BAUER Maschinen GmbH

Alternative drives in special foundation

Dr. Andreas Ziegler

November 13th, 2024

Agenda

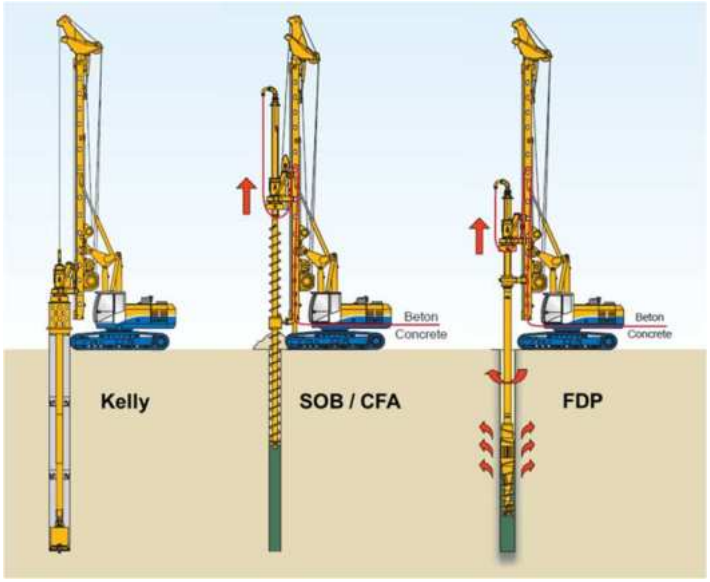
No.	Agenda topic
1	Sustainability in special foundation
2	Power demand and drive concepts overview
3	Power supply on jobsites, challenges and solutions
4	Cable electric
4.1	eBG 33 cable electric
4.2	eMC 96 cable electric
4.3	BCS 185pp
5	Battery electric
5.1	Klemm KR
5.2	eBG33H all electric
6	Summary

1

Sustainability in special foundation

Sustainability in special foundation

Being effective and efficient



Kelly:	SOB/CFA:	FDP:
60	<15	<15
l/Pile	l/Pile	l/Pile

Effective special foundation method

+

Efficient equipment and technology

=

Low consumption

BAUER B-TRONiC

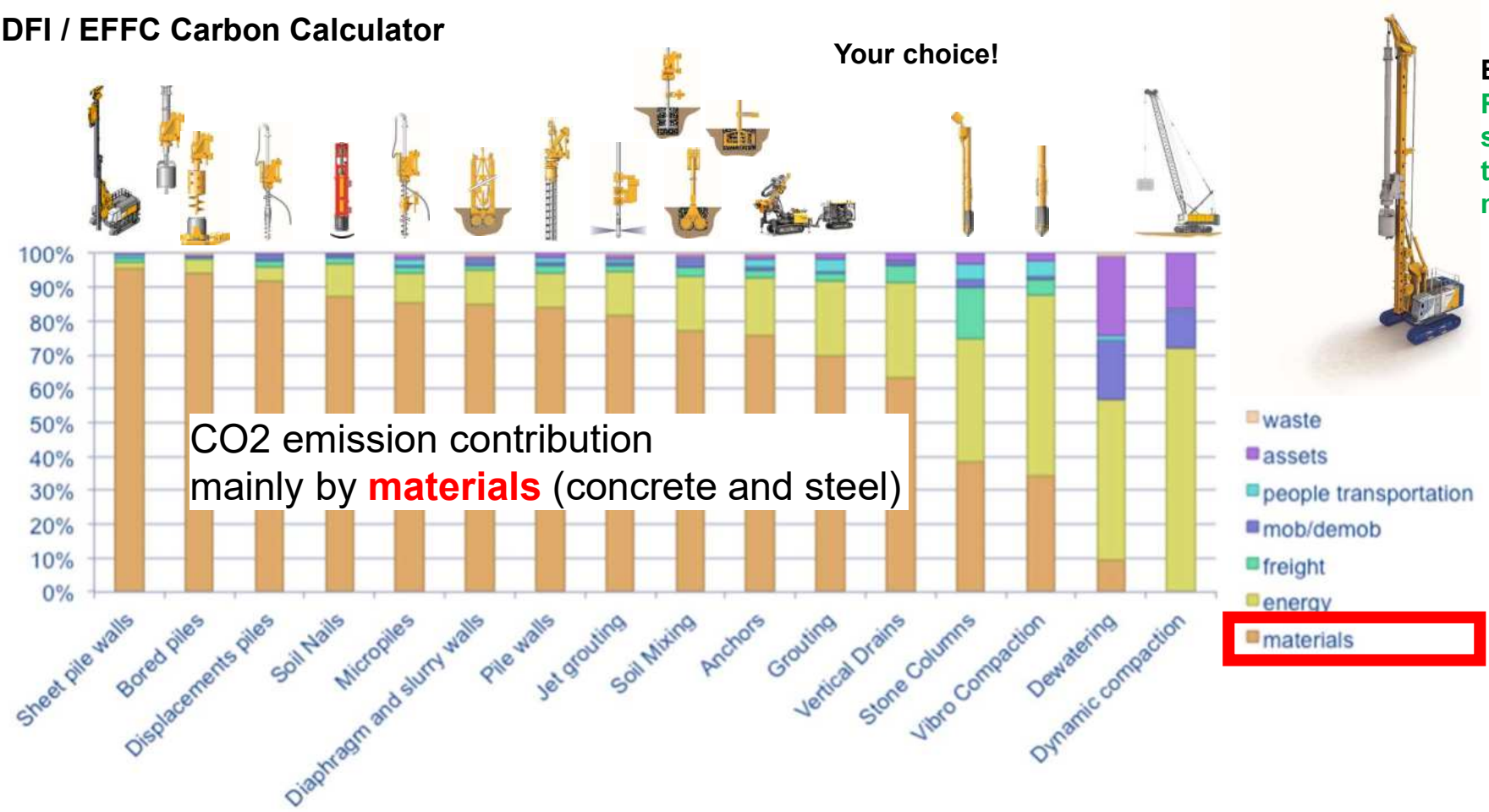
Energy-Efficient PowerEEP

Source: Research project TEAM – Diesel fuel consumption per pile 20m/880mm

Sustainability in special foundation

DFI / EFFC Carbon Calculator

Your choice!

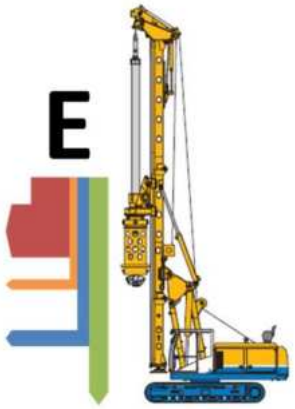


Example:
Ready for soil mixing to reduce material

Source: https://www.dfi.org/carbon-calculator-webinar

Sustainability in special foundation

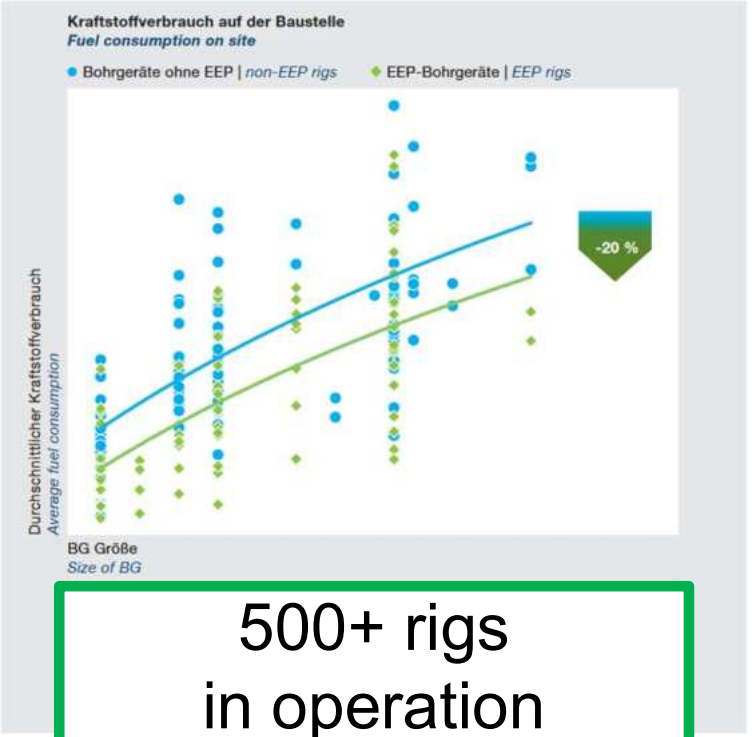
10 years of EEP – reduced fuel consumption on site



