



Know your Loads, Weights and Forces for a Safe and Secure Operation

Transport Middle East 2026
29 September to 1 October

Facts & Figures

About BROSA

Headquarters

- BROSA GmbH, Tettnang, Germany
- Production and R&D Sensors

Subsidiaries

- BROSAtronic AG, Switzerland
- Production and R&D Electronics, SW
- BROSA B.V., Oss, Netherlands
- Sales Office
- BROSA Pte Ltd, Singapore
- Sales Office
- BROSA (Nanjing) Co., Ltd., China
- Sales Office

Key Figures

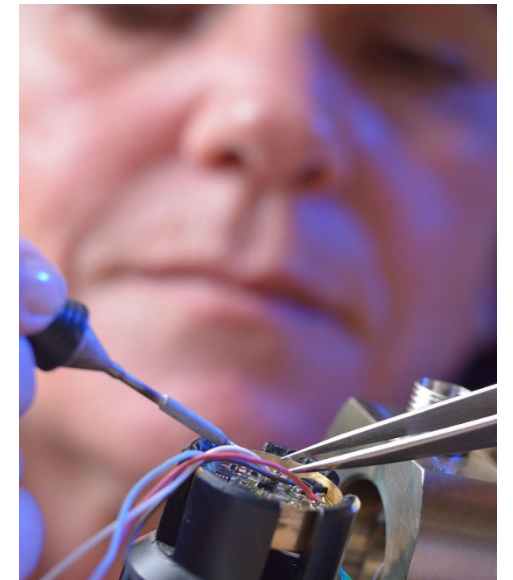
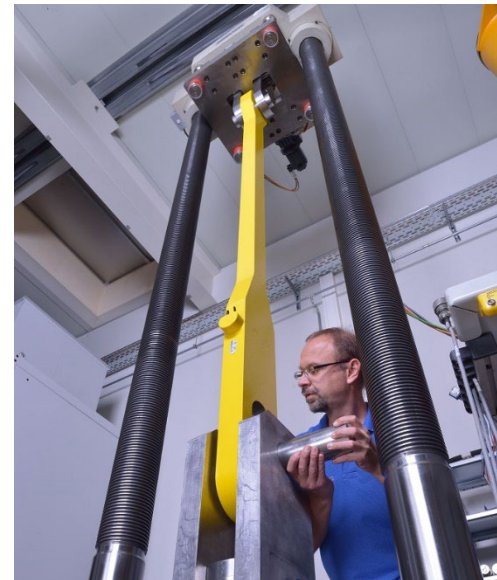
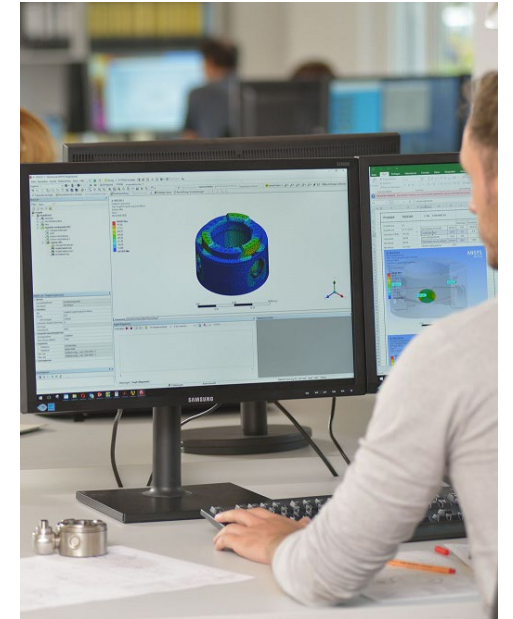
- Founded in 1935
- ISO 9001 and ISO 14001 certified



Facts & Figures

About BROSA

- Products are developed in close collaboration with our customers
- Understanding the Trends & Industries
- Compliance with worldwide safety standards
- “Made in Germany”
- More than 90% in house manufacturing
- Full scope of product engineering and manufacturing
 - Specification
 - Technical proposals
 - Production: mechanical, electrical, assembly
 - Calibration
 - Certification, Type Approvals,
 - Customer Acceptance Tests



