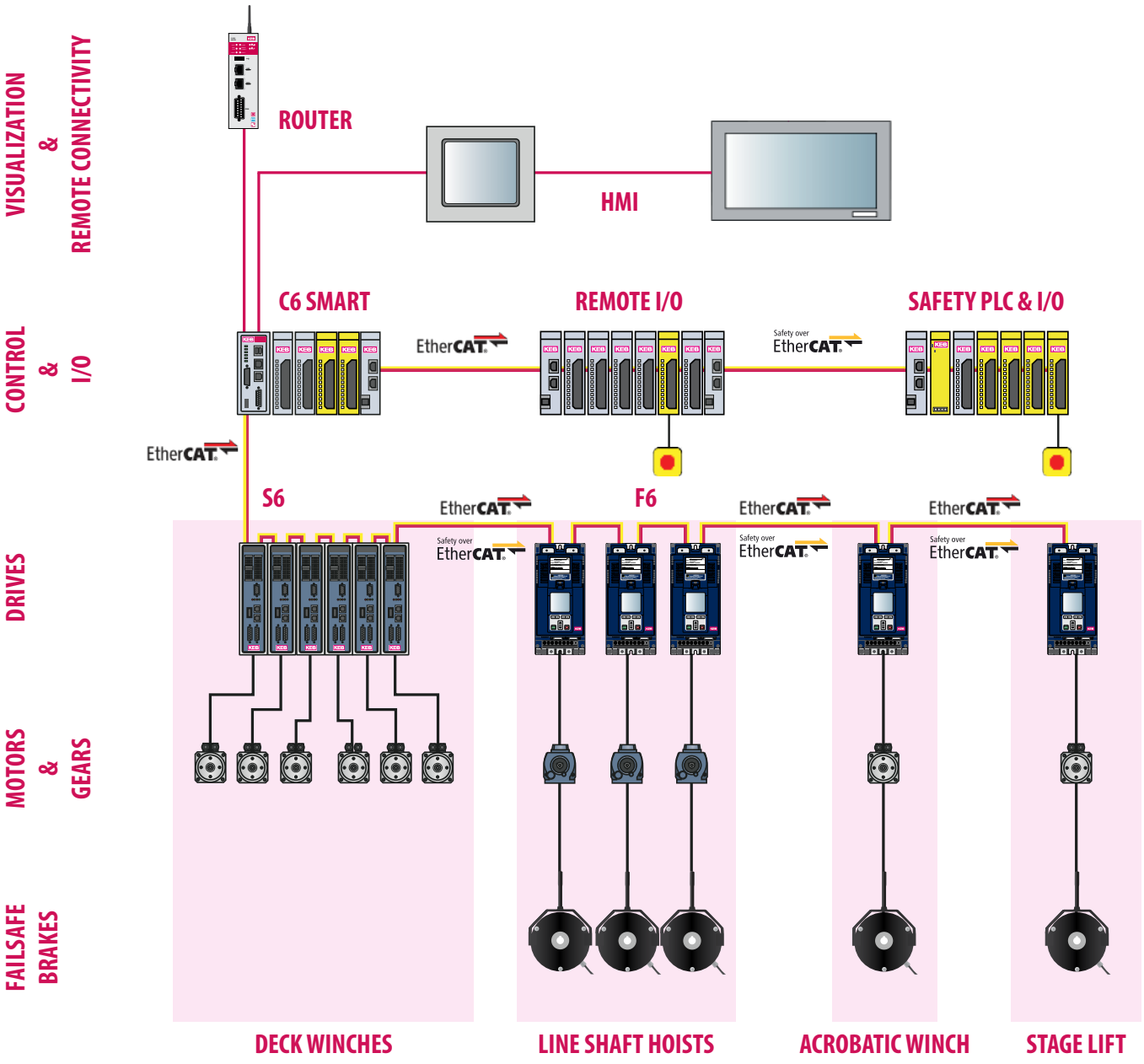
# THEATRE AND STAGE AUTOMATION

For nearly 50 years, KEB has been supplying power transmission and motion control solutions for theatre machinery, amusement and sports venues, and mechanized structures.



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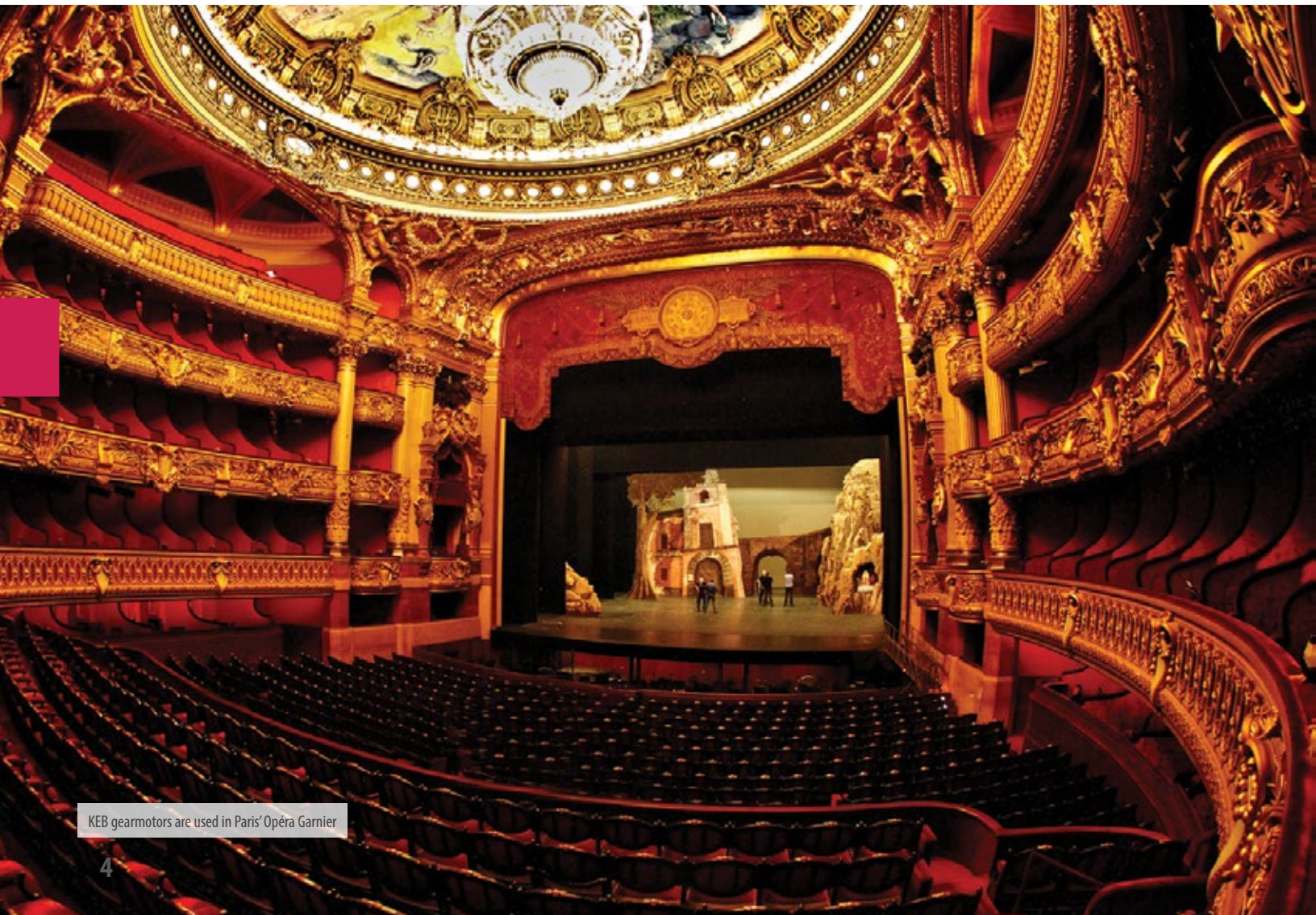
# THE SHOW MUST GO ON

Precise. Repeatable. Reliable. Proven.

That is what describes KEB automation products and the machines we power. KEB offers a full theatre automation portfolio ranging from hoist brakes to HMI touchscreen displays. KEB products allow the design of precise stage machinery that is repeatable and reliable, show after show.

KEB is the workhorse behind the scenes. Our products have been used on a variety of machine designs across a wide range of hoists, winches, lifts, trolleys, and doors.

With a worldwide presence KEB is there to support our product wherever it might end up - so the show can go on.



KEB gearmotors are used in Paris' Opéra Garnier

KEB brakes, gearmotors, and drives can be found on a variety of equipment in some of the most high-profile installations around the world.