TEAM

Gefördert vom Bundesministerium für Bildung und Forschung

Energy-Efficient Power EEP



500+ rigs
in operation

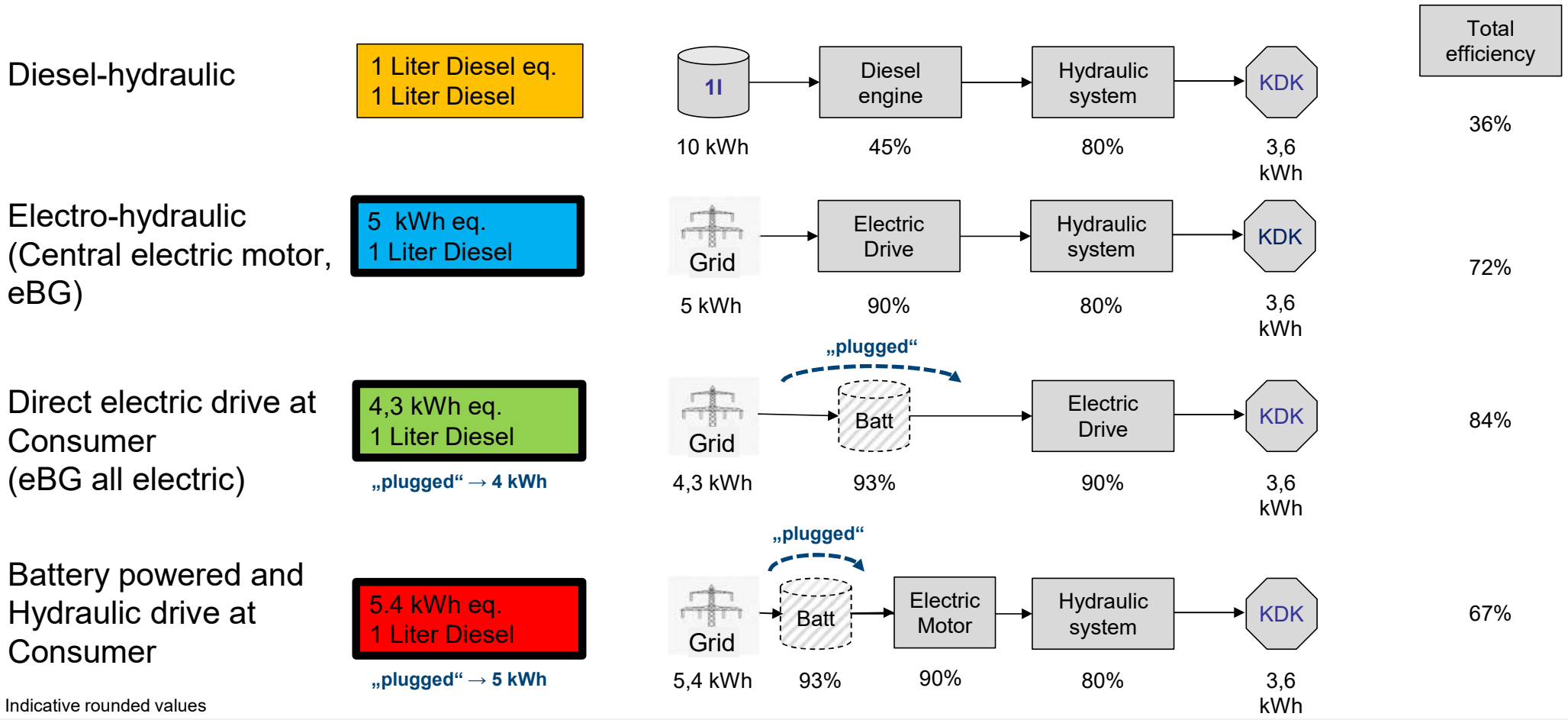
2012 2015 2022

2

Power demand and drive concepts overview

Power demand and drive concepts overview

Important basics



Indicative rounded values

Power demand and drive concepts overview

Typical energy consumption

Cable 405 kW: 8hrs shift

eBG 33H all electric approach

KLEMM KR806-3E approach

eBG 33 cable electric approach

BS61 electric hybrid approach

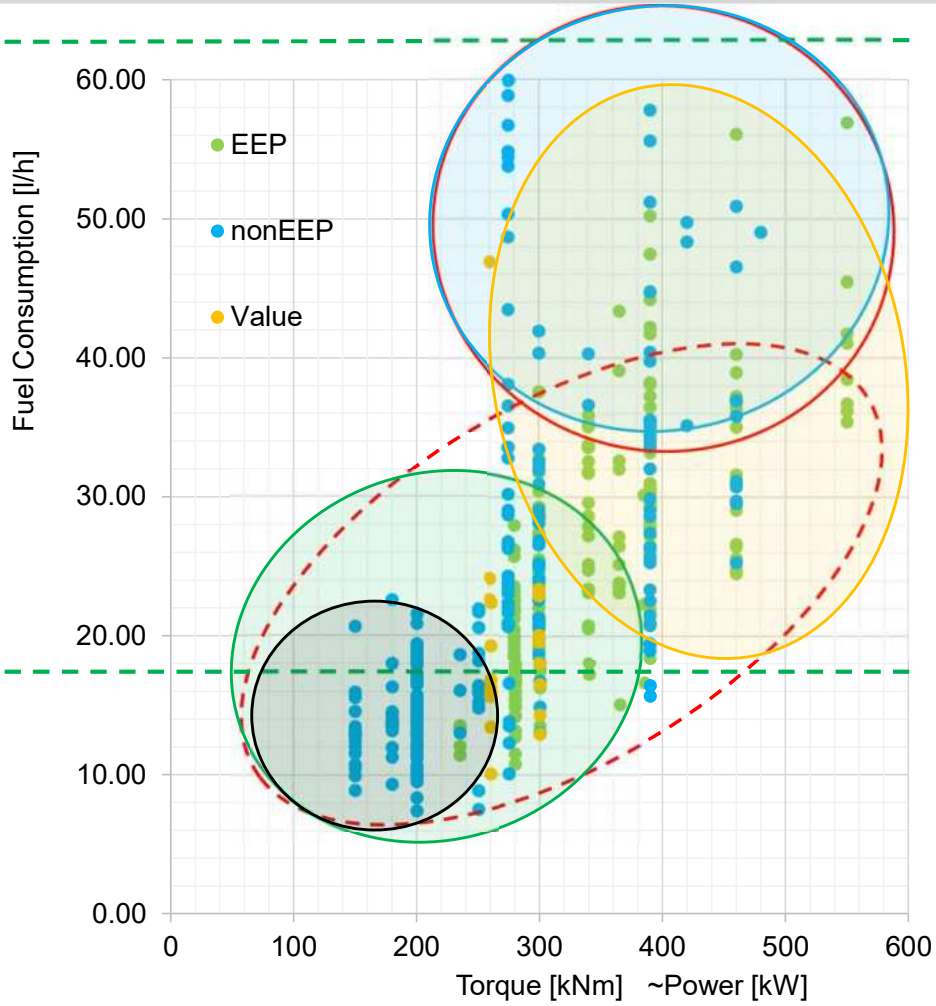
Diesel: 150 l **Battery:** ~650 kWh

1 Liter Diesel eq. 1 Liter Diesel

4 kWh eq. 1 Liter Diesel

Kelly and low perfomance apps

High perfomance apps



Power demand and drive concepts overview

KLEMM KR806-3E

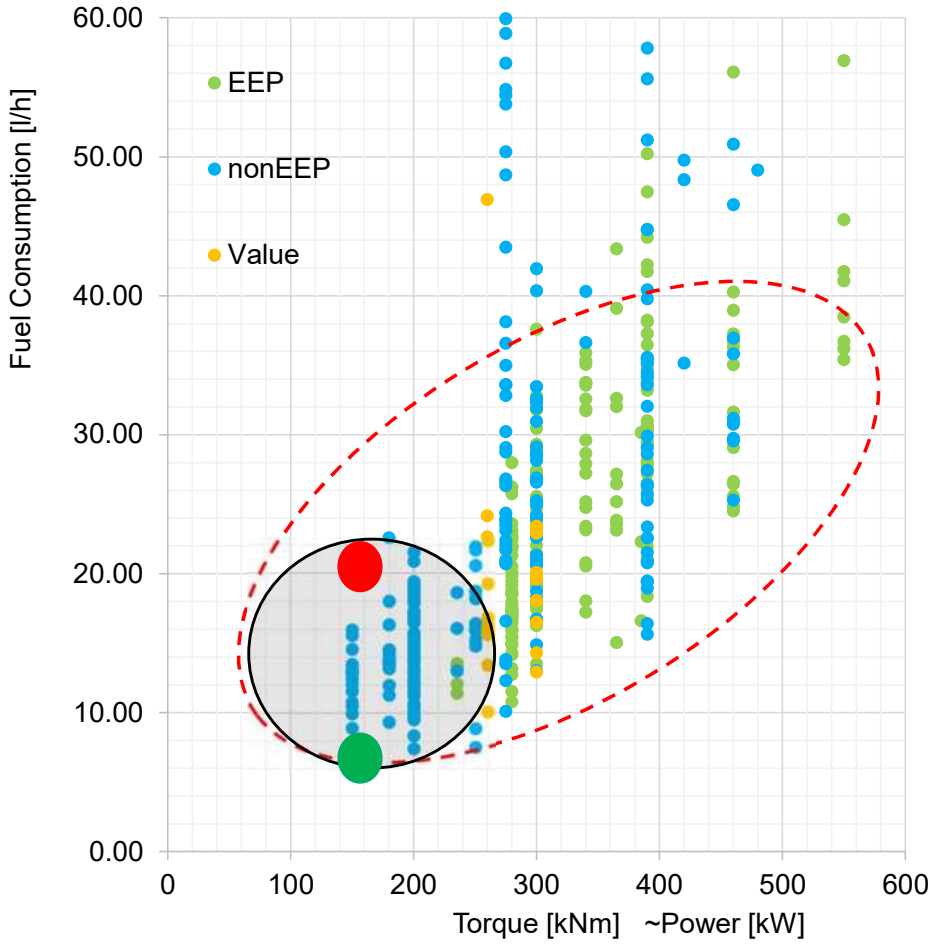
CEE 125A/400VAC

KLEMM KR806-3E approach

Kelly and low perfomance apps

Battery and cable connected

Battery only



Power demand and drive concepts overview

eBG 33H all electric

CEE 125A/400VAC

eBG 33H all electric approach

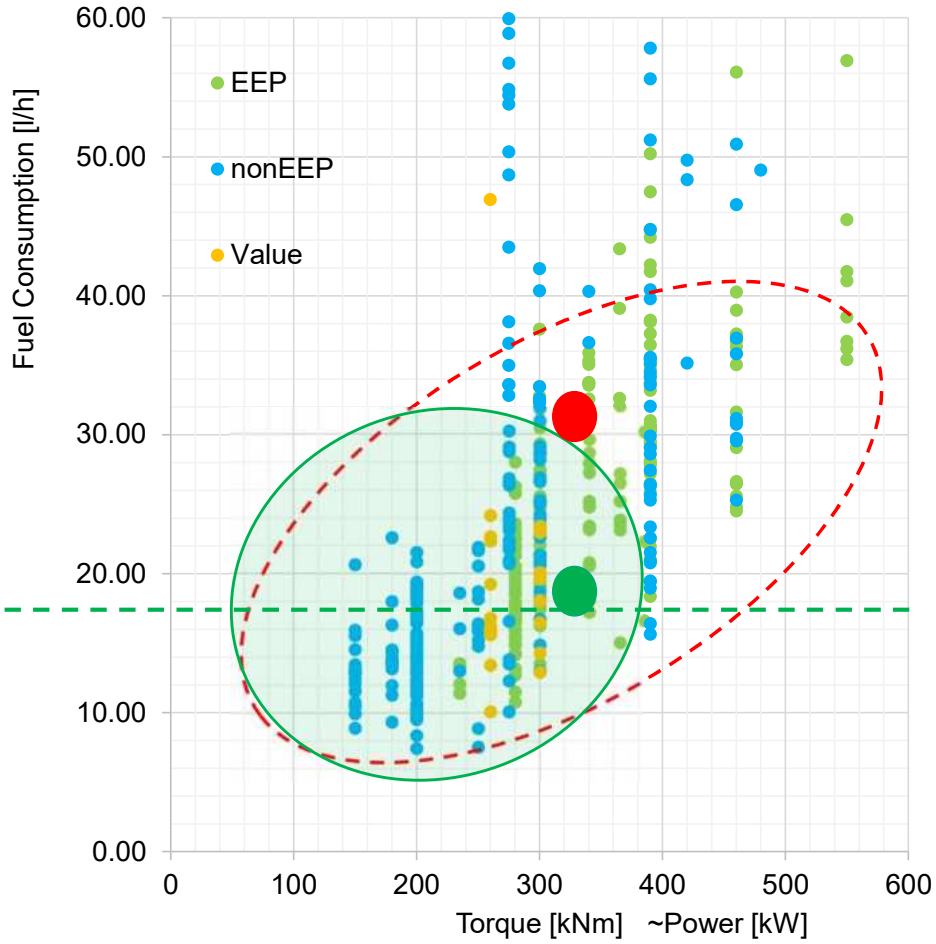
Kelly and low perfomance apps

Diesel: 150 l **Battery:** ~650 kWh

1 Liter Diesel eq. 1 Liter Diesel	4 kWh eq. 1 Liter Diesel

Battery and cable connected

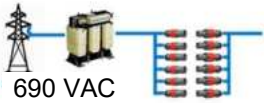
Battery only



Power demand and drive concepts overview

eBG 33 cable electric

Cable 405 kW: 8hrs shift



eBG 33 cable electric approach

High perfomance apps

Power demand and drive concepts overview

BS61 electric hybrid

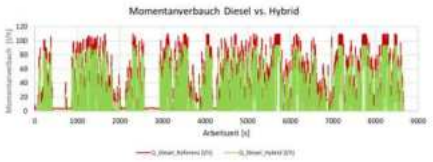
CEE 125A/400VAC

BS61 electric hybrid approach

Kelly and low perfomance apps

High perfomance apps

Up to 80 kW electric power combined with (smaller) diesel engine



Power demand and drive concepts overview

Overview

Rig	Concept	Power supply	Preferred Application	Main Advantages	Main Drawback
eBG 33 H	**a**ll **e**lectric	Standard Cable + Battery	Kelly + Low Performance	+ Best efficiency + Unplugged possible + Innovation benchmark + Standard CEE Plug	- Battery cost