Product



Force
measuring
pin



Tension load
cell



Force sensor
washer



Tubular load
cell



Compression
load cell



Shear force
sensor



Rod end load
cell



Measuring
block



Support jack
load cell



Bearing
force sensor



Angle sensor
MEMS



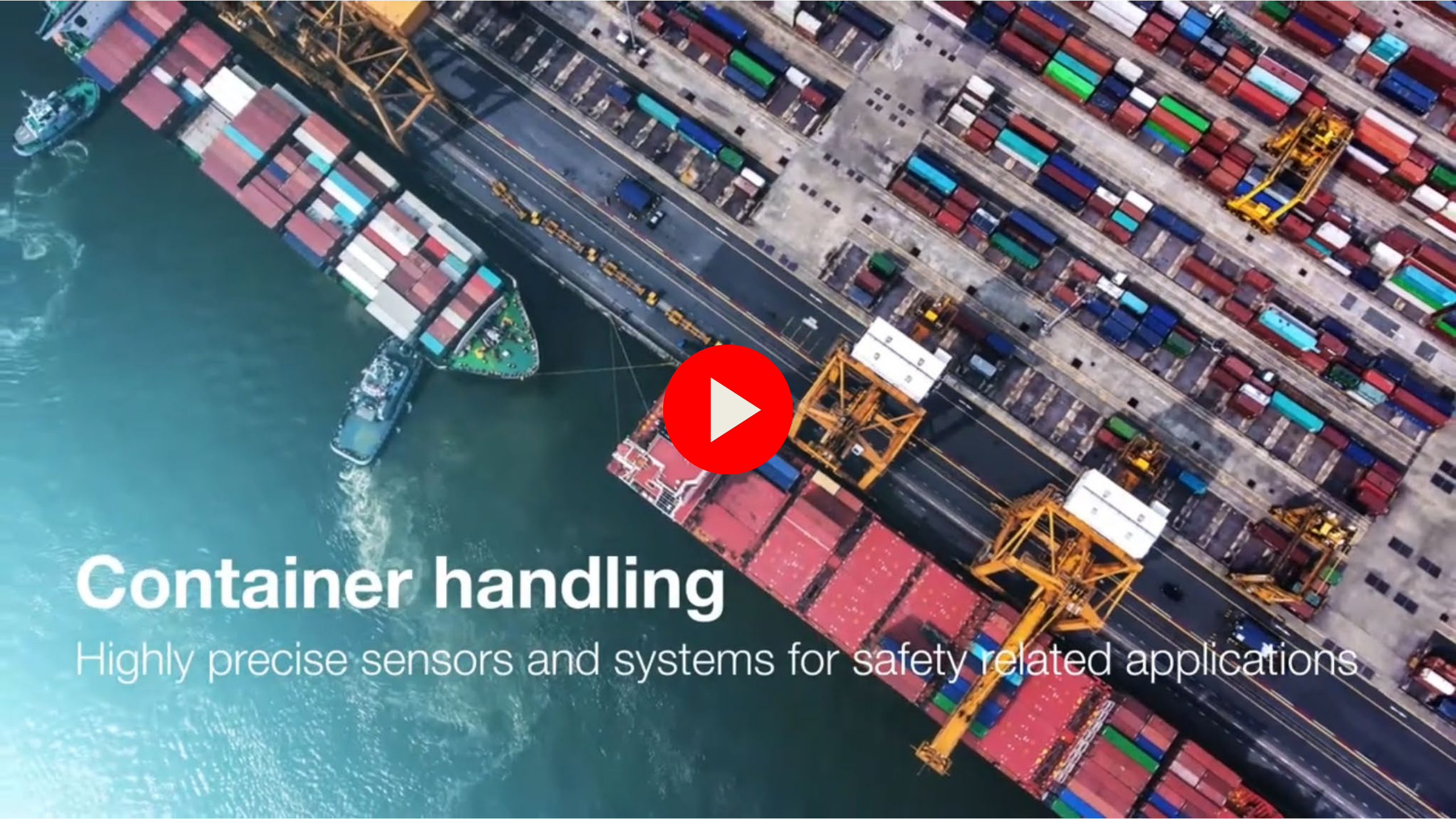
Pressure
transducer



BROSA
Electronic



Sensor
for Ex area



Container handling

Highly precise sensors and systems for safety related applications

Safety Sensor Concept

Single output

PL c / SIL 1



1 measuring system
1 amplifier
1 output

4-20 mA
CANopen
PROFINET

PL d / SIL 2

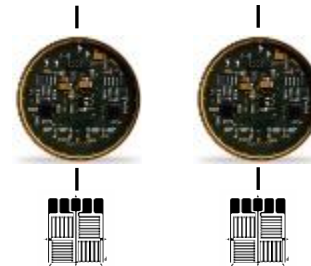


2 measuring systems
1 amplifier
1 output

4-20 mA
CANopen
CANopen safety
PROFINET
PROFINET PROFIsafe

Redundant (double output)