- Theatre and opera machinery
- Concerts
- Mechanized structures
- Acoustic banner hoists
- People flying winches
- Amusement park rides

## THEATRE & STAGE MACHINERY

## CONCERT & ENTERTAINMENT VENUES

## ARTISTIC & CULTURAL EXHIBITS

## ANIMATRONICS & ROBOTS

## AMUSEMENT PARKS

## STADIUMS & STRUCTURES

## PEOPLE FLYING

# YOUR GLOBAL PARTNER

## KEB

For over 40 years, KEB has been an innovative designer and manufacturer of automation products. More than just a component supplier, KEB works with their customer-partners to provide the optimum solution for the application.

Trust KEB with your next project.

- 4 global production sites
- 9 subsidiaries
- 37 representatives and service partners
- 1,200+ employees
- Annual sales: ~$250M USD

## PRODUCTION SITES

BARNTRUP, GERMANY

SCHNEEBERG, GERMANY

SHAKOPEE, MN

SHANGHAI, CHINA

# KEB AMERICA

KEB America, Inc. is headquartered in Shakopee, MN, a suburb outside of Minneapolis. KEB America has full design and manufacturing capabilities in its 150,000 sq ft facility to provide our North American clients with local service and support.  KEB America's facility is ISO 9001:2015 certified.

**Major sales and service facilities**

- Italy
- France
- Great Britain
- Austria
- Japan
- Russia

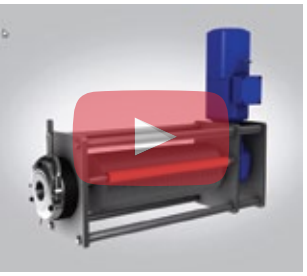
# BRAKES

## Single disc spring-set brake (5 ... 3,200 Nm)

### HIGHLIGHTS

- Silent operation - less than 65dB at 1 meter (option)
- Dynamic and holding applications possible
- Encapsulated DC coil (rectifiers for AC input voltage available)
- Redundant spring design
- Horizontal or vertical mount
- Mounting flange options
- Microswitch for engagement feedback (option)
- Dust protection ring, IP44 (option)
- Hand release (option)

**See How They Work**



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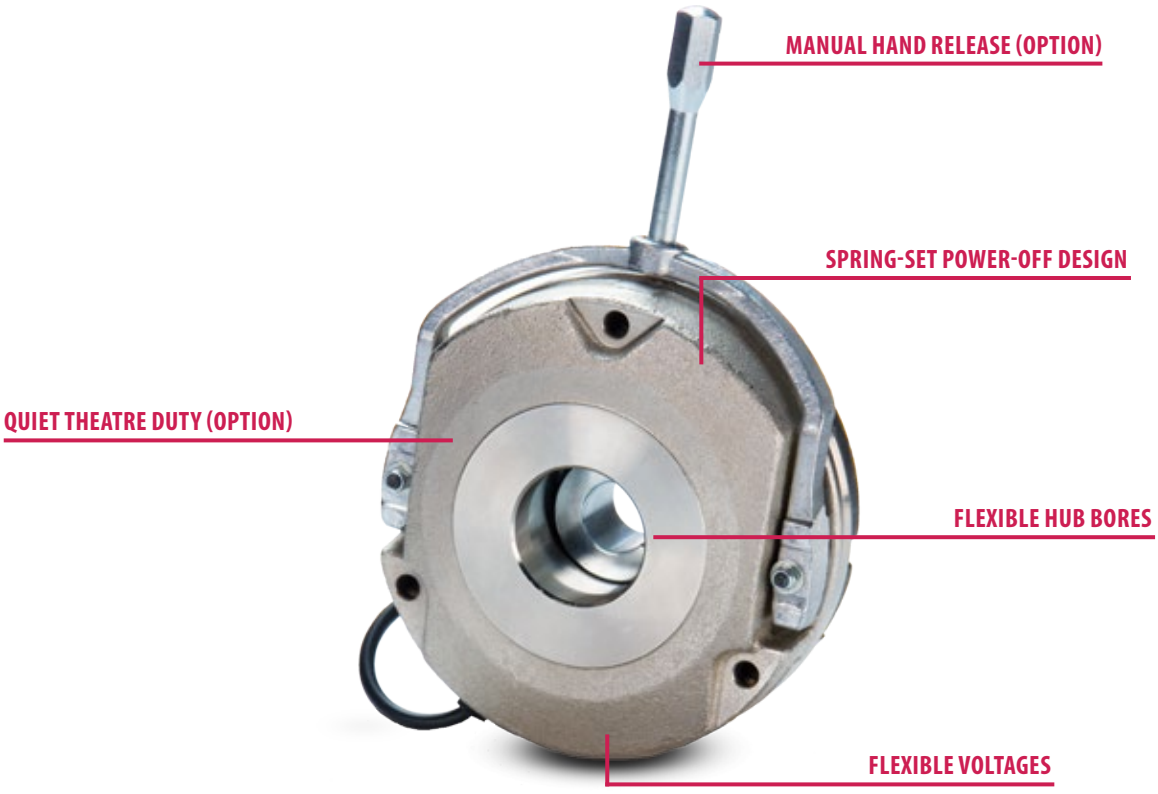
KEB spring-applied DC brakes provide failsafe power-off brake engagement. The brakes are released when power is applied to the electromagnetic coil.

The spring-set brakes are designed to last even in the toughest applications. Each brake has multiple springs rated for 10+ million cycles. The brake operation is very basic – the only moving part is the armature. No linkages. No solenoids. No moving parts to wear and replace.

KEB's single disc spring-set brake comes in two versions. Version N is designed for dynamic applications with regular brake engagements at high speeds. Version H is designed for static (holding) applications with the capability to handle emergency stops.



# BRAKES

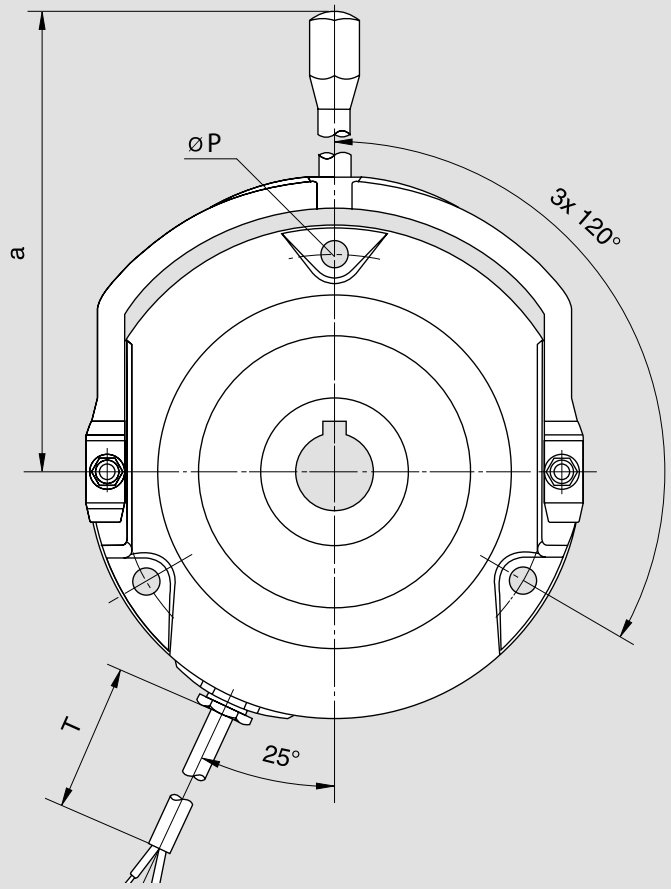
## Single disc spring-set brake (5 ... 1,500Nm)