KR806-E	**b**attery **e**lectric	Standard Cable + Battery	Anchor + Low Performance	+ Typical applications + Unplugged possible + High Flexibility + Standard CEE Plug	- Battery cost
eBG 33 eMC 96 HE 1400	**c**able **e**lectric	Substation + Cable	Full range High Performance	+ All applications + High efficiency + High performance + Numerous references	- AC Substation
RG19T	**e**lectric **h**ybrid	Standard Cable + Diesel	Full range High Performance	+ All applications + CO2-Reduction + Boost operation + Standard CEE Plug	- Cable

3

Power supply on jobsites - challenges and solutions

Power Supply on jobsites

Low-Performance-Applications

- **Kelly-Drilling**
- High **Peak Power**, but frequent low power phases (idling, sideline activities) resulting in medium average power.
- Power up to **88 kW** (400V, 125A, 3-phase)
- International **Standard Plug** / Voltage / Current
- **Typically available** on jobsites
- **Cable**: diameter ca. **40 mm**, weigth ca. **2,7 kg/m**
- **Unplugged operation** possible **max. 123 kW** average power (14hrs charging; 10hrs working; battery capacity ≥ 1.230 kWh)

High-Performance-Applications

- **Single-Pass**: CCFA-/FoW-Drilling, SCM, FDP, CFA, ...
- **Constant high load factor**
- Power **>200 kW** (e.g. 690 V)
- No standard for plugs, clamped cable connectors, high power transformer on jobsites
- Long time for planning (**4-6 months**) **in advance** for local power supply and paperwork
- **Cable** (~400 kW): diameter ca. **120 mm**, weigth ca. **20-30 kg/m**

Power Supply on jobsites – Japan

Low-Performance-Applications

- Special version of **On-Board-Charger (OBC)** necessary to connect to Japanese grid (200V Two phase – three wire „split phase“)
- Please make sure to ask for this option

- Or use Genset with CEE 125A TN grid

High-Performance-Applications

- **Project specific substation, transformer and filter** necessary
- Please clarify contact persons and local conditions (legal, standards, contract details, etc.) in advance