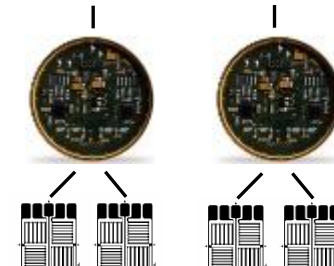
2x PL c / SIL 1 *



2 measuring systems
2 amplifiers
2 outputs

4-20 mA
CANopen
PROFINET

2x PL d / SIL 2 *



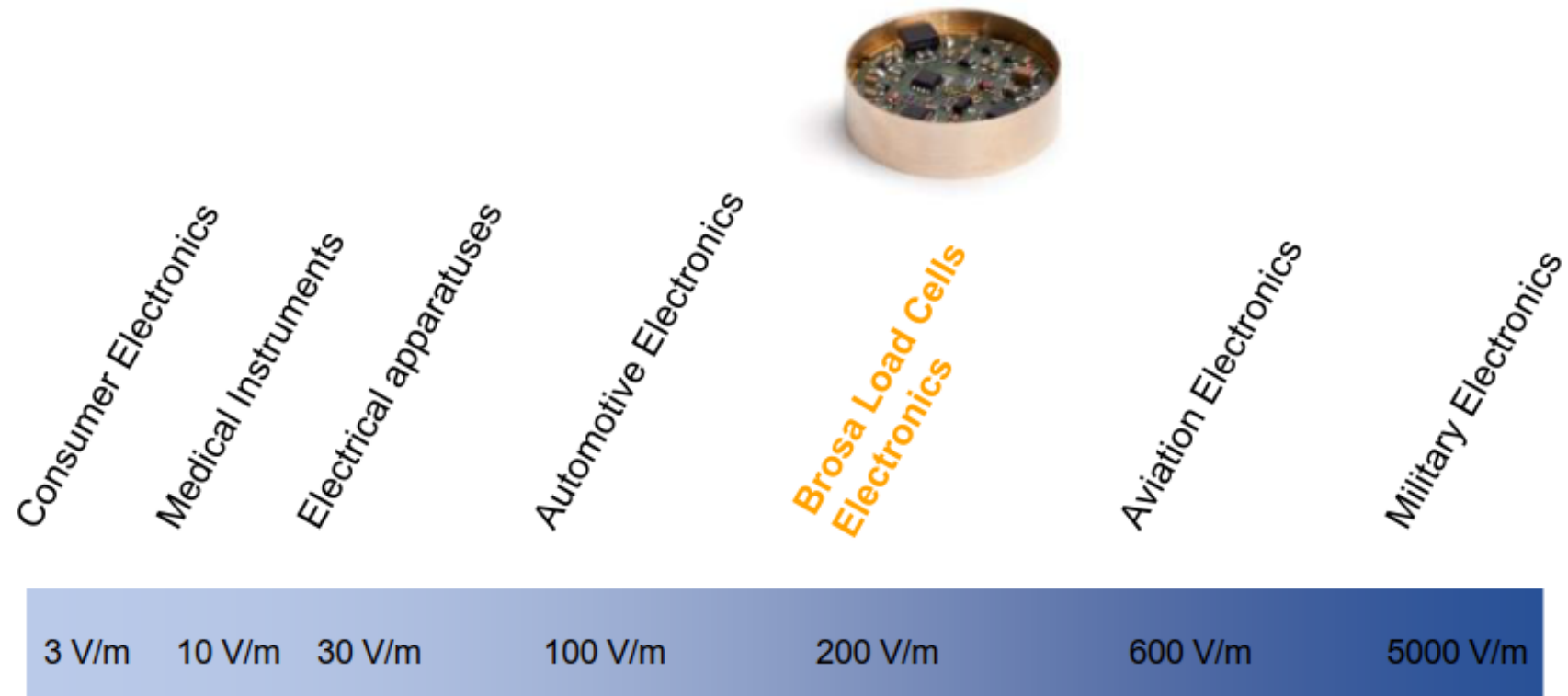
4 measuring systems
2 amplifier
2 output