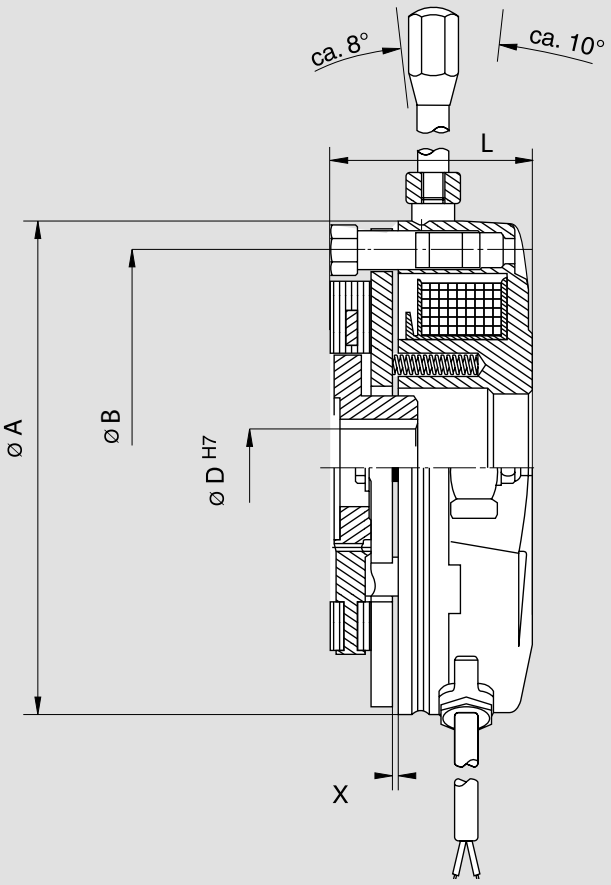
| | VERSION N | | VERSION H | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | $M_{2N}$ [1] (Nm) | $P_{20}$ (W) | $M_{2N}$ [1] (Nm) | $P_{20}$ (W) | A | B | $ØD_{H7}$ MAX. | L | P | T | X | a | WEIGHT (KG) |
| 02 | 5 | 25 | 7.5 | 25 | 85 | 72 | 15* | 37.7 | 3x4.5 | 500 | 0.2 | 105.5 | 1 |
| 03 | 10 | 30 | 15 | 30 | 102 | 90 | 20 | 41.7 | 3x5.5 | 500 | 0.2 | 113 | 1.5 |
| 04 | 20 | 30 | 30 | 30 | 127 | 112 | 25 | 51.7 | 3x6.5 | 500 | 0.2 | 128 | 3 |
| 05 | 36 | 48 | 50 | 48 | 147 | 132 | 30 | 57.7 | 3x6.5 | 500 | 0.2 | 168 | 4.5 |
| 06 | 70 | 62 | 90 | 75 | 164 | 145 | 35* | 68.8 | 3x9 | 500 | 0.3 | 176 | 7 |
| 07 | 100 | 65 | 150 | 90 | 190 | 170 | 45 | 75.5 | 3x9 | 750 | 0.3 | 225 | 10 |
| 08 | 150 | 75 | 225 | 90 | 218 | 196 | 60 | 87.4 | 3x9 | 750 | 0.4 | 235 | 16 |
| 09 | 250 | 80 | 375 | 115 | 253 | 230 | 60 | 101.7 | 3x11 | 750 | 0.4 | 256 | 26 |
| 10 | 500 | 130 | 750 | 180 | 307 | 278 | 75 | 110.8 | 6x11 | 750 | 0.5 | 335 | 39 |
| 11 | 1,000 | 180 | 1,500 | 280 | 363 | 325 | 90 | 134.5 | 6x13 | 1,000 | 0.6 | ** | 80 |

1) Rated torque after running in process
* Only available with keyway according to DIN 6885/3
** Mechanical release with hexagon screw

All dimensions in mm
Keyway according to DIN 6885/1
English bore and keyways available

100% on time duty cycle
Standard protection of IP20
ISO Class F (Class H upon request)



# LOAD BRAKES

## Spring-set load brake (250 ... 3,200 Nm)

### HIGHLIGHTS

- Noise reduced - less than 65dB at 1 meter
- Manual release bolts standard
- Internal and external mounting options (integrated)
- Rubber dust protection ring with IP44 rating
- 10 ft. S00W cable leads
- Microswitch and hand release options

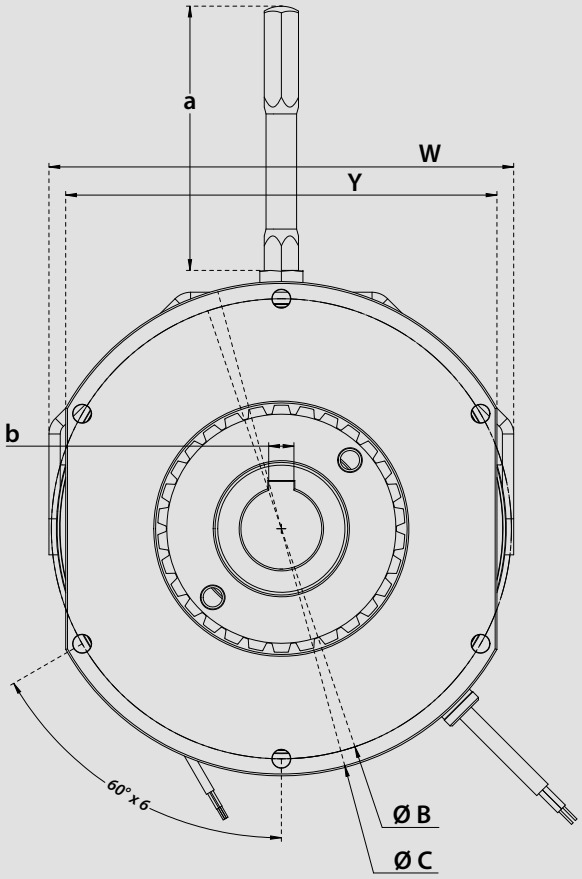
KEB's load brakes are specially designed for theatre applications. The brakes are typically placed on the drum side of a hoist. Their small footprint allows them to be placed in compact winch designs.

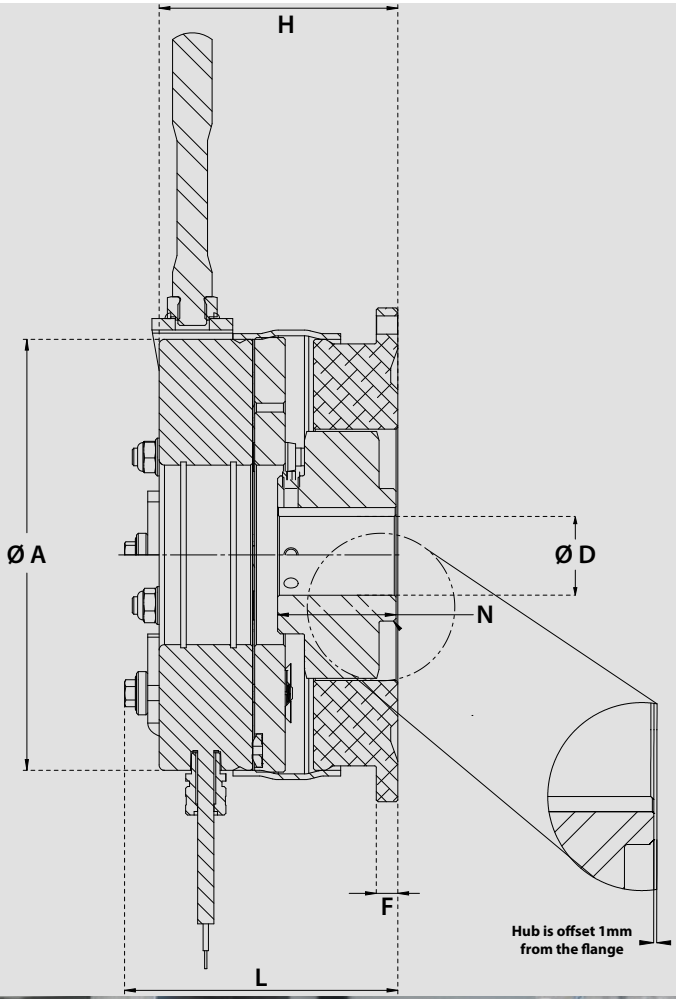
# SIZE 09 LOAD BRAKES (UP TO 1500 Nm)

| STATIC TORQUE (Nm) | A | a | B** | C** | ØD F7 (MAX)* | F | H | L*** | N | W | Y | WEIGHT (KG) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 240 | 400 | 256 | 273 | 65 | 12 | 128 | 148 | 66 | 259 | 240 | 29 |
| 500 | | | | | | | | | | | | |
| 750 | | | | | | | | | | | | |
| 1000 | | | | | | | | | | | | |
| 1250 | | | | | | | | | | | | |
| 1500 | | | | | | | | | | | | |

All dimensions in mm - English bore and keyways available
*Sizes larger than 65mm are possible but below drawing will change - contact KEB for details
** Internal mounting options available - contact KEB for details
*** Without optional hand release L = 143mm

Max. Speed = 600 RPM
Rated Power = 135 W
100% on time duty



KEB load brakes are used on JR Clancy's PowerLift® Hoist.

# BRAKES & CLUTCHES MANUFACTURING

## MANUFACTURED & TESTED IN SHAKOPEE, MN - **MADE IN USA**

KEB America has become a leading brand in magnetic brakes and clutches, supplying customized solutions for robotics, self-driving vehicles (AGVs), medical devices, and theatre automation applications.

Our entire manufacturing process, from raw materials to finished product, occurs within our state-of-the-art, 150,000 sq. ft. facility in Shakopee, Minnesota. This facility boasts ISO 9001:2015 certification, ensuring the highest quality standards. We offer complete design and manufacturing capabilities catering to the North American market.