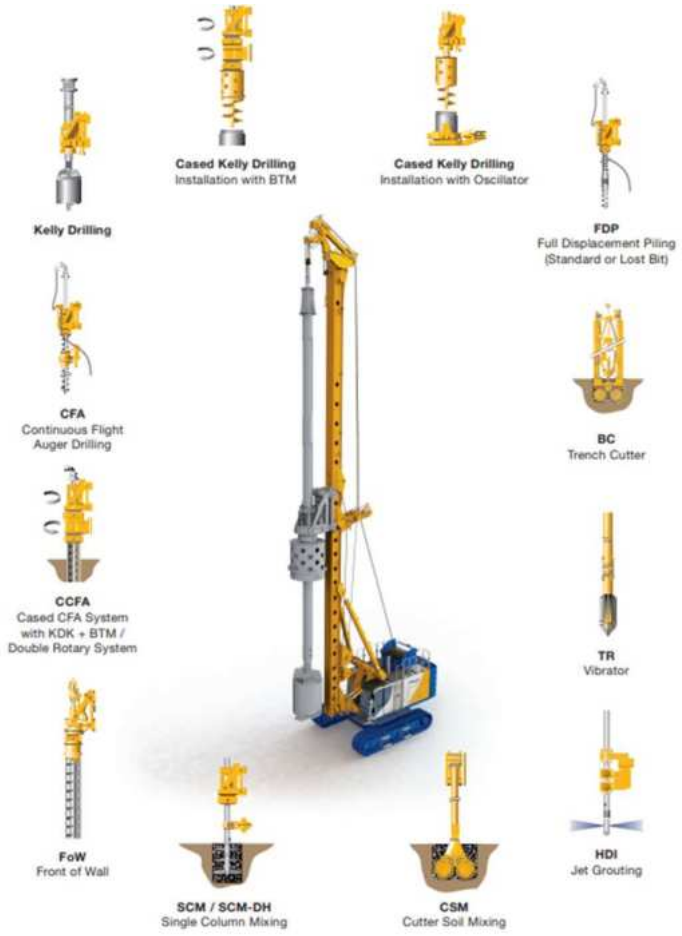
- Or use Genset with Transformer (Dd0 or Yd5) IT grid

- Examples in the following slides

4

Cable electric

eBG 33 ce



- Urban, complex jobsites
- Work in closed sites
  (Tunnels, Halls, Buildings,...)
- Linear jobsites
  (dam remidiation, pile walls
- Work in sensitive environment
- Low noise emission
- And much more...

eBG 33 ce

405 kW
high performance
e-motor

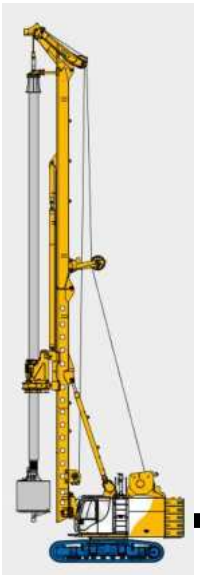
cable arm
for easy handling
and slewing

backpack genset
for
mobility of crawler

secant pile wall
jobsite
in Germany

eBG 33 ce

eBG 33 ce
Scheme variant 1

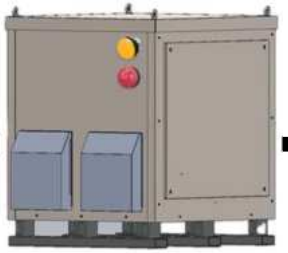


or

Distribution box

Transformer

Filter
passive or active
if necessary

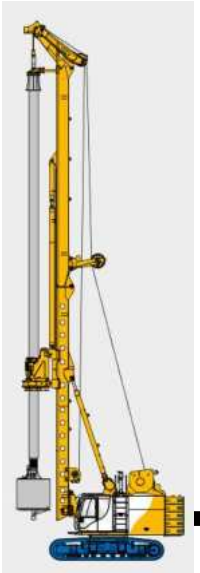


reusable filter for other rigs

local
Grid regulations

construction site

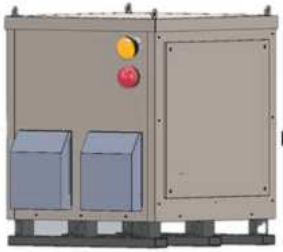
eBG 33 ce
Scheme variant 2



or

Distribution box

Filter
passive or active
if necessary



reusable filter with rig

Transformer

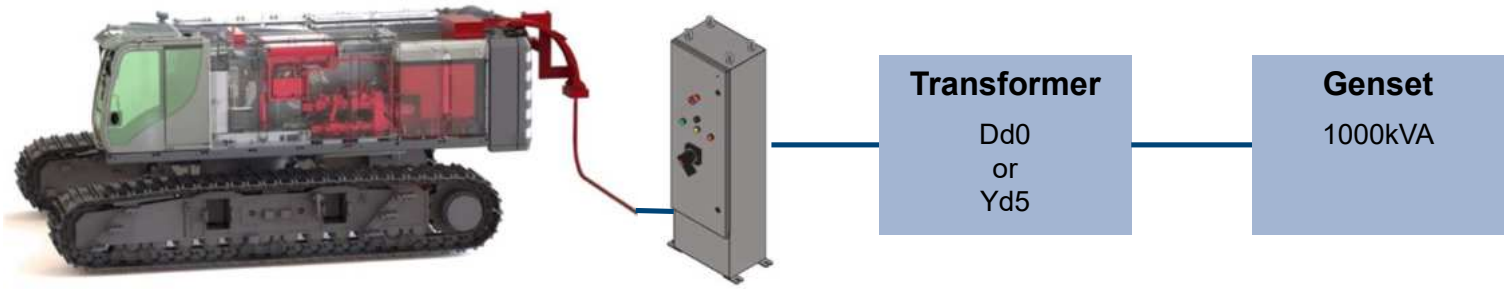
local
Grid regulations

construction site

Scheme variant 3 (Genset)

Example eMC 96 cable electric

Jobsite reference Hongkong



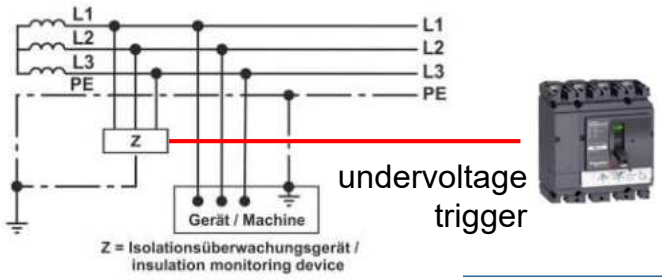
eMC 96 ce

Requirements

Secondary circuit (eMC96 side)

- Electrical network: IT
- Voltage: 690V
- Frequency: 50 Hz
- Power: 600…1000kVA*
- Max. short circuit current: 50 kA
- Fuse protection: 800A
- Insulating monitoring device

IT network required



Primary circuit (grid side)

- Power supply from grid
- Power: 600…1000kVA*

* Depends on local conditions regarding available power supply

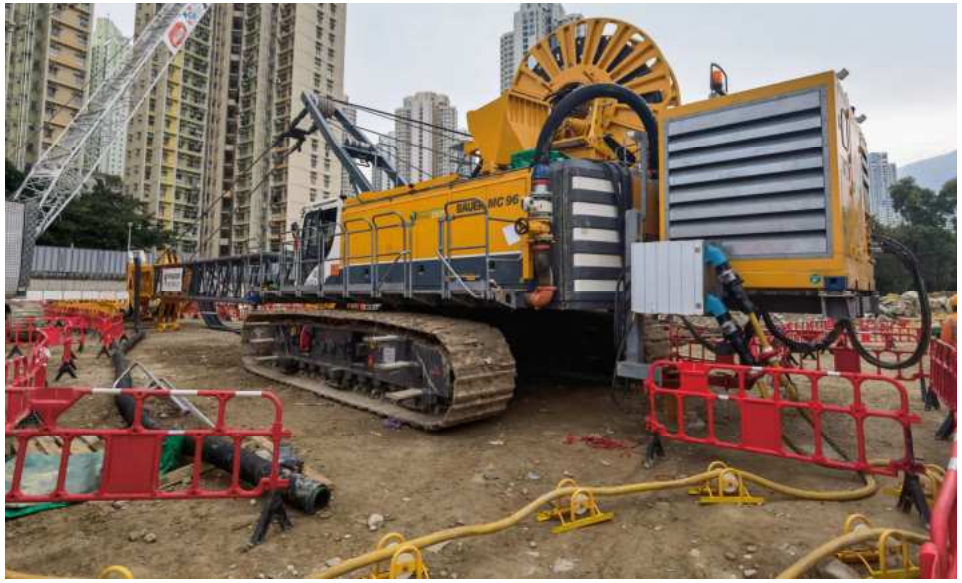
Customer in Hongkong worked from:

1. Genset
2. Grid connection

eMC 96 ce

Cable handling

- Cable handling in customer’s responsibility
  - Heavy cables are difficult to move
  - Cables need to be protected → should not be pulled over the floor → rollers in place
  - In current situation point for disconnection is on eMC96 back



eMC 96 ce

Interface realization

- Handling of separate distribution box inconvenient
- Solution developed with customer
  - Additional distribution box mounted on eMC96 (yellow)
  - High-current plugs installed for quicker connection/disconnection

eMC 96 ce

Main reasons
for electric choice:

