



Intermodal Africa 2026 Exhibition and Conference
12th February 2026

**Know Your Loads, Weights and Forces for a Safe
and Secure Operation**

Facts & Figures

About BROSA

Headquarters

BROSA GmbH, Tett nang, 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
- 100 Employees
- ISO 9001 and ISO 14001 certified



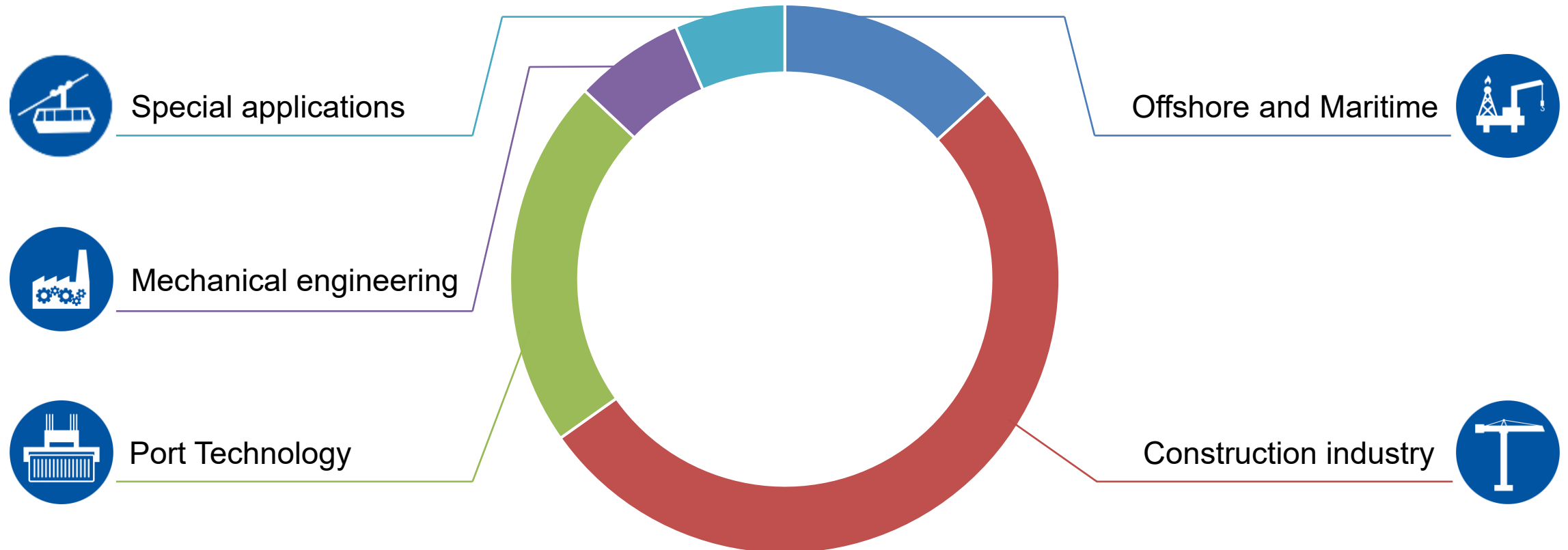
Facts & Figures

About BROSA

- Products are developed in close collaboration with our customers
- Understanding the Trends & Industries
- Compliance with worldwide safety standards
- “Made in Germany” The logo for 'Made in Germany', featuring the German flag's horizontal stripes (black, red, and gold) and the text '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