4-20 mA
CANopen
CANopen safety
PROFINET
PROFINET PROFIsafe

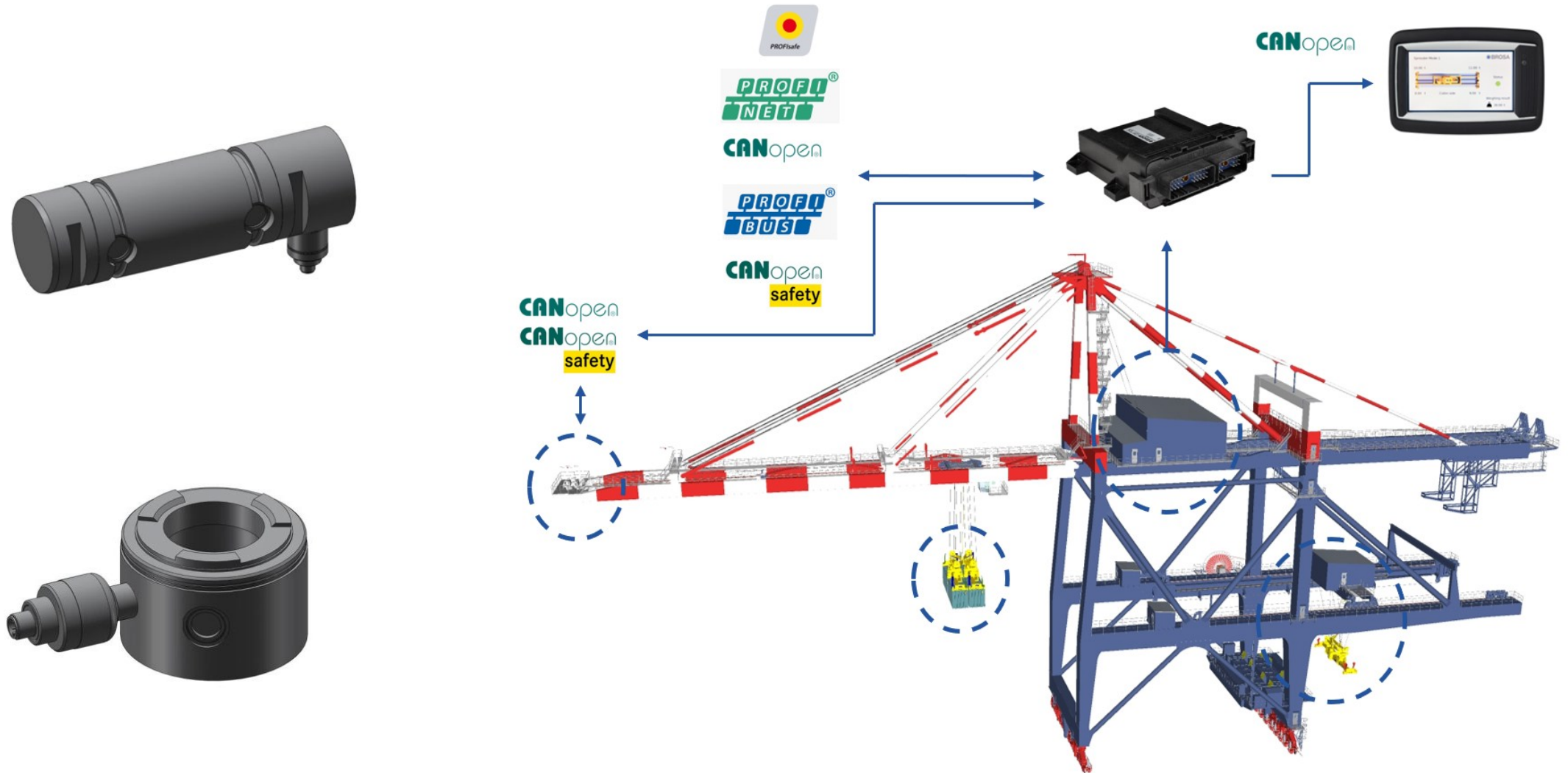
* PL e / SIL 3 is possible if used in parent systems DIN EN ISO 13849-1

EMC (Electro Magnetic Compatibility)

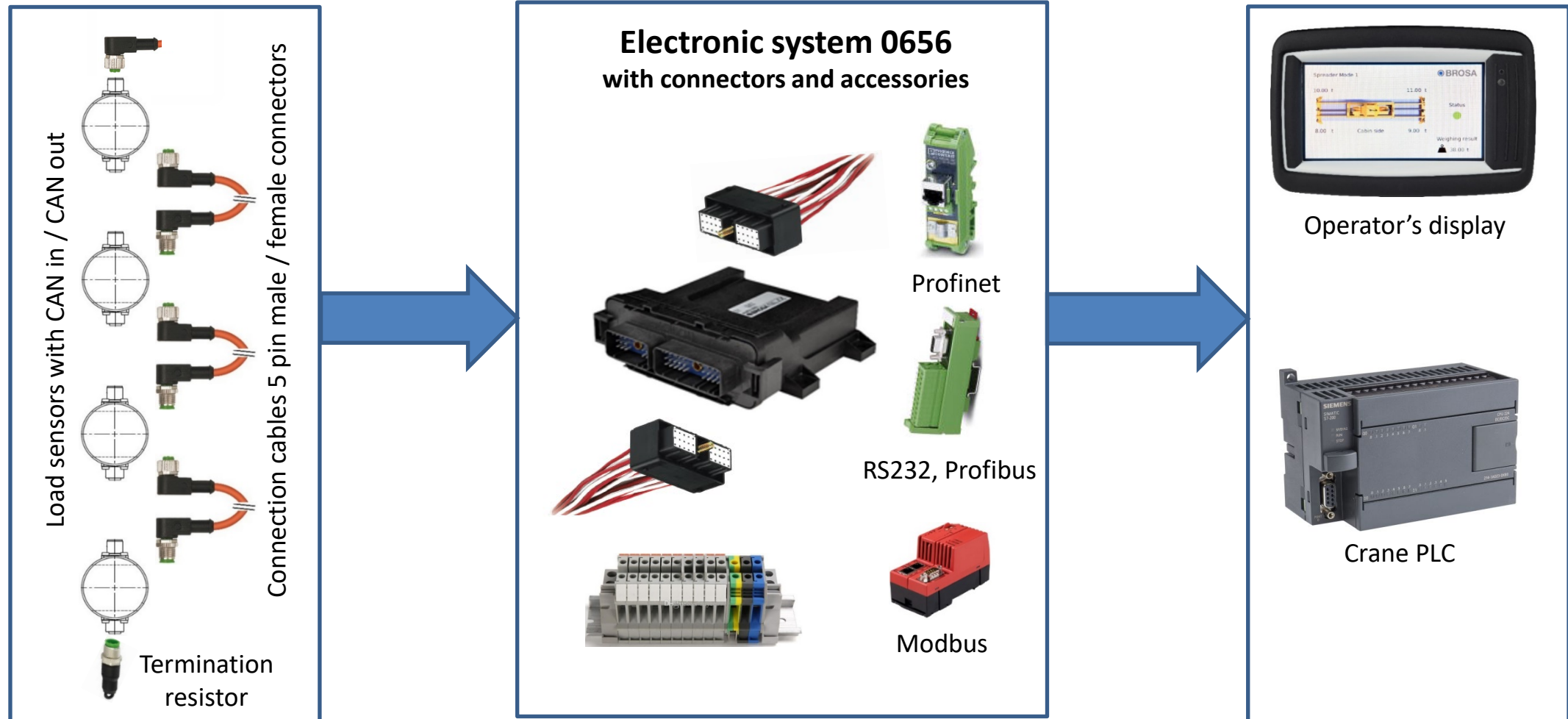
Immunity (perfectly shielded amplifiers & measuring zones)