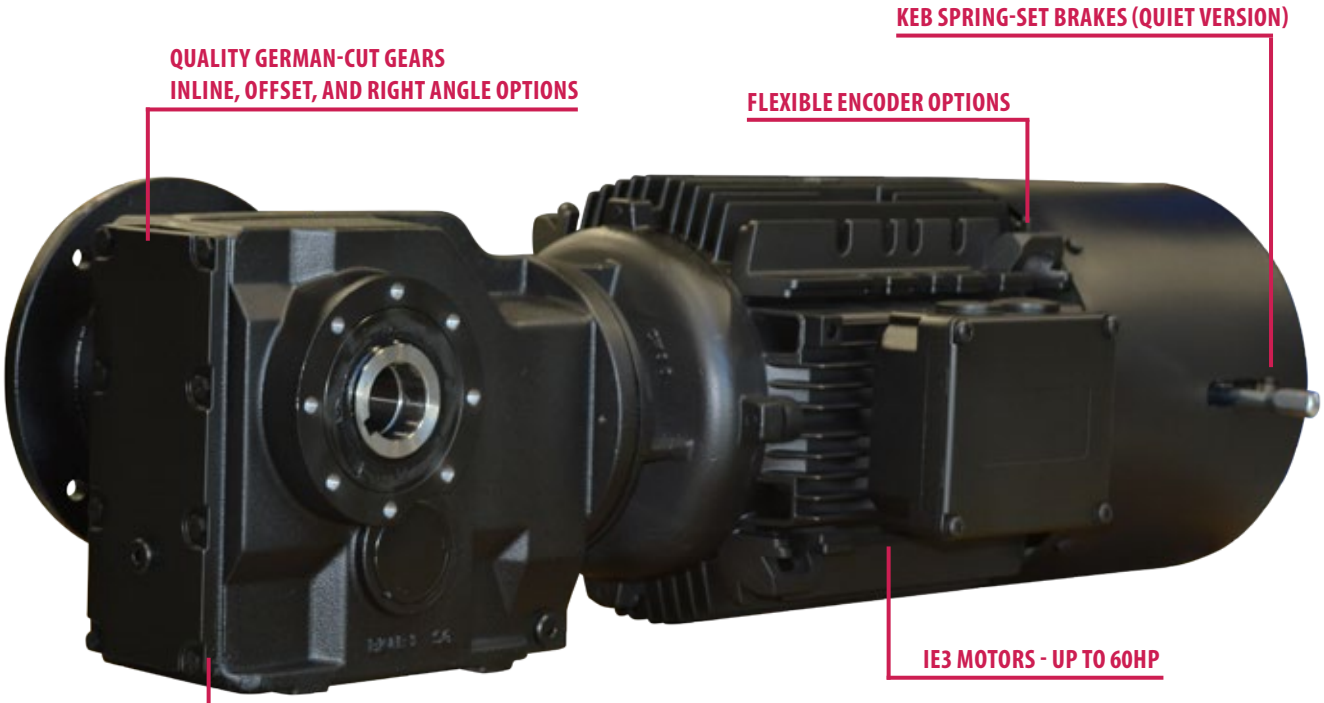
Watch the video tour of how our brakes and clutches are made on our YouTube channel: www.youtube.com/@KEBAmerica

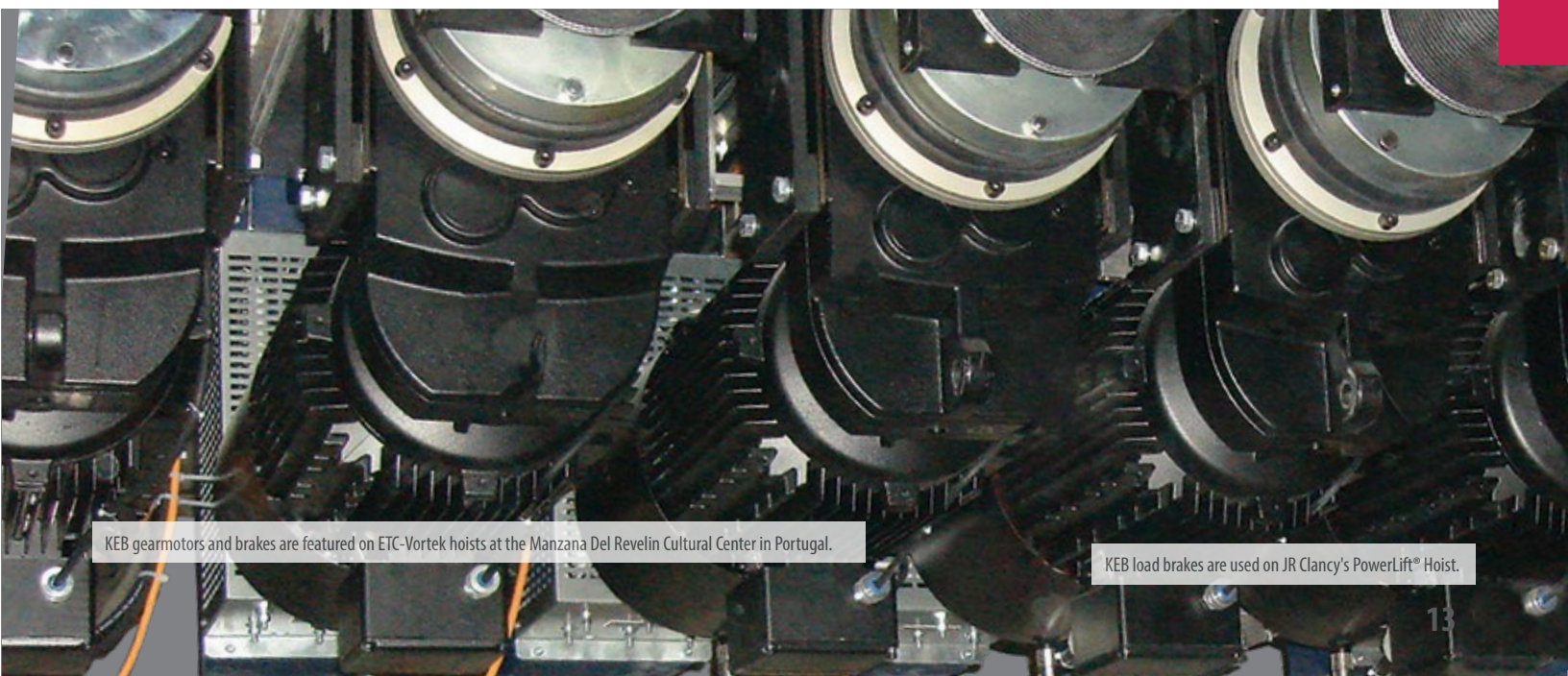
# GEARMOTORS

## Integral gearmotors

### HIGHLIGHTS

- Induction or servo motor (up to 60Hp)
- Flexible flange options
- Fanless motor for S2 duty - reduced noise version
- Prepared for handwheel (option)
- KEB brake technology with noise reduced, hand release, and microswitch options available
- Forced ventilation options for sustained operation at low speeds



KEB gearmotors and brakes are featured on ETC-Vortek hoists at the Manzana Del Revelin Cultural Center in Portugal.

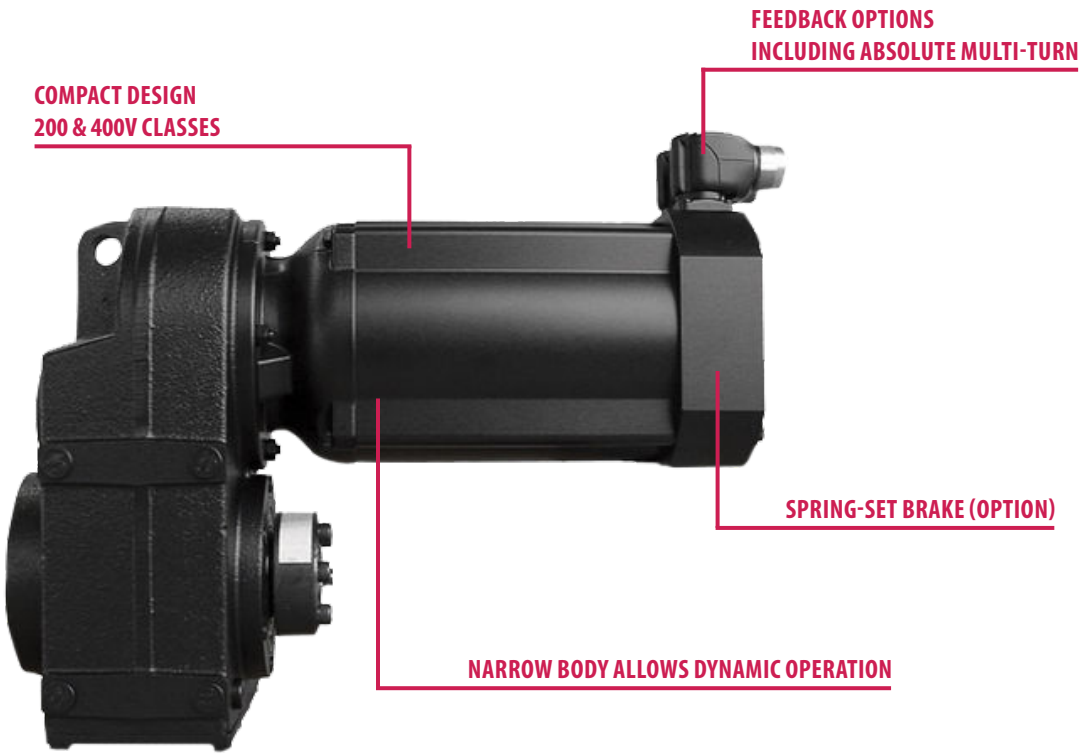
KEB load brakes are used on JR Clancy's PowerLift® Hoist.