Markets



Product Portfolio



Force
measuring
pin



Tension load
cell



Force sensor
washer



Tubular load
cell



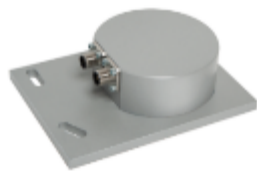
Compression
load cell



Weighing and Overload
Systems



Support jack
load cell



Angle sensor
MEMS



Normal force
sensor



Sensor
for Ex area



Pressure
transducer

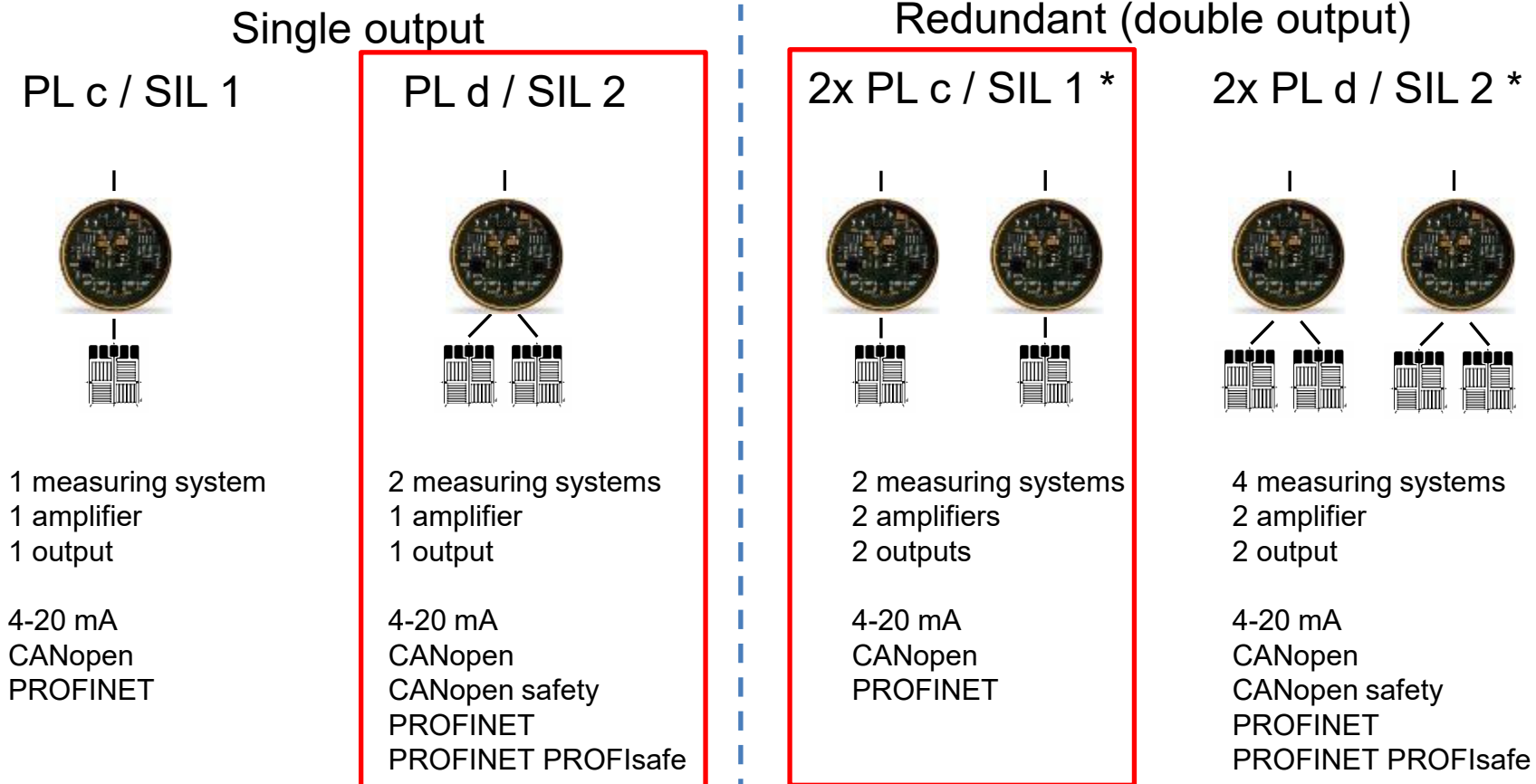


Pressure
transducers



BROSA
electronics

Safety Sensor Concept



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

Functional Safety acc. EN13849

Categories

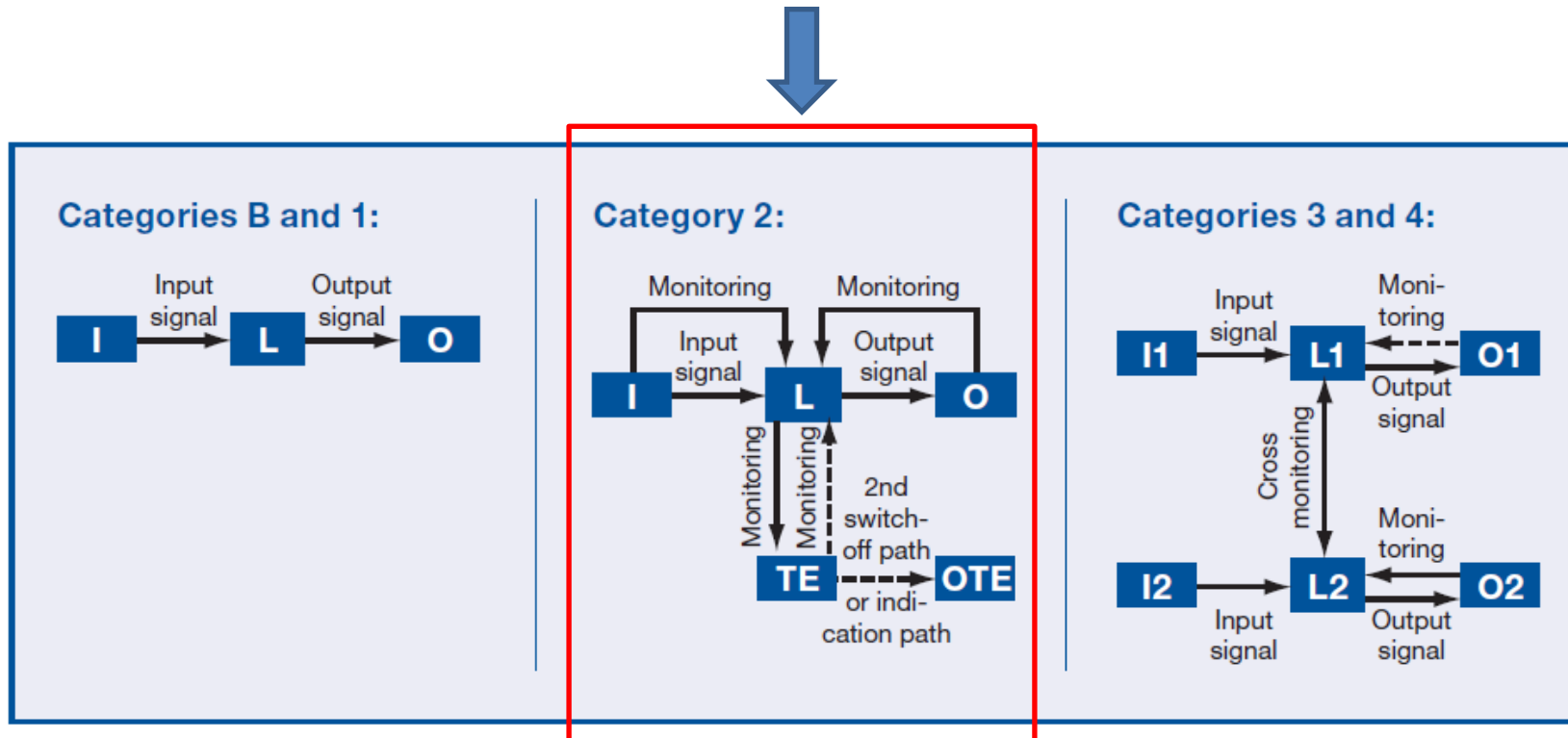
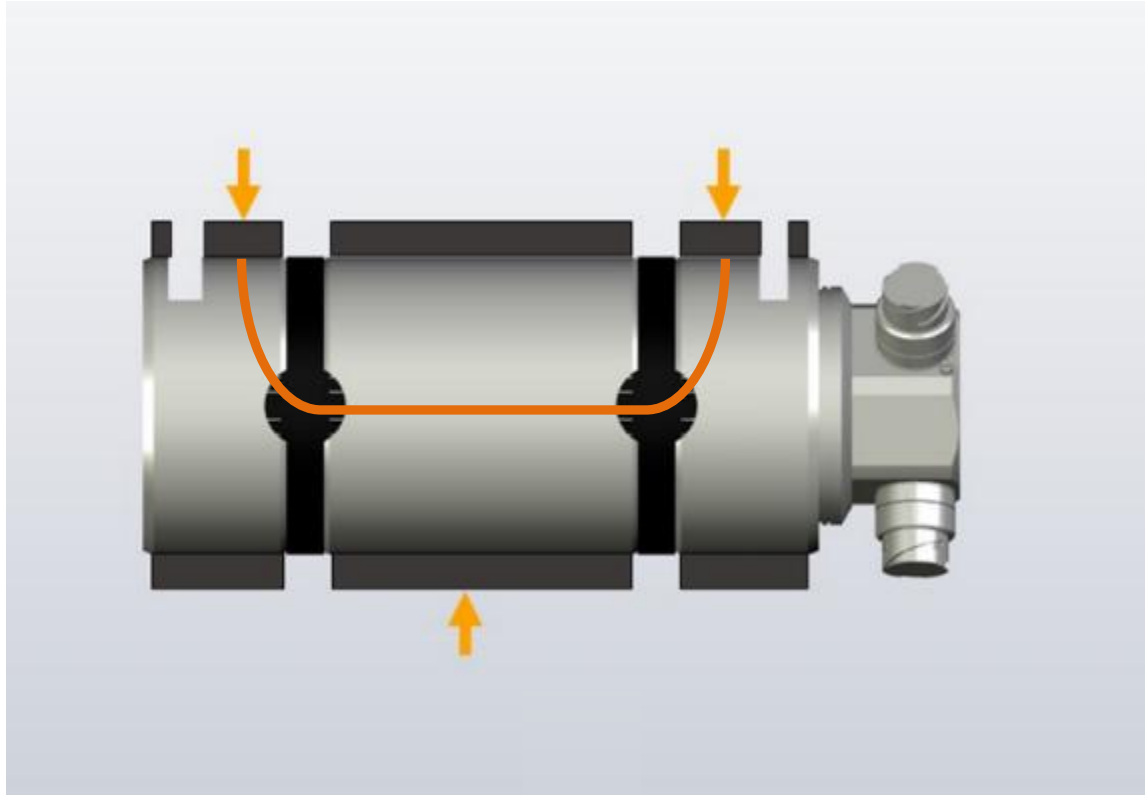