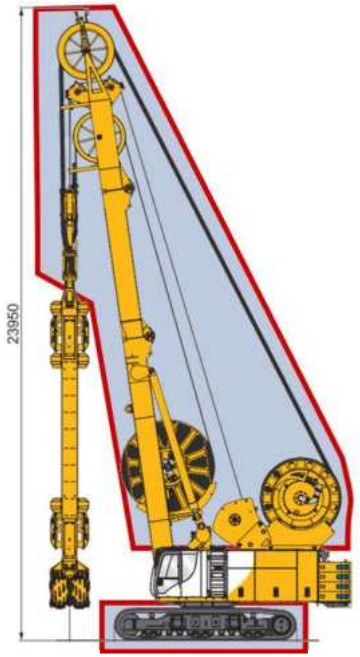
→ **Low noise**
→ Long working hours
→ Innovation leader

4.3

BCS 185pp

Request for compact trench cutter unit with flexible power supply

BCS 185



Compact single purpose trench cutter system with turnable HDS 90-T, proven undercarriage UW 185

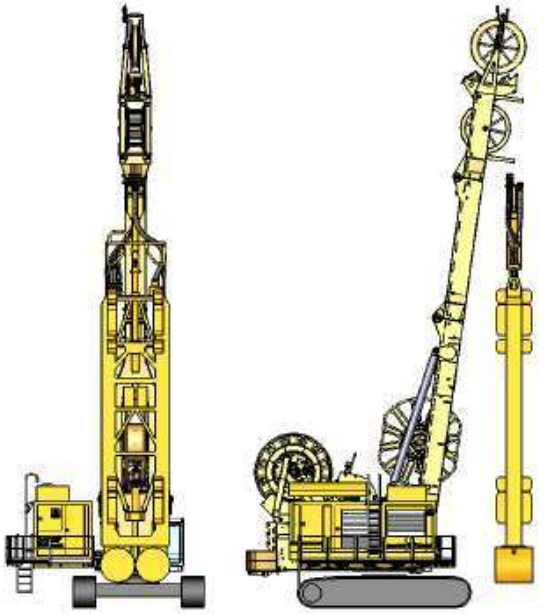
+

CBC 45

Hydraulic power pack HE 1400 or HD 1400 (electrically or diesel powered) with flexible attachment options

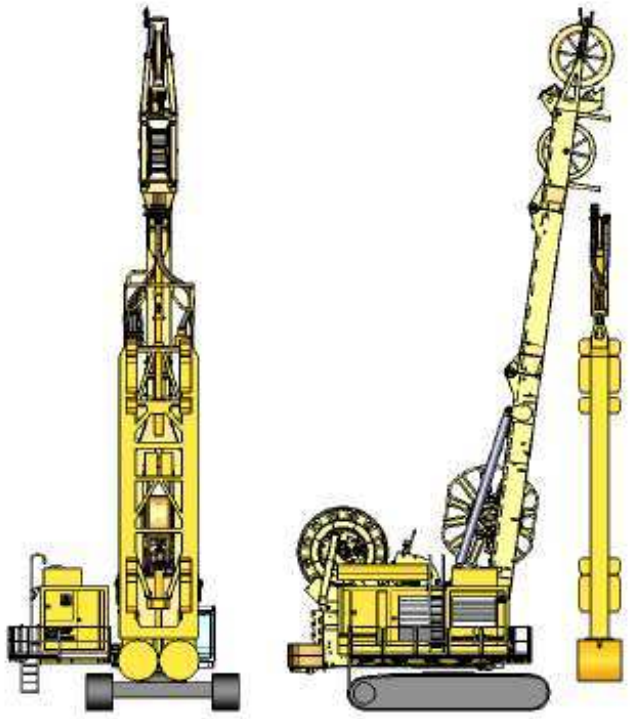
=

New BCS 185pp



BCS 185pp consisting of modified base frame of BT 160 and existing components from BCS 185 and CBC 45

BCS 185pp Technical Data



Base carrier

- Modified base frame of BT 160
- BCS 185 HDS frame
- UW 185 (same as BCS 185)
- CBC Hydraulic Power Pack frame

Hydraulic Power Pack	**HD 1400**	**HE 1400**
▪ Engine type	diesel	electric engine
▪ Installed power	563 / 570 kW	550 kW

HDS 90-T Hose Drum System (same as BCS 185)

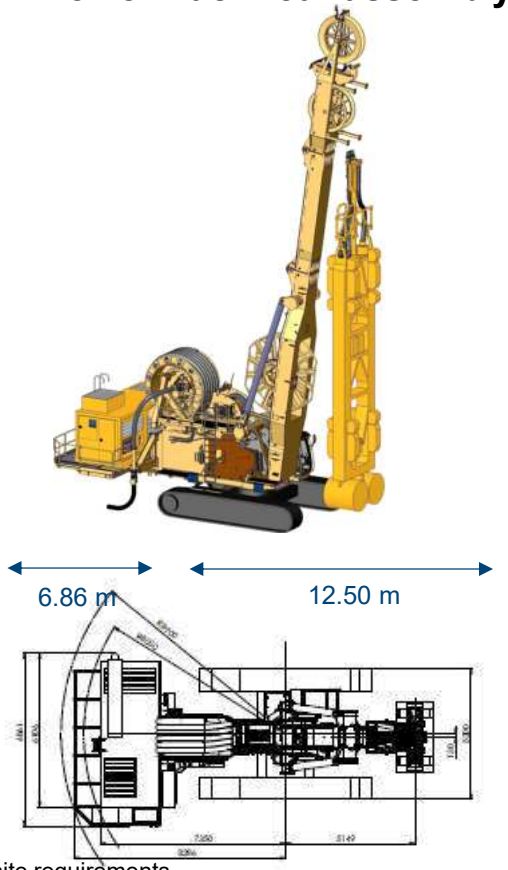
▪ Cutting depth	90 m
▪ Maximum Hook load	43 t
▪ Maximum recovery force	600 kN
▪ Turning option	

Trench cutter

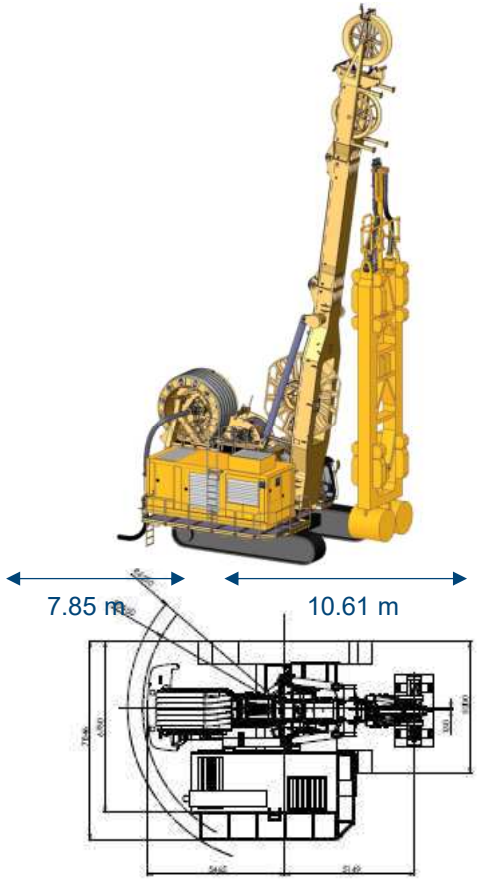
- Maximum 43 tons hook load of BCS 185 enables to use all cutters from BC 32 up to BC 48

BCS 185pp Setup Options

Power Pack rear assembly



Power Pack side assembly

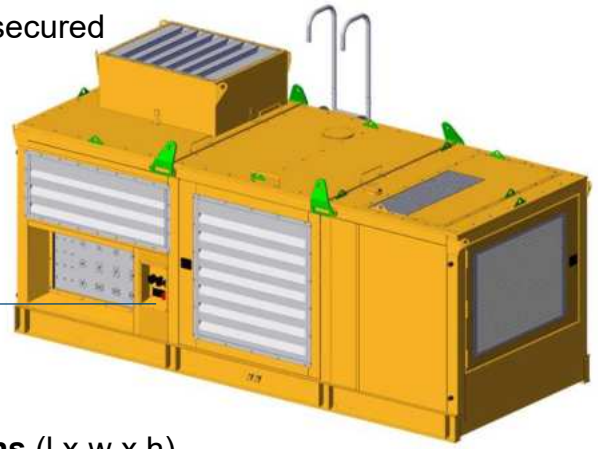


Tailored to the jobsite requirements

Hydraulic Power Pack Options

HE 1400 with electric drive

Engine	Three-phase asynchronous motor
Electrical equipment	Soft starter insulated and secured switch cabinet
Power output	550 kW
Rated speed	1,490 rpm
Frequency	50 / 60 Hz
Noise level	**50 %**