# MOTORS

## PM servo motors

### HIGHLIGHTS

- Motors up to 82 Nm nominal torque
- Compatible with KEB integral gear product (inline, offset and right angle)
- Small diameter for under-hung drum designs
- Option with KEB spring-set brake
- Variety of feedback devices supported including absolute encoders
- Quick connect power and feedback connectors




## RECTIFIERS

| TYPE | PART # | INSTALLATION VOLTAGE | OUTPUT VOLTAGE (VDC) | RATED CURRENT(1) | DC SIDE SWITCHING | UL |
|---|---|---|---|---|---|---|
| HALF-WAVE | 0291010-CE07 | 275VAC | $VAC_{Input}$ * .45 | 1.0A | Yes | Yes |
| FULL-WAVE | 0291020-CE07 | 275VAC | $VAC_{Input}$ * .90 | 2.0A | Yes | Yes |
| OVEREXCITATION(2) | 9098200-CE09 | 300VAC | OEX(2) | 1.2A | Yes | Yes |
| HALF-WAVE | 0491010-CE07 | 500VAC | $VAC_{Input}$ * .45 | 1.0A | Yes | Yes |
| FULL-WAVE | 0491020-CE07 | 500VAC | $VAC_{Input}$ * .90 | 2.0A | Yes | Yes |
| OVEREXCITATION (2) | 9098200-001U | 500VAC | OEX(2) | 1.2A | Yes | Yes |
| HALF-WAVE | 0591010-CE09 | 600VAC | $VAC_{Input}$ * .45 | 1.0A | No(3) | Yes |

(1) Rating at 45°C; Units can be placed in parallel for added capacity.
(2) Overexcitation provides full-wave rectification for approx. 300ms, then steps down to half-wave. Advantage: improved brake release time.
(3) Available, but not built into rectifier.

# F6 inverter

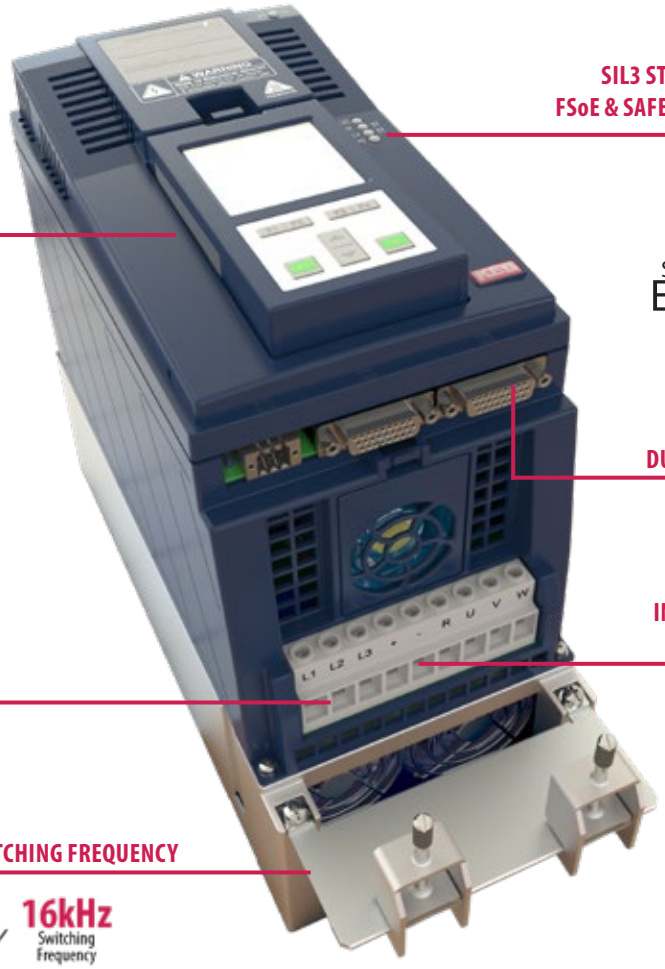
## HIGHLIGHTS

- Worldwide platform: 230 and 480V classes (up to 500Hp)
- Internal 32-bit positioning control
- SIL3 Safe-Torque-Off (STO) standard | networked FSoE optional
- Integrated brake handling with Pre-Torque™
- Dual channel encoder card
- Supports all major industrial ethernet protocols including EtherCAT

KEB's F6 provides realtime performance with its integrated EtherCAT bus.  Failsafe over EtherCAT

KEB's High Performance F6 VFD features an internal positioning module which allows for easy coordinated hoist positioning. One possible implementation is to have a master control simply provide a set position to the drive through the communication bus and the drive handles the position profile. Both drive platforms are capable of operating at 16kHz switching frequency with automatic derate. This provides silent operation from the drive.

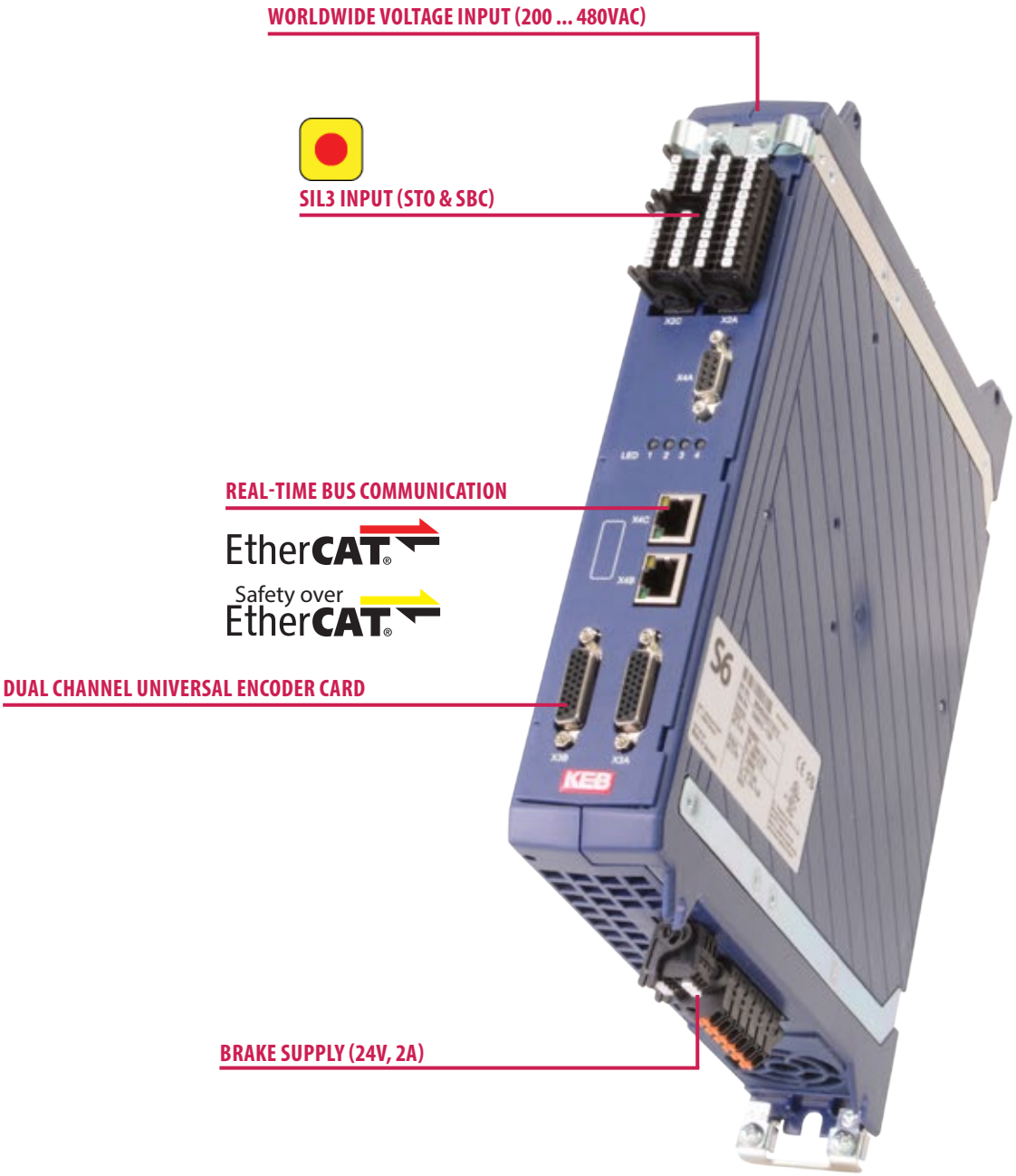
KEB's drives feature dual encoder channels which can be configured as inputs or outputs. This makes evaluating the hoists speed feedback very easy. A sample implementation is to compare the motor feedback and speed feedback from the drum side of a theater winch. The KEB drive can continuously evaluate the two signals with an internal gearing ratio and determine if an e-stop is necessary.