Figure 10: Introduction to Designated Architectures

I = Input, L = Logic, O = Output, TE = Test Equipment, OTE = Output of Test Equipment

BROSA Load pins



Typical installations

Installations

Anchor points on dead end of hoist rope

Sheave at rope system

Brakes

Designs

Standard Design, 1 measuring direction

X-Y Measurement, 2 measuring directions with a 90° offset

MOP Design, with Mechanical Overload Protection



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



Installations



Twistlock on Spreaders



Twistlock on Headblock



Rope anchor point

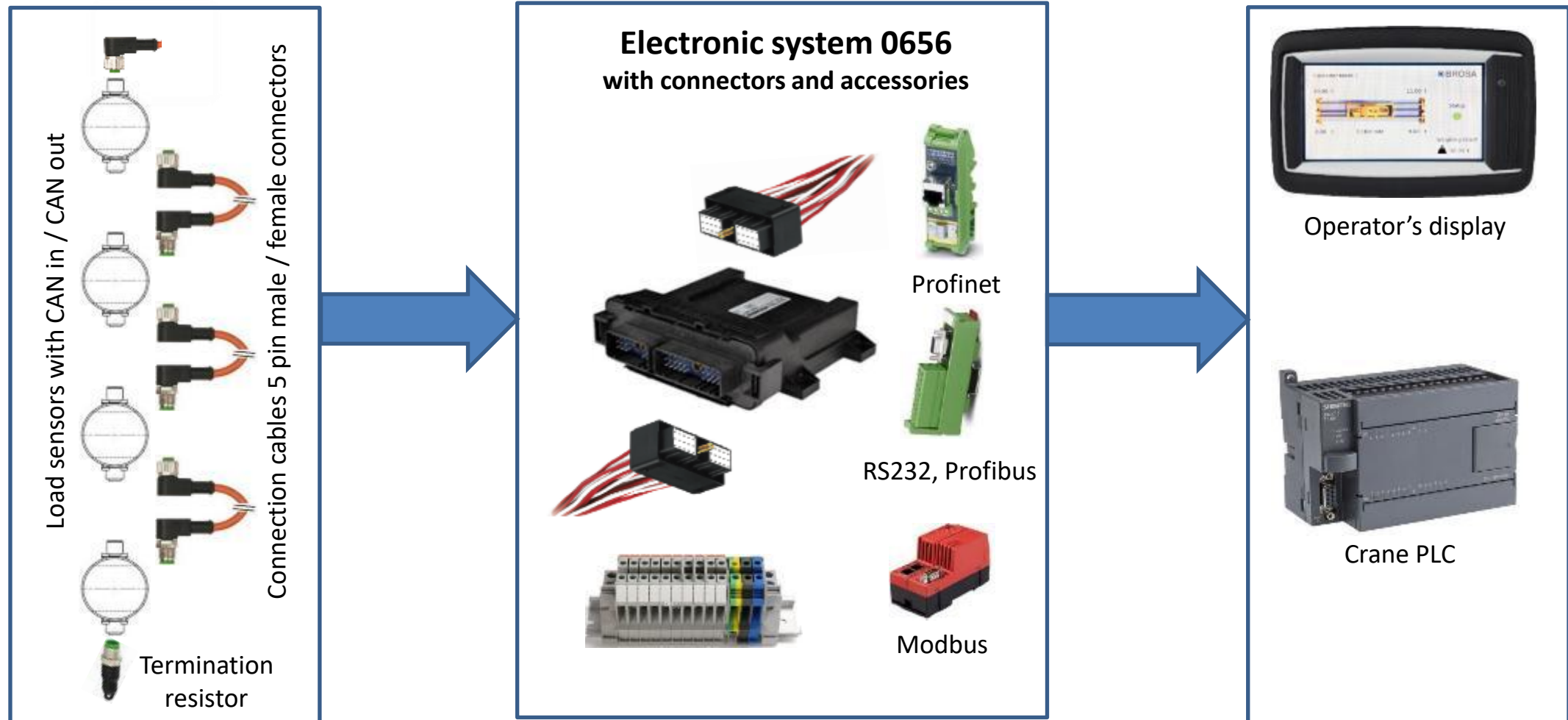
Product Portfolio Systems

Safety System for SIL2 requirements

- Processor TMS570 Texas Instruments
- 8 digital inputs,
- 8 digital outputs
- 3 CAN lines (sensors, display & communication)
- Safety cut-off, Power MOSFET
- Communication controller for interfacing with the main PLC
 - Profinet (ProfiSafe)
 - CANopen (Safety)
 - Profibus DP
 - RS-485 (compatible to BROSA display)
 - RS-232 (for service purposes)
- Firmware FlexLim Safety
- Suitable for headblock installation, shock & vibration proofed
- Area of Use
 - Safety System
 - Weighing System
 - Gateway



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 (MTTF_d)
- Diagnostic Coverage of dangerous failures (DC)
- Mission time
- Resulting in Safety Integrity Level
 - SIL2 = PL_d

| | |
|---------------------------|------------------------|
| Project Nr. LUD0130024 | DANGmicro (2 Mess) |
| Issue: 02 | Reliability Prediction |

OVERVIEW

The following failure rates have been calculated (Für das Projekt DANGmicro (2 Messb. erlaubt):