HD 1400 with diesel engine

Engine	CAT C18	
Exhaust emission certification	Tier 2 Stage II	Tier 4f Stage V
Power output	570 kW	563 kW
Rated speed	1,850 rpm	
Volume diesel tank (appr.)	1,350 l	
Noise level	**100 %**	

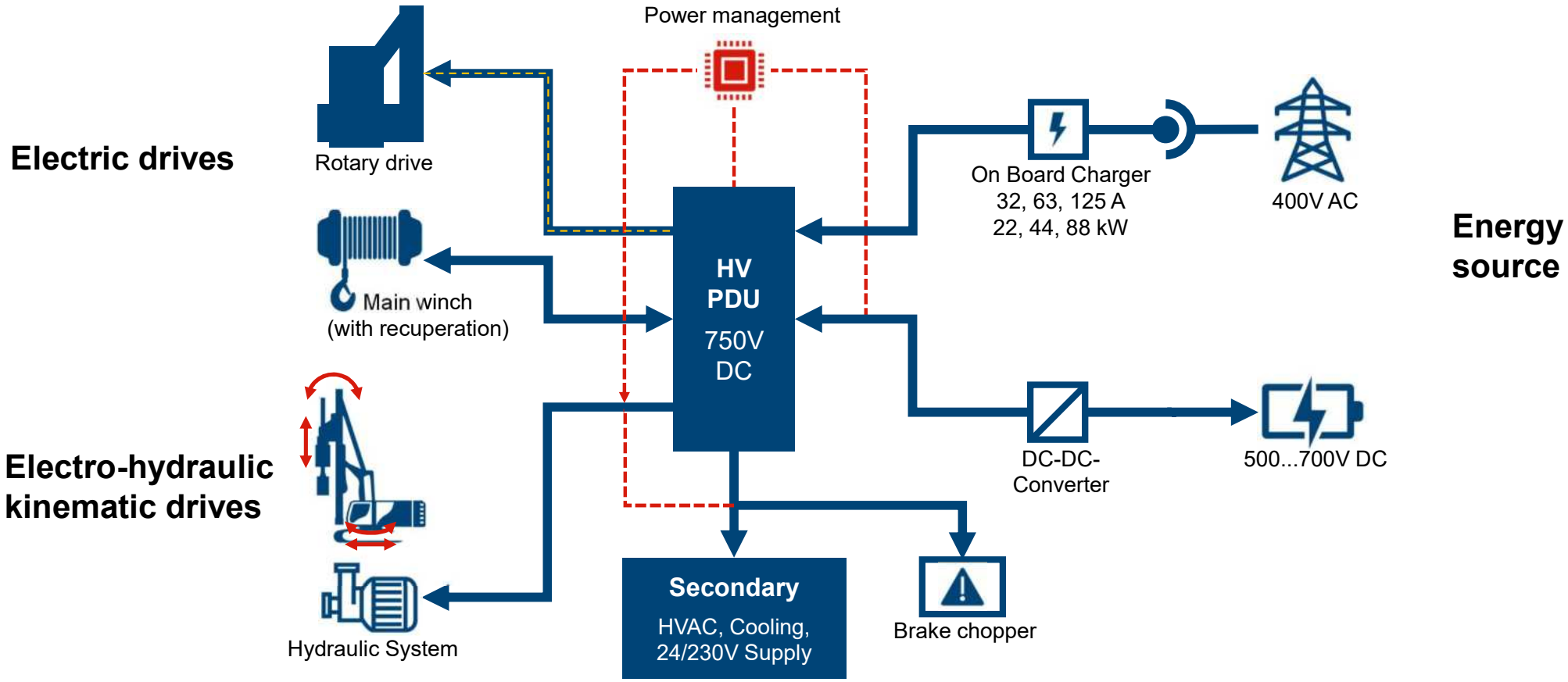
Dimensions (l x w x h) (without ladder and Silent pack)	6,031 mm x 2,400 mm x 2,547 mm
Weight appr.	14.300 kg
Hydraulic system	
Flow rate open circuit	3 x 345 l/min + (1 x 325) l/min
Flow rate closed circuit	2 x 125 l/min
Max. working pressure	300 (350) bar

5

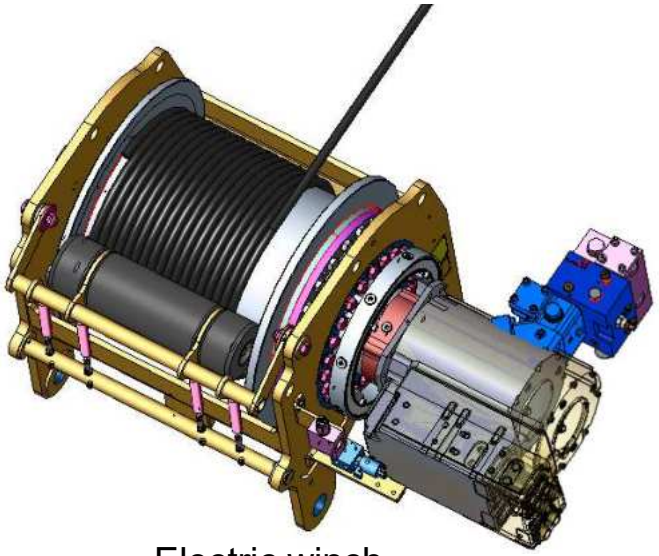
Battery electric drilling rigs


BAUER
eBG 33 H
BAUER
all electric
BG 36
It's just a tap away.
Experience intuitive and smart design:
the brand-new B-Tronic 5
more about
Saving resources with
highly efficient rigs:
The next level of electric drilling rigs.
more about