## S6 servo drive

### HIGHLIGHTS

- Up to 5.5kW
- 200 ... 480VAC input
- Real-time communication: EtherCAT standard
- Narrow profile (book mount style)
- Quiet operation (16kHz maximum)
- SIL3 safety functionality including STO and SBC



# C6 Smart embedded control

## HIGHLIGHTS

- ARM Cortex™-A9 powered
- 32-bit processor for motion and camming profiles
- Integrated micro UPS for critical applications
- Integrated EtherCAT E-bus for expandable I/O
- DVI port for visualization handling

The C6 Smart is ideal for theatre applications requiring the synchronization of multi-axis motion control. The Smart features an EtherCAT master for real-time performance. A quad-core version with a DVI output allows the Smart to handle the system visualization as well.

A micro-UPS with 512KB of persistent/retain memory to protect against power outages is included as standard on the Smart. Also standard is 8 GB of on-board memory for application. The Smart includes a Combivis Connect™ license which allows a user to securely and easily remote connect to the machine through an internet connection.

# SAFETY PLC

## FSoE Safety Master

### HIGHLIGHTS

- Fail Safe over EtherCAT (FSoE) Master
- TÜV Rheinland approved
- IEC 61508 SIL3 and EN/ISO 13849-1 PL e
- Black channel approach - main and safe control on the same bus
- Safety PLC can be used in decentralized topology
- Safe I/O can be distributed remotely

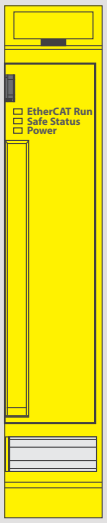
Safety over EtherCAT®

| | |
|---|---|
| Certified | By TÜV SÜD (up to SIL3) |
| Open | Managed by EtherCAT Technology Group (ETG) |
| Proven | FSoE established in 2010 |
| Flexible | Machine PLC and Safety share common bus |
| Scalable | Up to 65,535 addressable slaves per master |
| Drive safety | Triggering Safety Functions in Drive over FSoE bus (e.g. STO, SLS, SLP, SOS, SS1, etc.) |

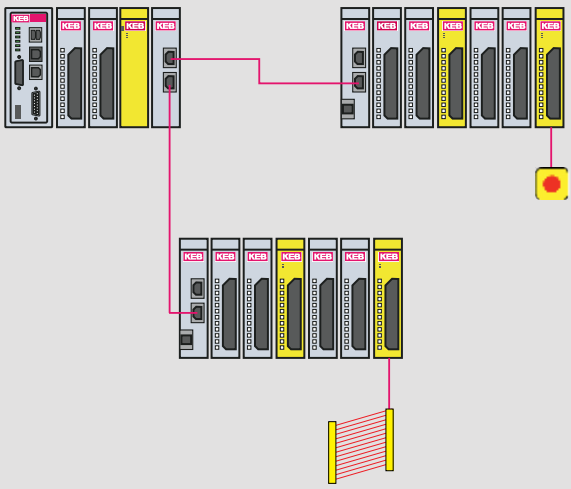
Safety over EtherCAT®
EtherCAT®

Safety

PLCopen safety




### Decentralized safety concept



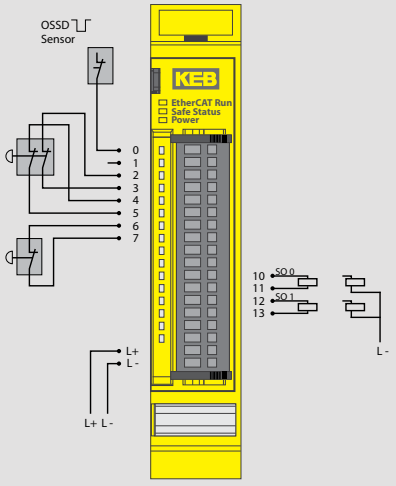
# SAFE I/O

## Safety Inputs
## Safety Outputs

### HIGHLIGHTS

- Fail Safe over EtherCAT (FSoE) slave
- TÜV Rheinland approved
- IEC 61508 SIL3 and EN/ISO 13849-1 PL e
- 4 safe inputs
- 2 safe outputs (max = 2 Amps)
- 4 OSSD outputs (Safe Input supply)

Safety over EtherCAT®



# C6 remote I/O

## HIGHLIGHTS

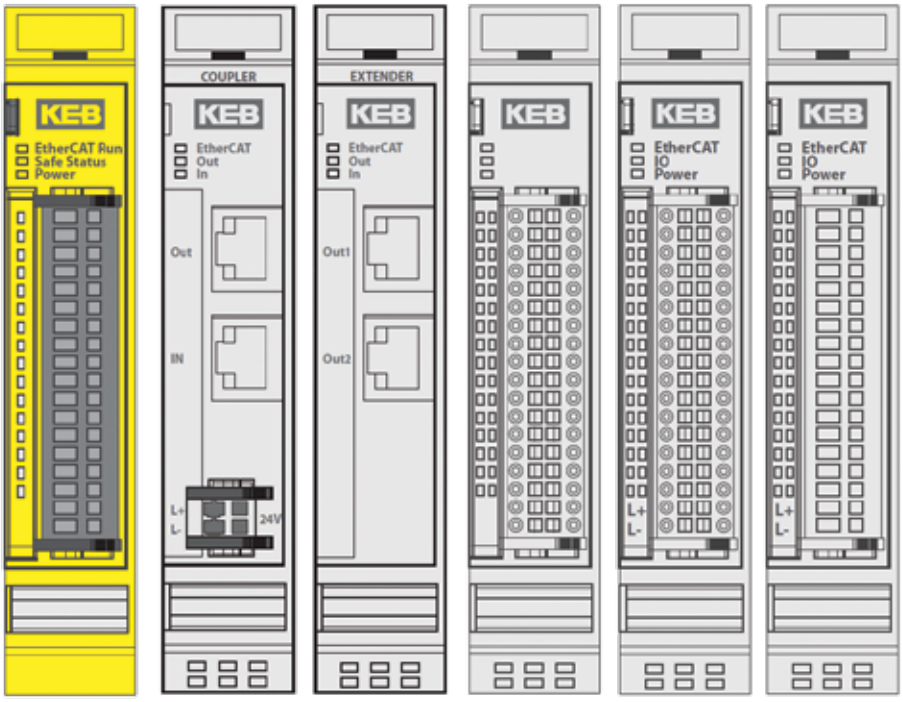
- EtherCAT communication bus
- Expandable and scalable
- DIN mount
- Large number of options and configurations possible

KEB's line of remote EtherCAT I/O is scalable and many options for analog and digital signals are available. The modules are DIN rail mounted and easily snap into each other. The units are only 25mm wide and are capable of 32 discrete inputs/outputs.