Safety System Concept



Safety System Concept



Certificates

Weighing & Safety, FMEA, OIML Certificate

Key Data from RP & FMEA

- Standard: IEC 61508 / EN 13849
- Architecture-Category
- Probability of a dangerous failure (PFH)
- Mean Time to a dangerous Failure (MTTFd)
- Diagnostic Coverage of dangerous failures (DC)
- Mission time
- Resulting in Safety Integrity Level
- SIL2 = PLd

Project No: LUD013D024
Issue: 01

1 Overview:

Block-Nr.
Block-Name
Architecture
DO
DU
SD
SU
DC
log
log / log
PFH
Requirement
PFH
SIL
Requirement
MTTF
DC
PL

LUD013D024

Project Nr. LUD013D024	DANGmicro (2 Messbrücken)
Issue: 02	Reliability Prediction

OVERVIEW

The following failure rates have been c:
Messbrücken)
[Für das Projekt DANGmicro (2 Messbrücken ermittelt):

$$\begin{aligned}\lambda_{SD} &= 0,0502 \cdot 10^{-6} \text{ H}^{-1} \\ \lambda_{SU} &= 0,1230 \cdot 10^{-6} \text{ H}^{-1} \\ \lambda_{SD} &= 0,1797 \cdot 10^{-6} \text{ H}^{-1} \\ \lambda_{DU} &= 0,0087 \cdot 10^{-6} \text{ H}^{-1}\end{aligned}$$

The MTTF_d value of all dangerous failures is
[Die MTTF_d aller gefährlichen Ausfälle beträgt]

$$\text{MTTF}_d = 606 \text{ (100*) years (Jahre)}$$

* According to the DIN EN ISO 13849-1 years.
[Der MTTF_d ist nach DIN EN ISO 13849-1 au

The resulting diagnostic coverage of dangerous
[Es ergibt sich ein Diagnoseabdeckungsgrad]

$$\text{DC} = 95,40 \%$$

These values correspond to performance according to the table K1 in the DIN EN ISO
[Nach Tabelle K1 der DIN EN ISO 13849 einem Performance Level d.]

The probability of a dangerous failure (PFH)
[Die Wahrscheinlichkeit eines gefährlichen Ausfalls beträgt]:

$$\text{PFH} = 4,04 \cdot 10^{-9} \text{ H}^{-1}$$

The Safety Integrity Level, relative to the determined
[Der Sicherheits-Integritätslevel (SIL), bezogen auf]

$$\text{PL}_d = \text{SIL-2}$$

Standards and Handbooks
[Normen & Zuverlässigkeitsstandards]:

IEC TR62380	DIN EN ISO
FMD-91	DIN EN ISO
IEC 62061	IEC 61508

LUD013D024

Tobias Ludner - Elektronik Analyse



OIML BASIC CERTIFICATE OF CONFORMITY

OIM/ SW



OIML BASIC CERTIFICATE OF CONFORMITY

OIML Member State
SWEDEN

OIML Certificate N°
R60/2000-SE1-17.01



Identifi

General

The load
integrat
The ring
such as
position

Technic

Max cap
Min cap
Interval
Minimum
verificat
EMC cla
Temper
Power s
Apportic

Interfa

The load

CANopen

Applicant

Name:

Brosa AG

Address:

Dr.-Klein-Straße 1, D-88069 Tettnang, Germany

Issuing authority

Name:

SP Technical Research Institute of Sweden

Address:

Box 857, SE-501 15 Borås, Sweden

Person responsible:

Lennart Aronsson

Manufacturer of the certified pattern is the applicant.