$\lambda_{pu} = 0,0002 \cdot 10^{-6} \text{ H}^{-1}$
 $\lambda_{pu} = 0,1230 \cdot 10^{-6} \text{ H}^{-1}$
 $\lambda_{pu} = 0,1797 \cdot 10^{-6} \text{ H}^{-1}$
 $\lambda_{pu} = 0,0087 \cdot 10^{-6} \text{ H}^{-1}$

The MTTF_d value of all dangerous failures is (Die MTTF_d aller gefährlichen Ausfälle beträgt)

MTTF_d = 606 (100¹) years (Jahre)

* According to the DIN EN ISO 13849-1:2005 (Der MTTF_d ist nach DIN EN ISO 13849-1:2005)

The resulting diagnostic coverage of dangerous (Es ergibt sich ein Diagnoseabdeckungsgrad)

DC = 95,40 %

These values correspond to performance according to the table K1 in the DIN EN ISO 13849-1 (Nach Tabelle K1 der DIN EN ISO 13849-1:2005 einem Performance Level d.)

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

PFH = $4,04 \cdot 10^{-6} \text{ H}^{-1}$

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

PL_d = SIL-2

Standards and Handbooks (Normen & Zusammenfassungen)

IEC 61508 DIN EN ISO 13849-1
IEC 62061 DIN EN ISO 13849-2

OIML BASIC CERTIFICATE OF CONFORMITY

OIML Member State: SWEDEN

OIML Certificate No.: R60/2000-SE1-17-01

Identifi

General: The load integral, The ring such as position

Technical: Max cap, Min cap, Internal, Minima, verification, SMC die, Tempres, Power

Appoint: The load, OIML

Applicant

Name: Broca AG
Address: Dr.-Klein-Strasse 1, D-88064 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 the certified type: Type: 0120
Accuracy class: 0,0,20

Number of verification scale intervals: n = 240
(Verification 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 2017-03-28. This is the last page of this certificate.