## Available modules

- EtherCAT bus coupler
- EtherCAT I/O extender
- Digital in (16 or 32)
- Digital mixed (16 in, 16 out)
- Analog in, voltage (13 bit, 8 single or 4 differential)
- Analog in, voltage (13 bit, 16 single or 8 differential)
- Analog in, current (16 bit, 4 or 8)
- Analog out (12/16 bit, 4)
- Temperature in, Ni100 (16 bit, 4 or 8)
- Temperature in, Ni1000 (16 bit, 4 or 8)
- Temperature, thermocouples (16 bit, 4 or 8 in)
- Fast counter / encoder (max. 400kHz)
- Stepper / brushless DC control

| | |
|---|---|
| **FIELDBUS** | EtherCAT 100 Mbits/s |
| **DIMENSIONS (W X H X D)** | 12 x 120 x 90 mm |
| **INSTALLATION** | 35 mm DIN top-hat rail |
| **E-BUS CONNECTION** | Side plug (EtherCAT) |
| **POWER SUPPLY** | 24VDC -20% +25% |
| **OPERATING TEMPERATURE** | 0 ... 55° C |
| **PROTECTION CLASS** | IP20 |



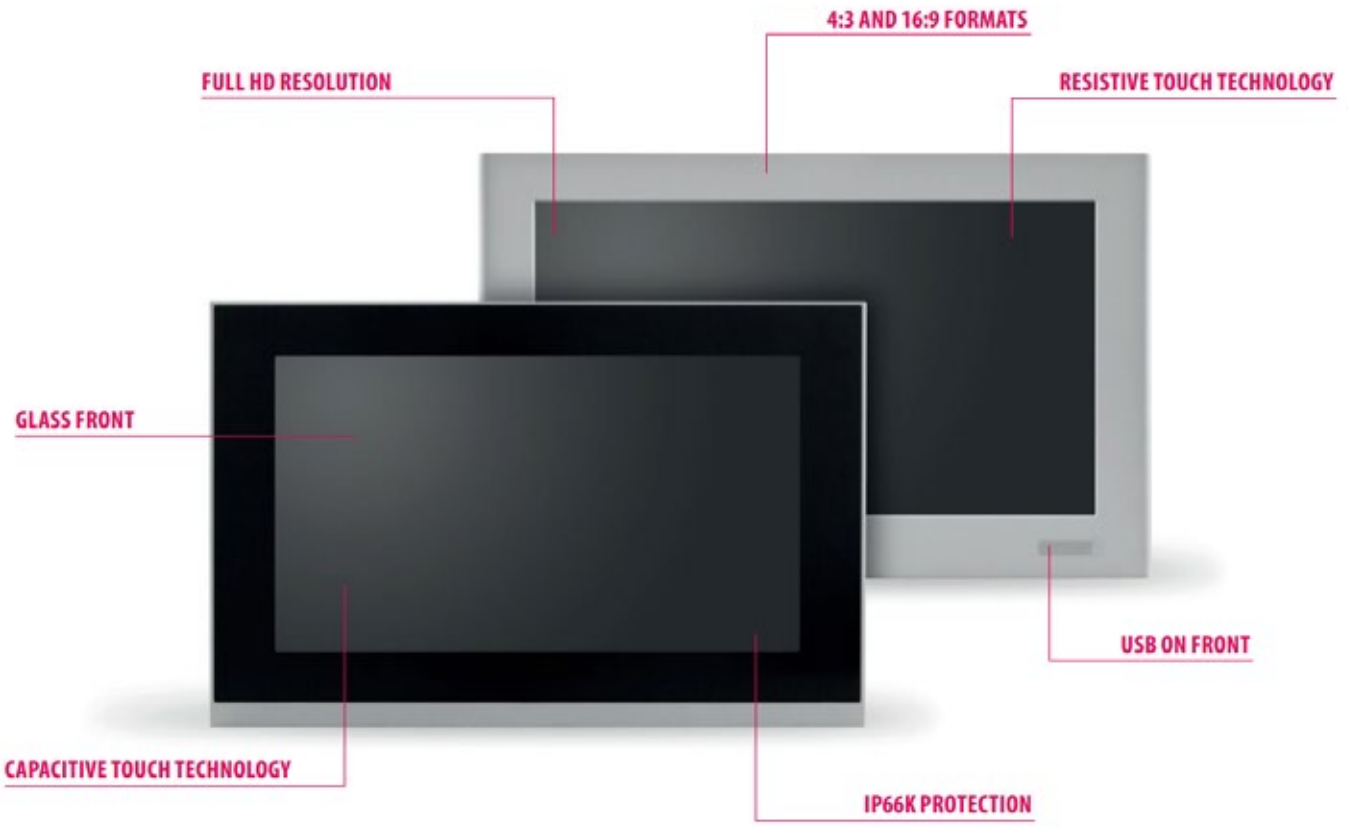
# HMI and panel IPCs

## HIGHLIGHTS

- Fanless panel or IPC box up to 50° C operating temperature
- Intel® Bay Trail Platform with 64 bit architecture
- LED backlight TFT LCD display with 16 million colors in range of formats
- Slim version available for installations with limited space
- Two operating systems tailored to the application
- Smart memory concept for maximum flexibility in application

Industrial grade HMIs and Panel IPCs from KEB are designed to last, especially in demanding environments. They have no fans or moving parts and a tough front panel that is rated IP66.

KEB HMIs are available in a wide range of sizes and formats and have beautiful displays for putting all the right information at your fingertips. Choose from capacitive touch technology for accurate responses to taps, touches, and swipes, or resistive touch technology that responds to a pen, stylus, or gloved hand.



# CONTROL

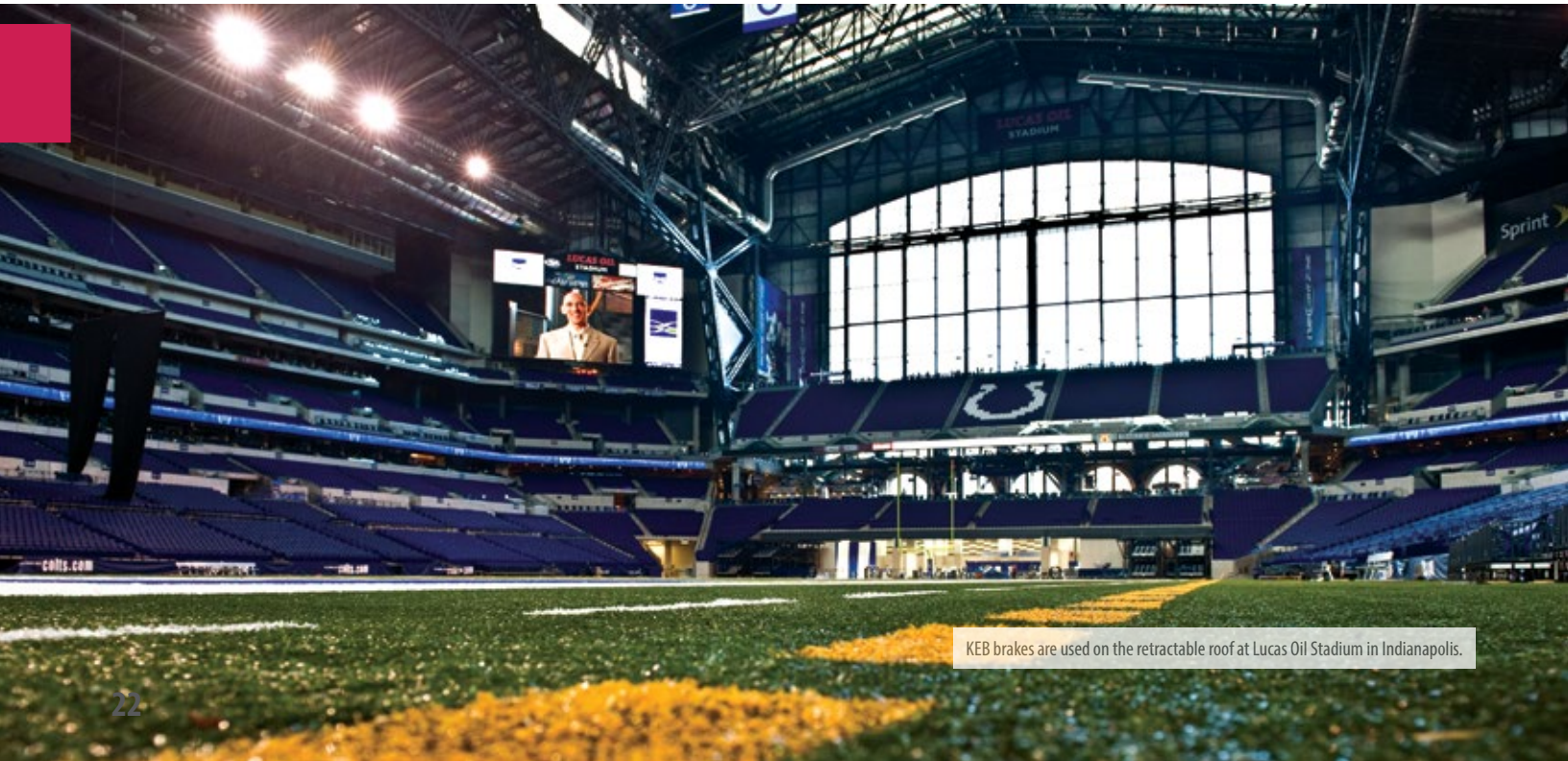
## VPN router

### HIGHLIGHTS

- Remote monitoring using Ethernet
- Worldwide support from redundant servers
- 4G GSM cellular modem available
- Access to remote devices via Ethernet or serial interface
- Optional HMI functionality for data logging, diagnostics, and notifications

Some installations can be in tight, hard-to-reach spaces. That's where KEB's VPN Router shines. Connect to any PLC on your network for monitoring and diagnostics without having to crawl into potentially dangerous situations.

