more than two million steps per turn are no difficulty at all.

### One single ASIC – multiple functionality

The Opto-ASIC integrated in series EFL is the one-component merger of all basic optical encoder functionalities:

- Fast and precise acquisition of the absolute position information
- 21-bit interpolation for all-digital speed feedback
- BiSS C or SSI communication protocol
- Additional SinCos signal output up to 2048 periods per turn
- Integrated illumination control
- No auxiliary power unit required due to extended voltage range 4...5.5 VDC
- Error diagnostic and calibrated temperature measurement

Besides cutting down on component costs, the high integrated ASIC technology ensures enhanced immunity against errors and in parallel improved robustness towards mechanical impacts such as strong shocks or vibrations.



## BiSS C – the open standard

Highspeed protocol BiSS C is ideal for demanding applications with fast isochrone data transmission and high demands on safety.



### Benefits of the BiSS C interface:

- All-digital speed acquisition without sine signals
- Bi-directional communication for acquisition and preset of the absolute rotor position
- Fast transmission rates at clock frequencies up to 10 MHz
- Protected transmission by CRC sum
- Open, nonproprietary standard
- Fast, flexible interfacing

# Complementary product portfolio for the elevator industry.



- Series ITD 41 A4, ITD 61 A4  
For large shaft diameters
- Incremental, optical encoders
  - Rectangular signals up to 10 000 ppr
  - Through hollow shaft designs up to 50 mm



- Series ITD22H00 SIL  
For safety applications
- Incremental, optical encoders
  - SIL2/PLd respectively SIL3/PLe where used as redundant system
  - SinCos signals up to 2048 periods/turn
  - Series GI357 with optional SIL2-compliant rectangular signals
  - Through hollow shaft designs up to 12 mm



- Series ITD 01 A4, ITD 01 B14  
Where space is a constraint
- Incremental, optical encoders
  - Rectangular signals with up to 1024 ppr
  - Housing diameter 24 mm/installation depth 20 mm
  - Blind or through hollow shaft

## Precise speed feedback by high-performing signal processing – series MQR69

- Bearingless, magnetic encoders
  - Through hollow shaft 76 mm
  - Position resolution up to 24 bits per turn
  - Quasi-absolute position thanks to zero pulse information
  - Efficient filtering for noise suppression and improved signal quality
  - Continuous error compensation by offset, phase and amplitude control
  - Speed resolutions up to 0.004 rpm
  - Digitized speed word via RS485 – precision down to zero speed
- (Product on request)



# Product overview – Baumer encoders for the elevator industry

## Selection Guide

### Incremental encoders

Size (ø)	Solid shaft (ø)	Blind hollow shaft (ø)	Through hollow shaft (ø)	Hybrid bearings	ShaftLock- bearing concept	Rectangular signals (TTL)	Rectangular signals (HTL)	SinCos signals	PPR	Programmable	Magnetic sensing	Optical sensing	Product family	Page
			70...150 mm*			■	■	■	≤ 8192		■		ITD89H00	4
68 mm		12 mm		■	■		■		≤ 8192			■	OptoPulse® EIL680	4
58 mm	6, 10 mm	8...15 mm	8...15 mm	■	■	■	■		≤ 5000			■	OptoPulse® EIL580	5, 6
58 mm	6, 10 mm	8...15 mm	8...15 mm	■	■	■	■		≤ 65 536	■		■	OptoPulse® EIL580P	5, 6

\*Optionally in 180 mm hollow shaft

### Absolute encoders

Size (ø)	Solid shaft (ø)	Cone shaft	BiSS C	SSI	CANopen / CANopen Lift	Singleturn resolution max.	Multiturn resolution max.	Optical sensing	ShaftLock bearing concept	Additional sine-incremental signals	Product family	Page
58 mm		9.25 mm	■			13 bit		■	■	■	EFL580 BiSS C	4
58 mm	6, 10 mm			■	■	12 bit	18 bit		■		MAGRES BMMV 58 CANopen/SSI	6
58 mm	6, 10 mm			■	■	13 bit	16 bit	■	■		GBP5W CANopen	6

### Applications and products

Motorfeedback	Digital shaft copying systems	Product family	Page
Positions and speed feedback	Positionfeedback		
■		EFL580 BiSS C	4
■		ITD89H00	4
■		OptoPulse® EIL680	4
■		OptoPulse® EIL580	5, 6
	■	OptoPulse® EIL580P	5, 6
	■	MAGRES BMMV 58 CANopen/SSI	6
	■	GBP5W CANopen	6

# Worldwide presence.

The Baumer Group is leading at international level in the development and production of sensor solutions. We strive to be close to our customers all around the world. We listen to them, and then after understanding their needs, we provide the best solution. About 2300 people worldwide in 38 locations and 19 countries are at your service. Worldwide customer service for us starts with on-the-spot personal discussions and qualified consultation. Our application engineers speak your language and strive from the start, through an interactive problem analysis, to offer comprehensive and user-compatible solutions. The worldwide Baumer sales organizations guarantee a high level of readiness to deliver.



## Africa

Algeria  
Cameroon  
Côte d'Ivoire  
Egypt  
Morocco  
Reunion  
South Africa

## America

Brazil  
Canada  
Colombia  
Mexico  
United States  
Venezuela

## Asia

Bahrain  
China  
India  
Indonesia  
Israel  
Japan  
Kuwait  
Malaysia  
Oman  
Philippines  
Qatar  
Saudi Arabia  
Singapore  
South Korea  
Taiwan  
Thailand  
UAE

## Europe

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Bulgaria  
Croatia  
Czech Republic  
Denmark  
Finland  
France  
Germany  
Greece  
Hungary  
Italy  
Malta  
Martinique  
Netherlands  
Norway  
Poland  
Portugal  
Romania  
Russia  
Serbia  
Slovakia  
Slovenia  
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Switzerland  
Turkey  
United Kingdom

## Oceania

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