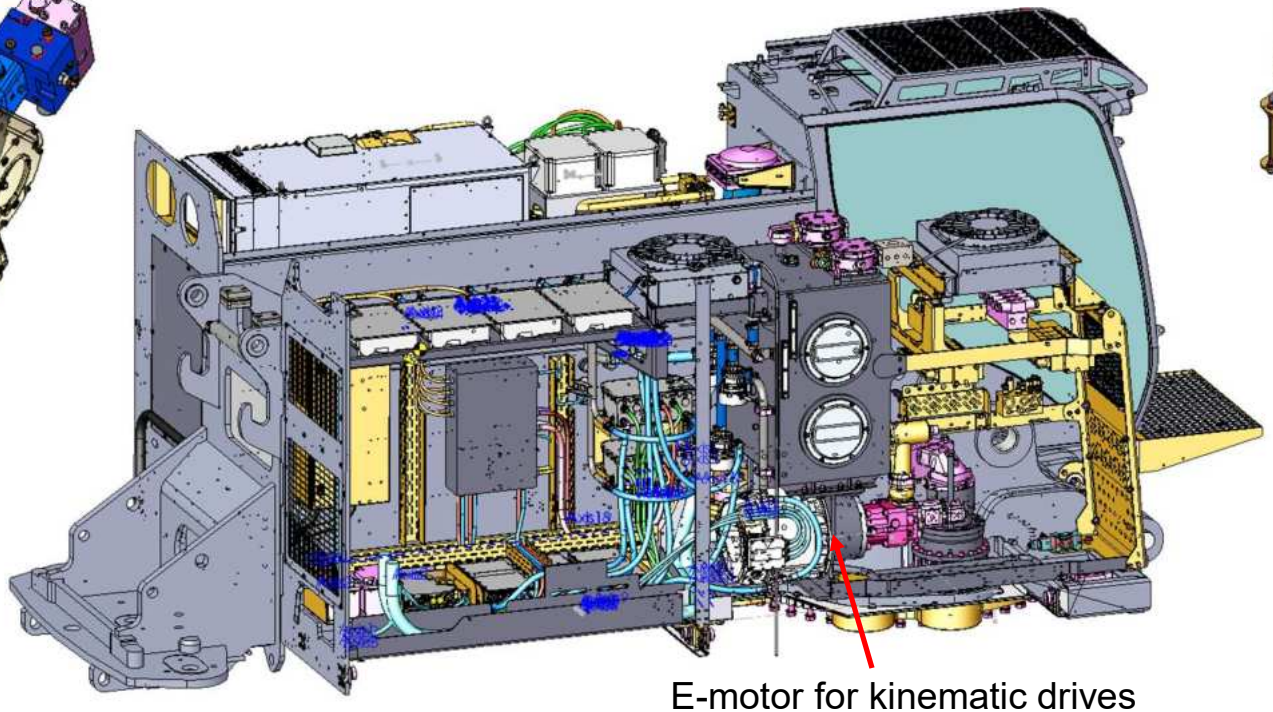
Architecture for **highest efficiency**



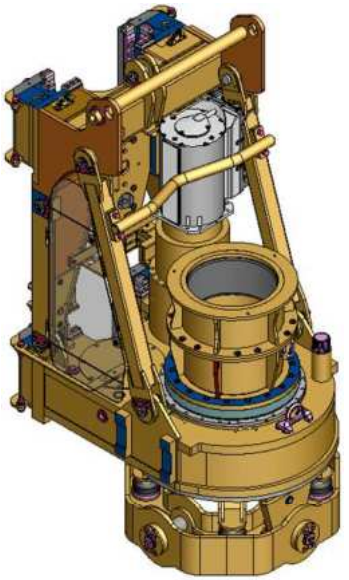
All electric systems



Electric winch

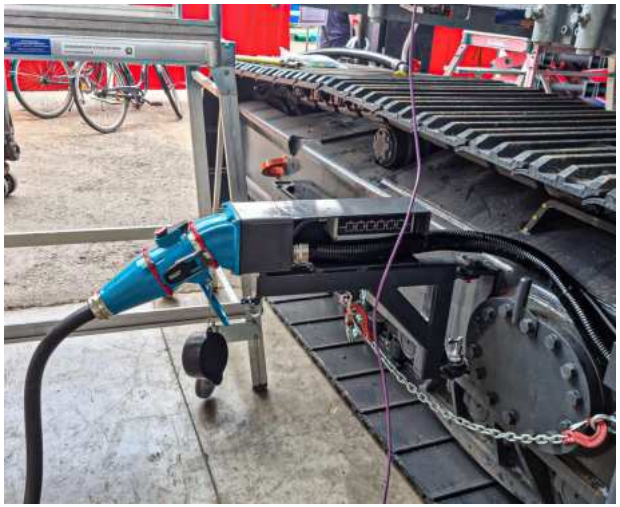


E-motor for kinematic drives



Electric
rotary drive

eBG 33 H all electric



Summary

Conclusions

- Main reasons for electric drives
  - Low noise emissions
  - Low CO2 emissions
  - Highest efficiency

- Technical solutions
  - Cable electric for high performance and single pass applications
  - Battery electric for low performance and Kelly applications
  - Electric hybrid for intermediate applications with high power peaks
  - All electric for highest efficiency

- For construction site setup and grid connection please clarify your requirements well in advance

PASSION for PROGRESS

BAUER Maschinen GmbH

Special foundation technologies made for Japan

Dr. Andreas Ziegler

November 13th, 2024

Agenda

No.	Agenda topic
1	eRG 19T hybrid
1.1	Electric hybrid system
1.2	Sheet pile press MPU 400/500 Japan
2	Drilling rigs
2.1	BG 23 V
2.2	BG 45 V
3	B-Tronic 5

1

Electric hybrid system

Hybridization

eRG19T hybrid on BS61eh at BAUMA in 10/2022

RTG Rammtechnik GmbH / Bauer Maschinen GmbH

Hybridization

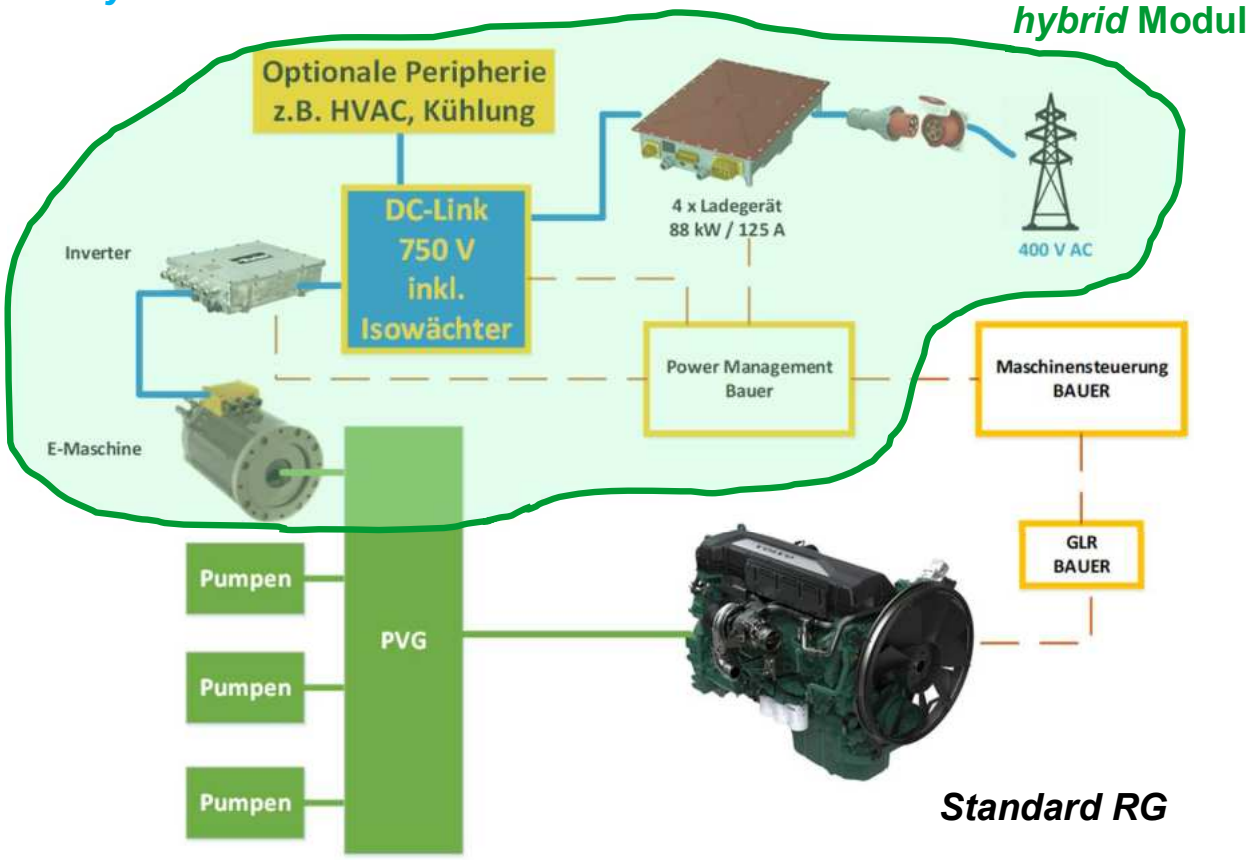
eRG19T hybrid demonstration in Aresing

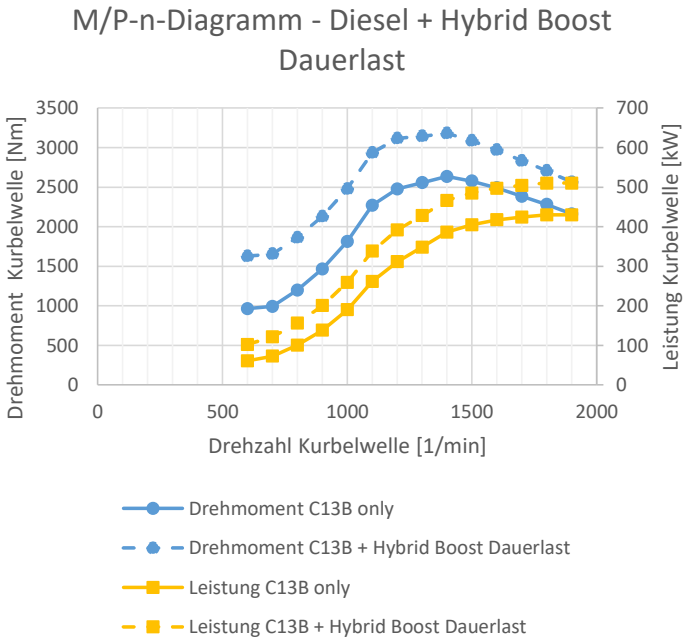
eRG21T hybrid at inhouse exhibition 2024 in Schrobenhausen