Identification of the certified pattern

A graduated, self-indicating, electronic, automatic weighing instrument.

Identification of

Digital load cell

the certified type

Type: 0120

Accuracy class

D(0,23)

Number of verification scale intervals

n ≤ 230

(Identification continued on next page.)

This certificate attests the conformity of the above-mentioned pattern (represented by the samples identified in the associated test report) with the requirements of the following Recommendation(s) of the International Organization of Legal Metrology (OIML):

R60, edition 2000.

This certificate relates only to the metrological and technical characteristics of the pattern of the instrument concerned, as covered by the relevant OIML International Recommendation(s).

This certificate does not bestow any form of legal international approval.

The conformity was established by tests described in the associated test report 6P07480-01-1 dated 2017-01-20. This is the first issue of this certificate.

Borås, January 23, 2017

SP Technical Research Institute of Sweden

Certification

Lennart Aronsson

Bengt Gutfelt



OIML Certificate

SP Technical Re

Box 857, SE-501 15 B

Phone: +46 10-516 50 00

E-mail/internet: info@sp.se

OIML Certificate of Conformity no R60/2000-SE1-17.01 dated January 23, 2017, page 1 (2)

SP Technical Research Institute of Sweden

Box 857, SE-501 15 Borås, Sweden

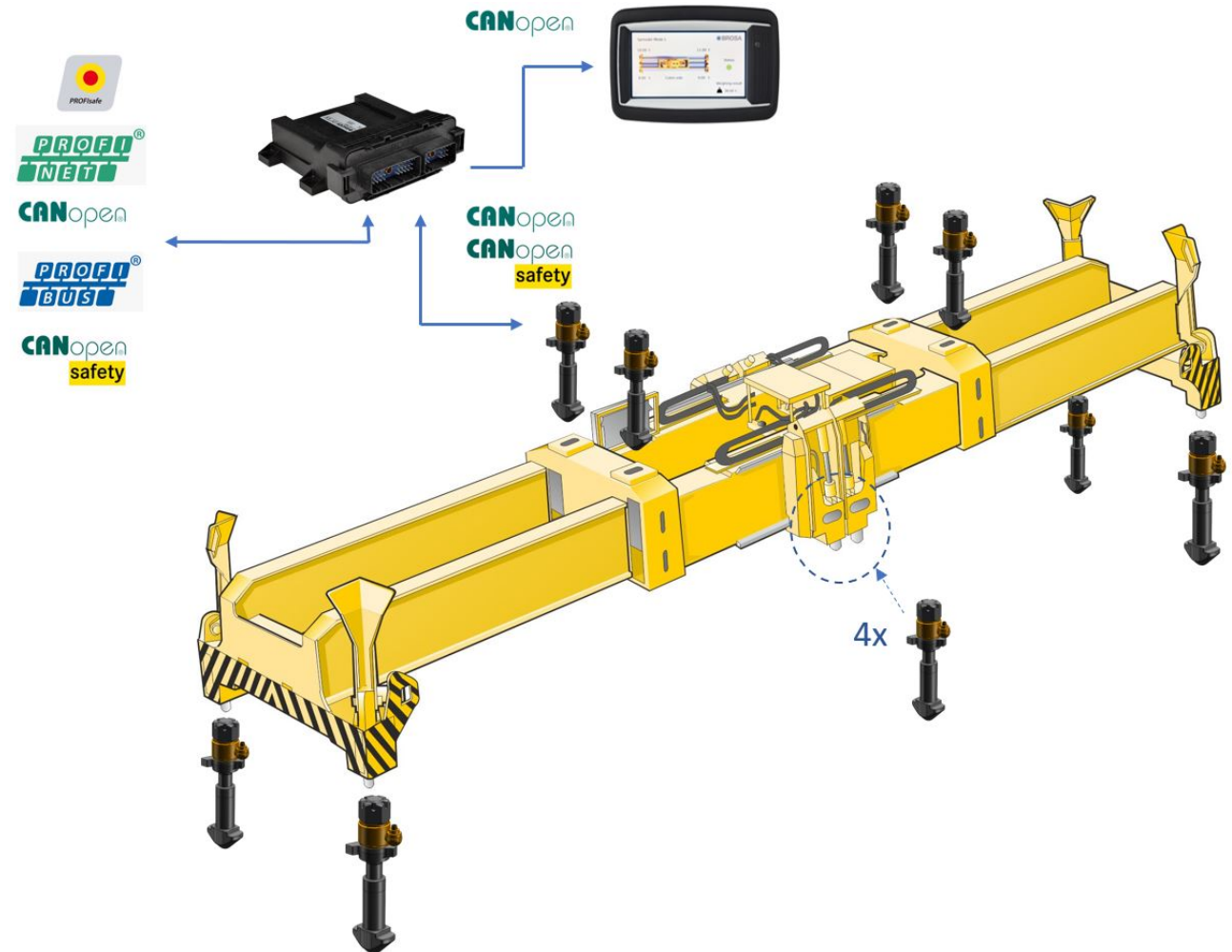
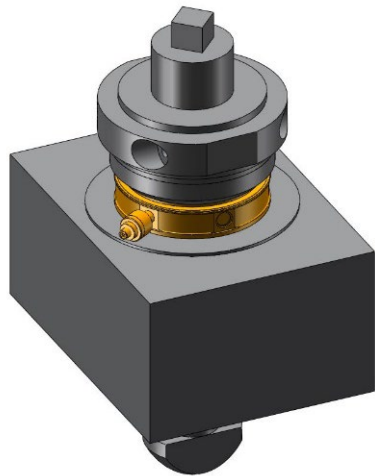
Phone: +46 10-516 50 00