Our C6 Router comes in four versions to best suit your installation. With or without HMI functionality, with or without the ability to connect via cellular modem. The C6 Router is the ideal tool to put it all together and create your perfect, functional automated system.




KEB brakes are used on the retractable roof at Lucas Oil Stadium in Indianapolis.

**Belgien** | KEB Automation KG
Herenveld 2 9500 Geraardsbergen Belgien
Tel: +32 544 37860 Fax: +32 544 37898
E-Mail: vb.belgien@keb.de Internet: www.keb.de

**Brasilien** | KEB South America – Regional Manager
Rua Dr. Omar Pacheco Souza Riberio, 70
BR-CEP 13569-430 Portal do Sol, São Carlos Brasilien
Tel: +55 16 31161294 E-Mail: roberto.arias@keb.de

**China** | KEB Power Transmission Technology (Shanghai) Co. Ltd.
No. 435 QianPu Road Chedun Town Songjiang District
201611 Shanghai P. R. China
Tel: +86 21 37746688 Fax: +86 21 37746600
E-Mail: info@keb.cn Internet: www.keb.cn

**Deutschland** | Stammsitz
KEB Automation KG
Südstraße 38 32683 Barntrup Deutschland
Tel: +49 5263 401-0 Fax: +49 5263 401-116
E-Mail: info@keb.de Internet: www.keb.de

**Deutschland** | Getriebemotorenwerk
KEB Antriebstechnik GmbH
Wildbacher Straße 5 08289 Schneeberg Deutschland
Tel: +49 3772 67-0 Fax: +49 3772 67-281
E-Mail: info@keb-drive.de Internet: www.keb-drive.de

**Frankreich** | Société Française KEB SASU
Z.I. de la Croix St. Nicolas 14, rue Gustave Eiffel
94510 La Queue en Brie Frankreich
Tel: +33 149620101 Fax: +33 145767495
E-Mail: info@keb.fr Internet: www.keb.fr

**Großbritannien** | KEB (UK) Ltd.
5 Morris Close Park Farm Industrial Estate
Wellingborough, Northants, NN8 6 XF Großbritannien
Tel: +44 1933 402220 Fax: +44 1933 400724
E-Mail: info@keb.co.uk Internet: www.keb.co.uk

**Italien** | KEB Italia S.r.l. Unipersonale
Via Newton, 2 20019 Settimo Milanese (Milano) Italien
Tel: +39 02 3353531 Fax: +39 02 33500790
E-Mail: info@keb.it Internet: www.keb.it

**Japan** | KEB Japan Ltd.
15 - 16, 2 - Chome, Takanawa Minato-ku
Tokyo 108 - 0074 Japan
Tel: +81 33 445-8515 Fax: +81 33 445-8215
E-Mail: info@keb.jp Internet: www.keb.jp

**Österreich** | KEB Automation GmbH
Ritzstraße 8 4614 Marchtrenk Österreich
Tel: +43 7243 53586-0 Fax: +43 7243 53586-21
E-Mail: info@keb.at Internet: www.keb.at

**Russische Föderation** | KEB RUS Ltd.
Lesnaya str, house 30 Dzerzhinsky MO
140091 Moscow region Russische Föderation
Tel: +7 495 6320217 Fax: +7 495 6320217
E-Mail: info@keb.ru Internet: www.keb.ru

**Schweiz** | KEB Automation AG
Witzbergstraße 24 8330 Pfäffikon/ZH Schweiz
Tel: +41 43 2886060 Fax: +41 43 2886088
E-Mail: info@keb.ch Internet: www.keb.ch

**Spanien** | KEB Automation KG
c / Mitjer, Nave 8 - Pol. Ind. LA MASIA
08798 Sant Cugat Sesgarrigues (Barcelona) Spanien
Tel: +34 93 8970268 Fax: +34 93 8992035
E-Mail: vb.espana@keb.de Internet: www.keb.de

**Südkorea** | KEB Automation KG
Room 1709, 415 Missy 2000 725 Su Seo Dong
Gangnam Gu 135- 757 Seoul Republik Korea
Tel: +82 2 6253 6771 Fax: +82 2 6253 6770
E-Mail: vb.korea@keb.de Internet: www.keb.de

**USA** | KEB America, Inc.
5100 Valley Industrial Blvd. South Shakopee, MN 55379 USA
Tel: +1 952 2241400 Fax: +1 952 2241499
E-Mail: info@kebamerica.com Internet: www.kebamerica.com

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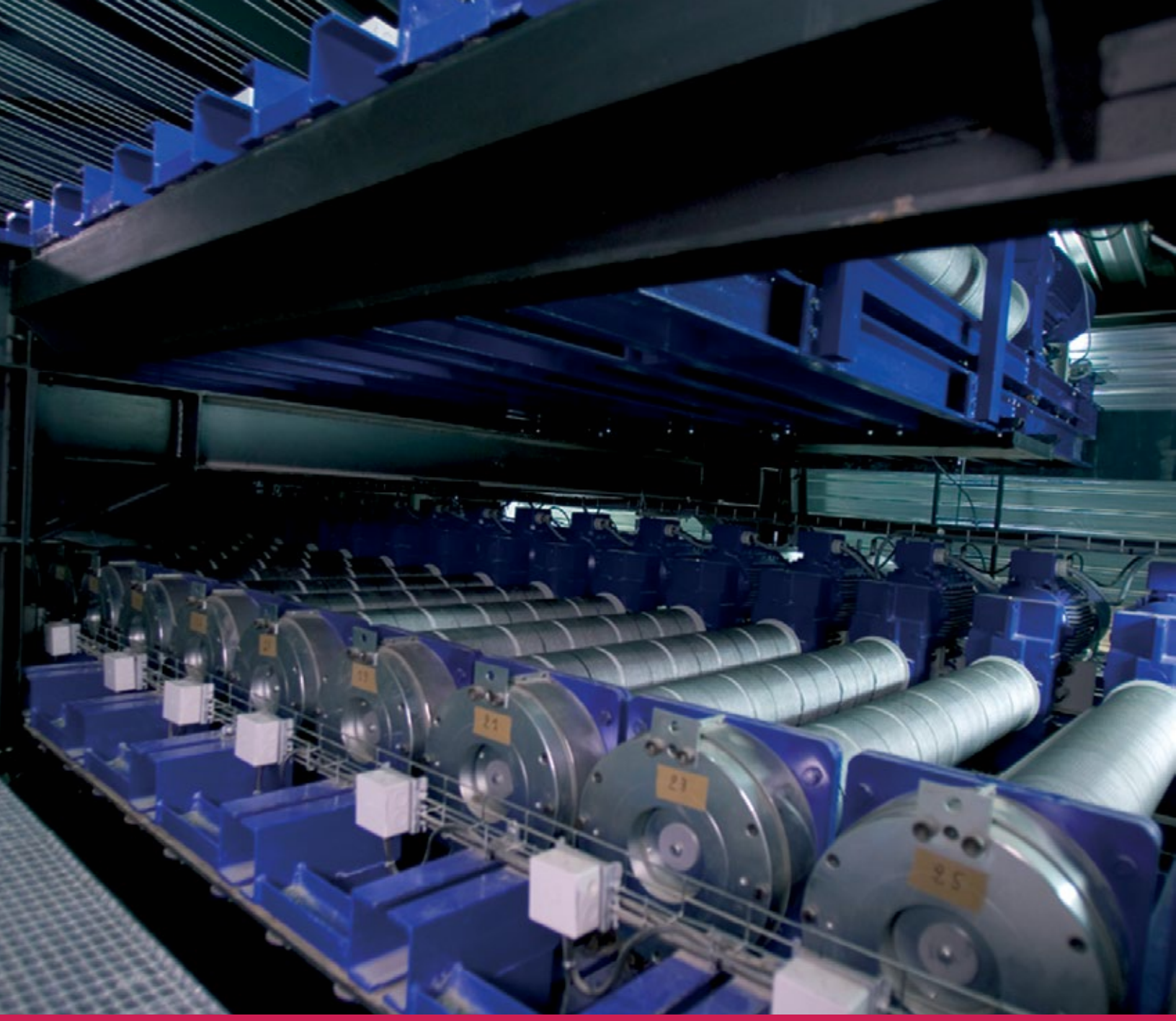

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**KEB AMERICA, INC.**

5100 VALLEY INDUSTRIAL BLVD. SOUTH, SHAKOPEE, MN 55379
TEL: (952) 224-1400

SALES@KEBAMERICA.COM
WWW.KEBAMERICA.COM

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