Borås, January 23, 2017

SP Technical Research Institute of Sweden
Certification

Lennart Aronsson
Dagmar Goffelt

OIML Certificate no R60/2000-SE1-17-01 dated January 23, 2017, page 1 (2)

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E-mail: info@sp.se

Safe Lifting of Loads

Why Safety Systems

- Safety systems on lifting equipment are a mandatory requirement when loads are lifted
- Nearly 25% of accidents in container ports are load dependant, but not in all cases containers are overloaded.
- 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)



Safety System



SOLAS Container Weighing

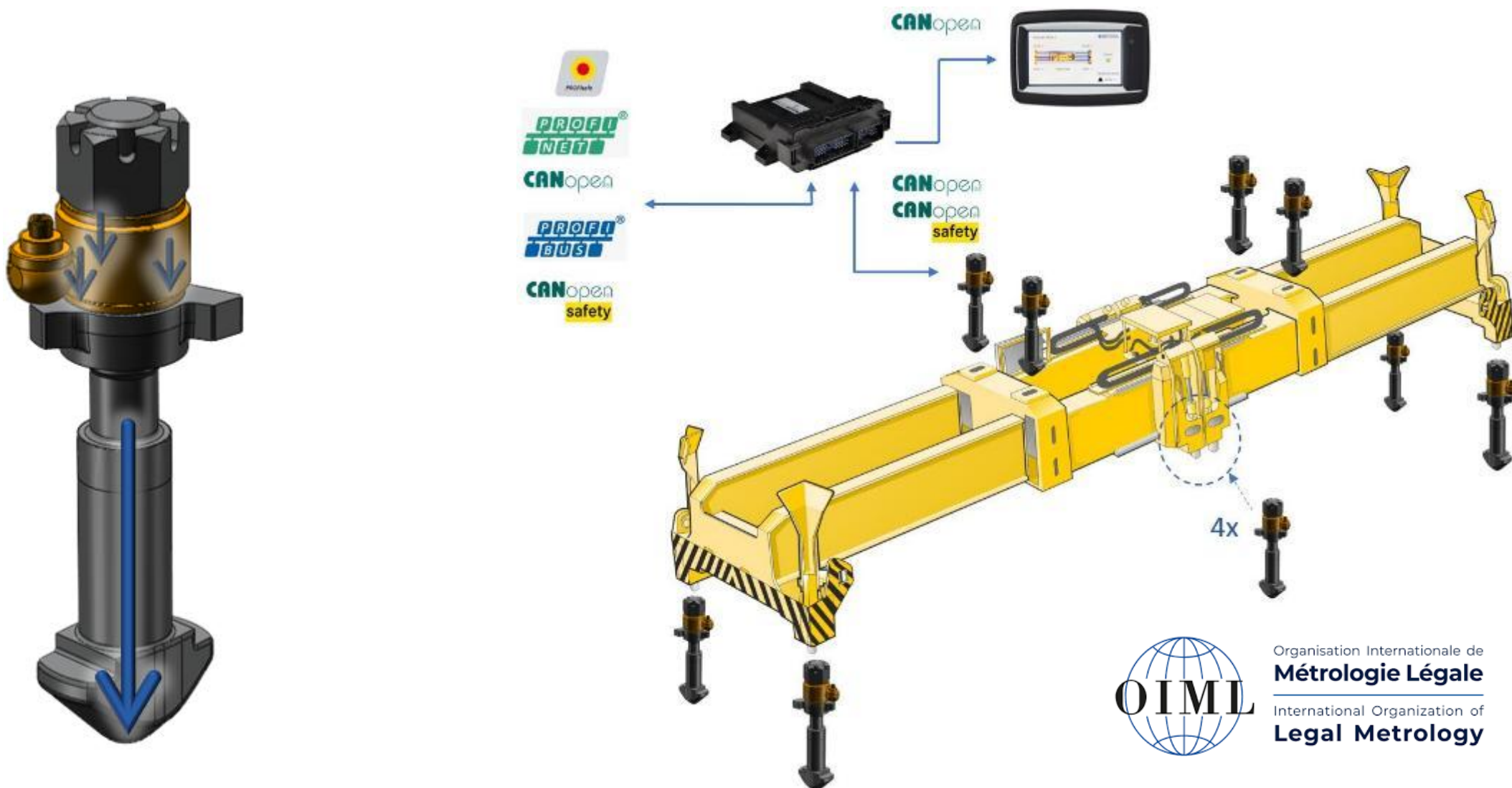
- Safety issues for extended functions (e.g. SOLAS)
 - Mandatory to verify the VGM of the container before its lifted to a vessel since 01.07.2016.
 - Different methods to verify the VGM (Method 1 & Method 2)
 - Detection of wrongly declared Container Weights
 - Improvement of Ship Stowage Plans
 - All VGM must be taken by a verified system



Organisation Internationale de
Métrieologie Légale
International Organization of
Legal Metrology