E-mail/internet: info@sp.se/www.sp.se

SP has been authorised by the Swedish OIML-member to issue and sign OIML-certificates. Important note: Apart from the mention of the certificate's reference number and the name of the OIML Member State in which the certificate was issued, partial quotation of the certificate or of the associated OIML Basic Type Evaluation report is not permitted, though either may be reproduced in full.
SP ref DC0652-16

BROSA 3P sensor washer

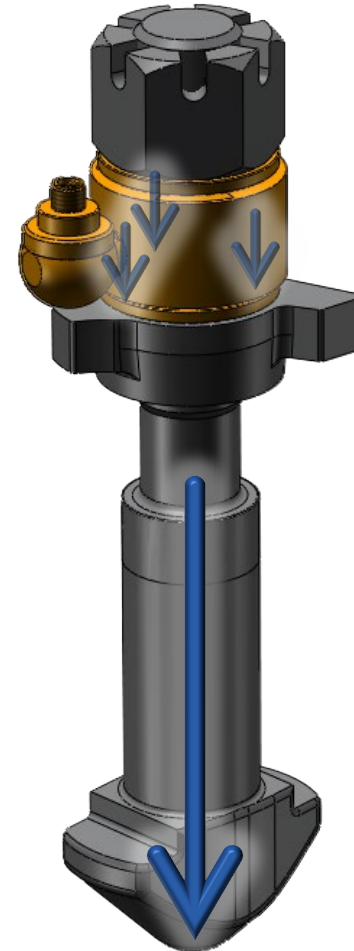
Integration of the sensor in a twistlock



BROSA 3P sensor washer

Integration of the sensor in a twistlock

- No effect on twistlock cross-section
- Direct force measurement by integrating the sensor into the twistlock assembly
- Tension of the twistlock is transformed into a compression force
- Detachable mechanical assembly
- Can be re-used during twistlock inspection
- Can be re-used after twistlock exchange
- Designed and tested for > 2 Mio. load cycles



Safe Lifting of Loads

Why Safety Systems

- Nearly 25% of accidents in container ports are load dependant. But not in all cases containers are overloaded.
- Safety systems on lifting equipment are a mandatory requirement when loads are lifted
- Monitoring of Safe Working Limits and Operational Limits at all times
- Safety Systems must comply with Safety Standards
- European and International Safety Standards
- Performance Level d (DIN 13849)
- Safety Integrity Level 2, SIL2 (IEC 61508)



Additional & Special Functions

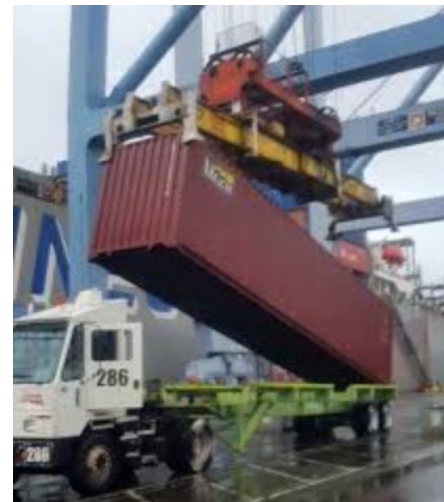
Lock detection for twistlocks

Dangerous situations occurs when

- One of the twistlocks is not correctly locked in corner
- For Twin-Spreaders: the twin detection system does not detect 2 containers, so that inner twistlocks will not lock

Enhancement for better detection and much more safe lifts

- Installation of force sensor washer on each twistlock
- Load measurement and plausible load checks by start lifting



Mobile Port Equipment

Critical Situations

- Driving at high speed
- Taking turns at high speeds
- Load too high at straddle carrier
- Load measurement at the twistlocks can reduce the possibility of dangerous situations (known weight)
- Knowing the centre of gravity and lifting height can also reduce the possibility of dangerous situations (position)



SOLAS Container Weighing

- Safety issues for extended functions (e.g. SOLAS)
 - Detection of wrongly declared Container Weights
 - Improvement of Ship Stowage Plans
 - All VGM must be taken by a verified system



Certificates

Weighing & Safety, FMEA, OIML Certificate

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 - SIL2 = PL_d

Project Nr. LUD013D024	DANGmicro (2 Messbrücken)
Issue: 02	Reliability Prediction

1 Overview:

Block-Nr.	
Block-Name	
Architecture	
DO	
DU	
SD	
SU	
DC	
log ₁₀ L ₀ /L _y	
PFH	
Requirement	
PFH _R	
SIF _{ES}	
SIL	
Requirement	
MTTF	
DC	
PL	

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PFH = $4,04 \cdot 10^{-9} \text{ H}^{-1}$

The Safety Integrity Level, relative to the determined
[Der Sicherheits-Integritätslevel (SIL), bezogen auf]

PL_d = SIL-2

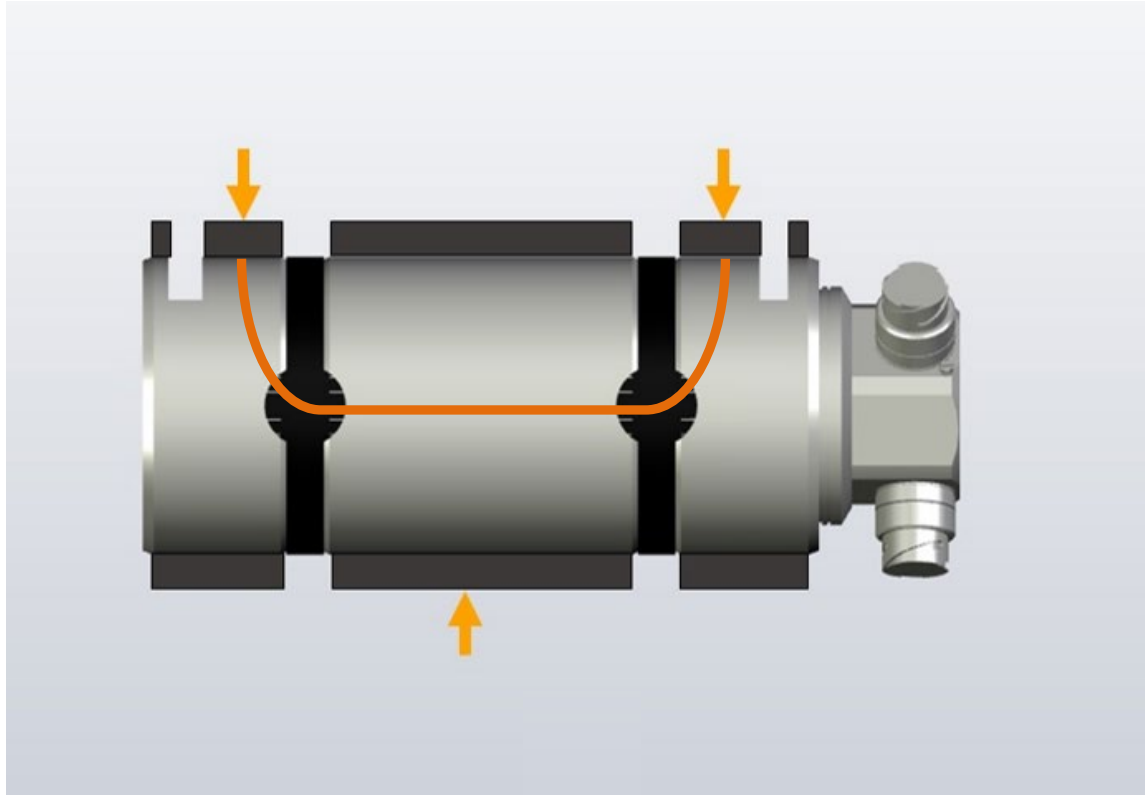
Standards and Handbooks
[Normen & Zuverlässigkeitsstandards]:

IEC 61508 DIN EN ISO 13849-1
IEC 62061 DIN EN ISO 13849-1
IEC 61508 IEC 61508

Tobias Ludner - Elektronik Analyse

OIML BASIC CERTIFICATE OF CONFORMITY	
SP	OIML Member State SWEDEN
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Applicant Name: Brosa AG Address: Dr.-Klein-Straße 1, D-88069 Tettnang, Germany	
Issuing authority Name: SP Technical Research Institute of Sweden Address: Box 857, SE-501 15 Borås, Sweden Person responsible: Lennart Aronsson	
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SP Technical Research Institute of Sweden Certification Lennart Aronsson Bengt Gutfelt	
OIML Certificate of Conformity no R60/2000-SE1-17.01 dated January 23, 2017, page 1 (2) SP Technical Research Institute of Sweden Box 857, SE-501 15 Borås, Sweden Phone: +46 10-516 50 00 E-mail/Internet: info@sp.se/www.sp.se	

Calibration according to installation situation



Current customer





THANK YOU VERY MUCH FOR YOUR ATTENTION