SOLAS Weighing System Spreader



SOLAS Weighing System Headblock



Mobile Port Equipment

- Critical Situations:
 - Driving at high speed
 - Taking turns at high speeds and to sharp
 - 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)



Additional & Special Functions

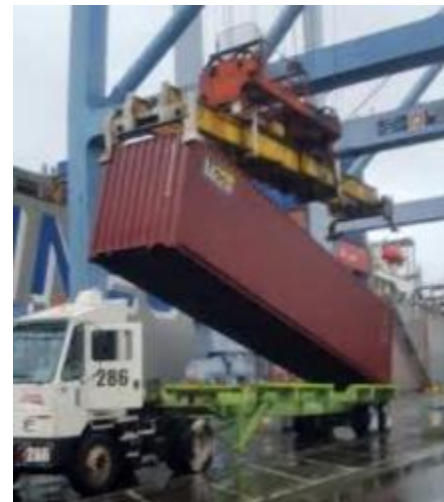
Lock detection for twistlocks

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

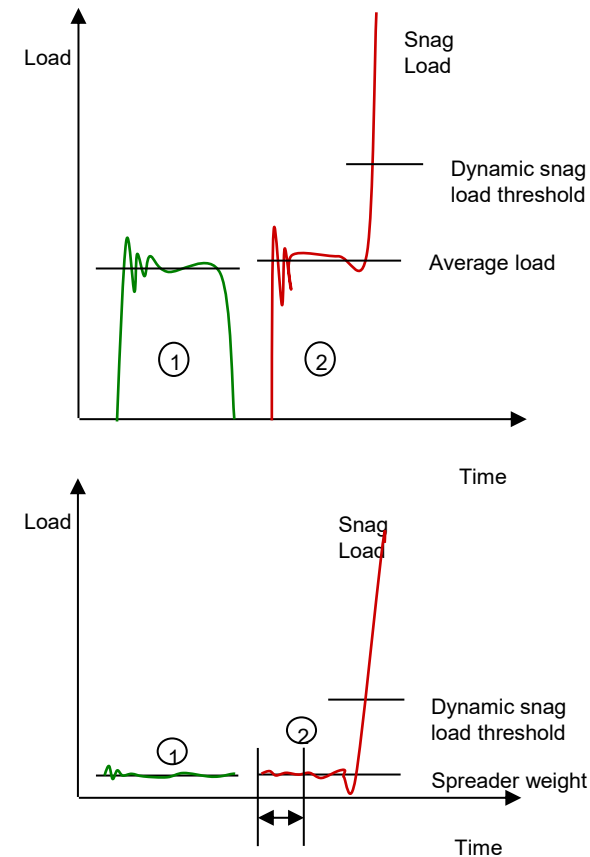


Additional & Special Functions

Snag Load Detection

Dangerous situations occurs when

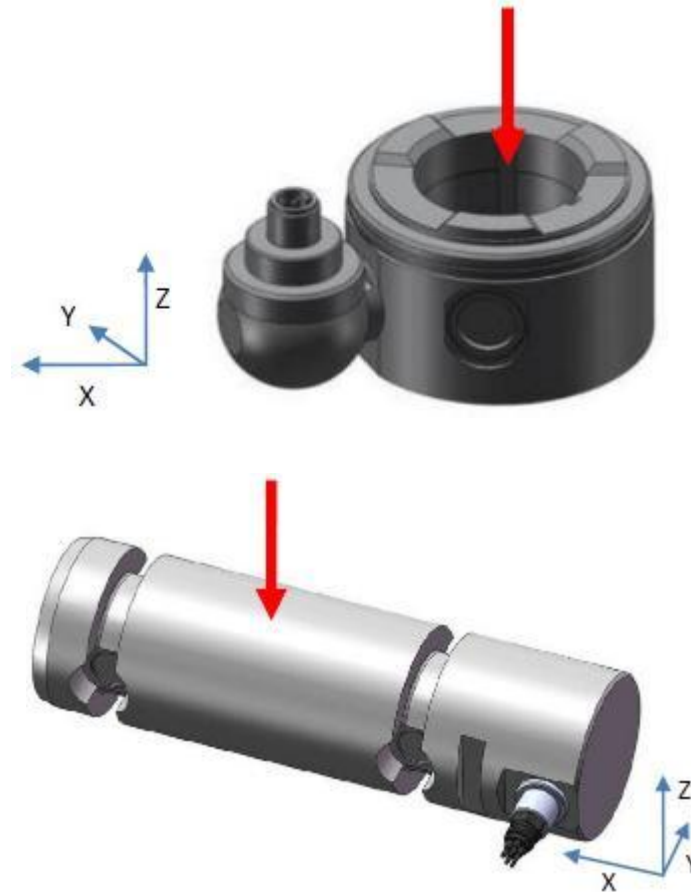
- A container gets stuck in the railings of a vessel during the lift
- Parts of the spreader block the lift
- When the head covers are not completely removed and obstruct the lifting area
-
- The load sensors are immediately registering a second increase of the load signal
- Once a second increase is detected on any of the load sensors the snag warning can be triggered
- The threshold for the detection is dynamic, dependant on the weight of the container being lifted.



New Developments

Intelligent Sensors

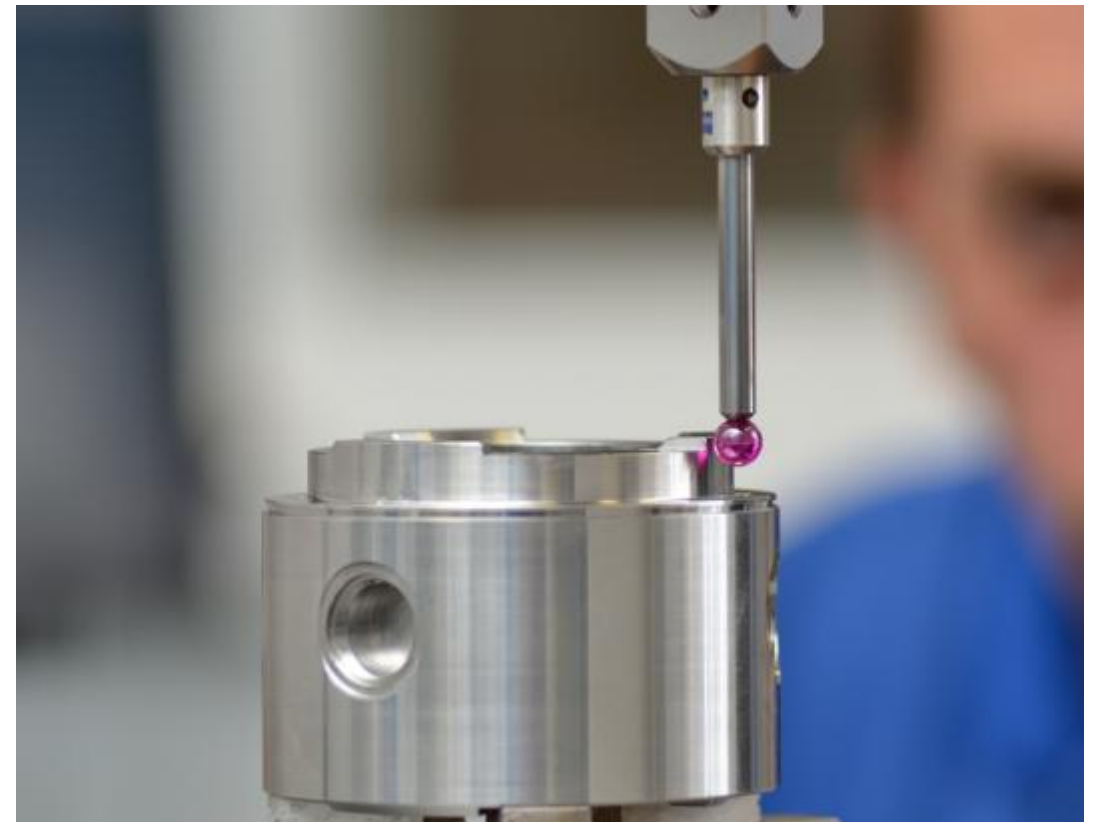
- For sensor installation in the headblock
- Acceleration = change in velocity
 - Change in speed
 - Change in direction
 - Change in both
- During a lift of a container the hoisting speed accelerates while the trolley movement changes the direction.
- This causes unwanted effects into the measurement of the force created by the container
- The amplifier inside the sensor needs to calculate the dynamic forces
- Result shall be an increase of the overall accuracy of the load measurement by splitting the load signal in a static and a dynamic signal



Why Brosa?

BROSA GmbH

- A competent partner for load sensing and monitoring
- A leading supplier to the container handling industry
- An innovation driven development partner for future oriented products
- Supplier to all major crane and port equipment manufactures
- Products are used in all major ports around the world.





THANK YOU VERY MUCH FOR YOUR ATTENTION