RTG Rammtechnik GmbH

Hybridization

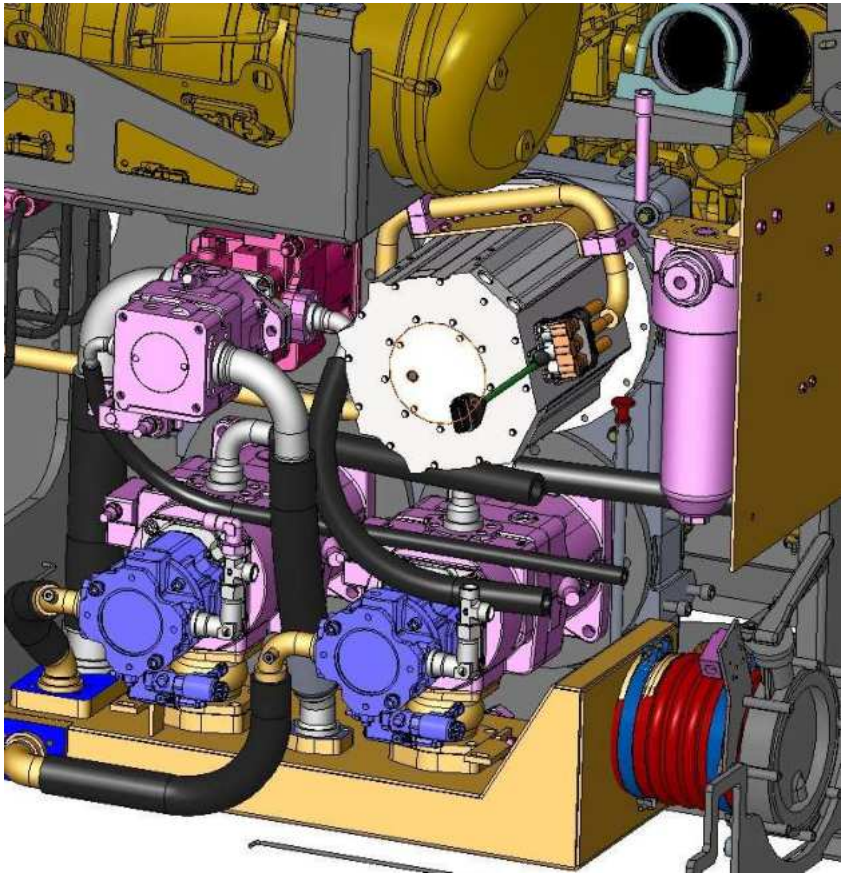
RG19T *hybrid* on BS61eh New

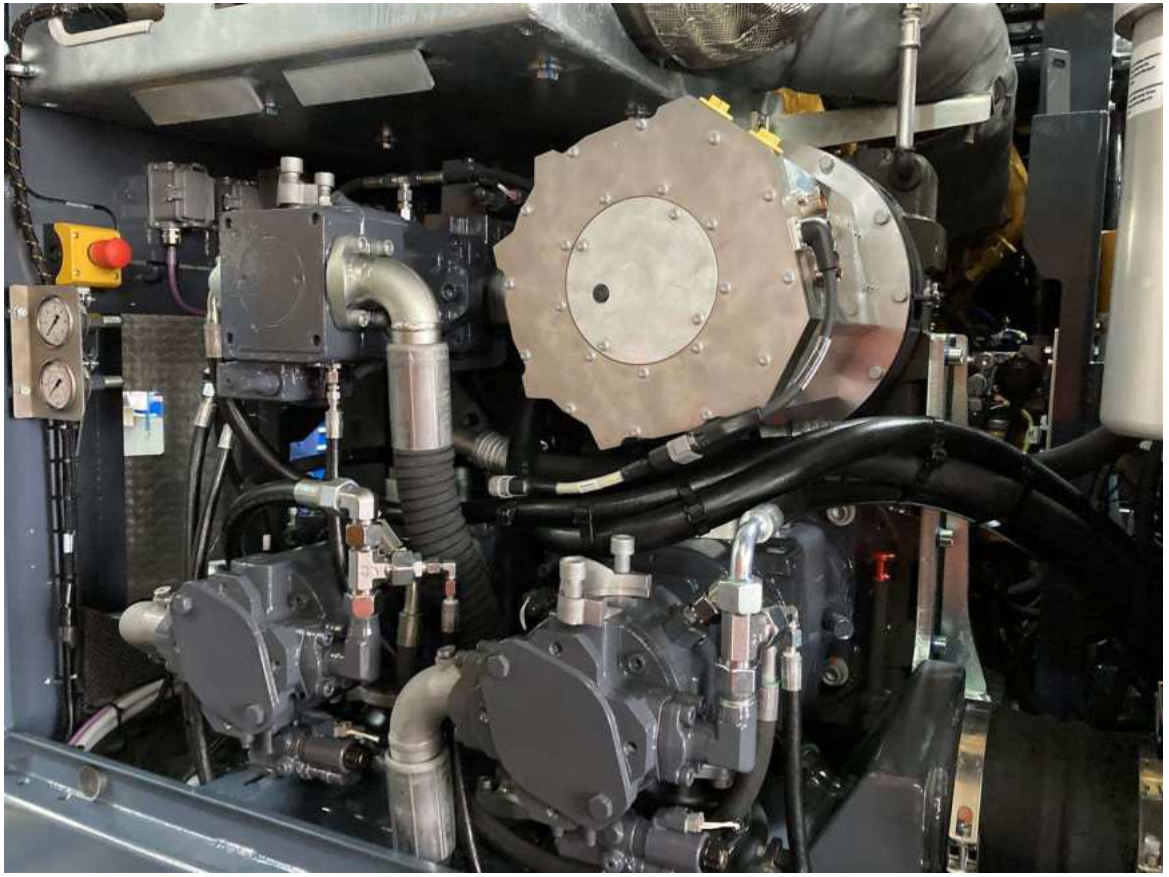




Hybridization

RG19T *HYBRID* on BS61eh New

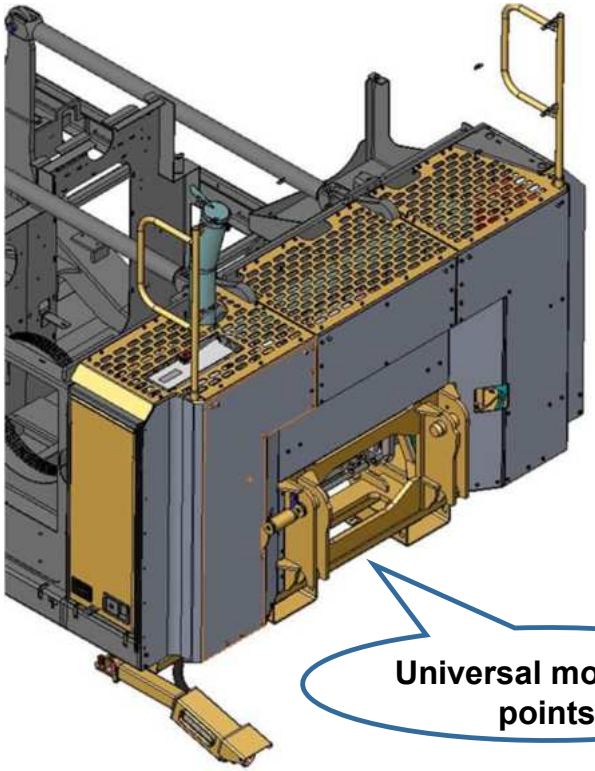




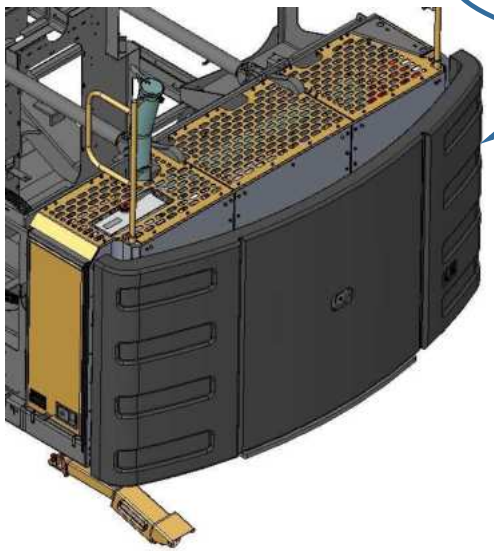
RTG Rammtechnik GmbH / Bauer Maschinen GmbH

Hybridization

eRG19T hybrid **➔ modular counterweights (max 12,4 t)**

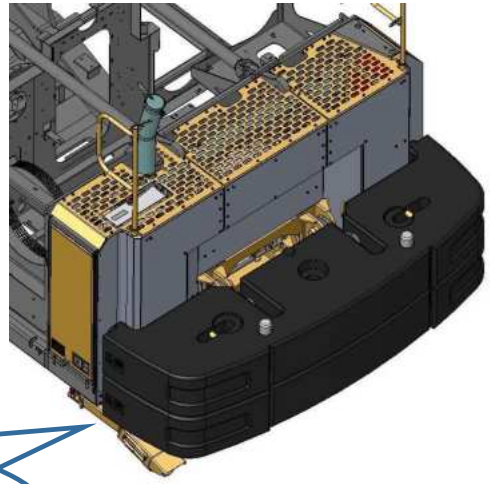


Universal mounting points



Counterweights from BS55R/RS

- 1x 4,1 t
- 1x 1,9 t

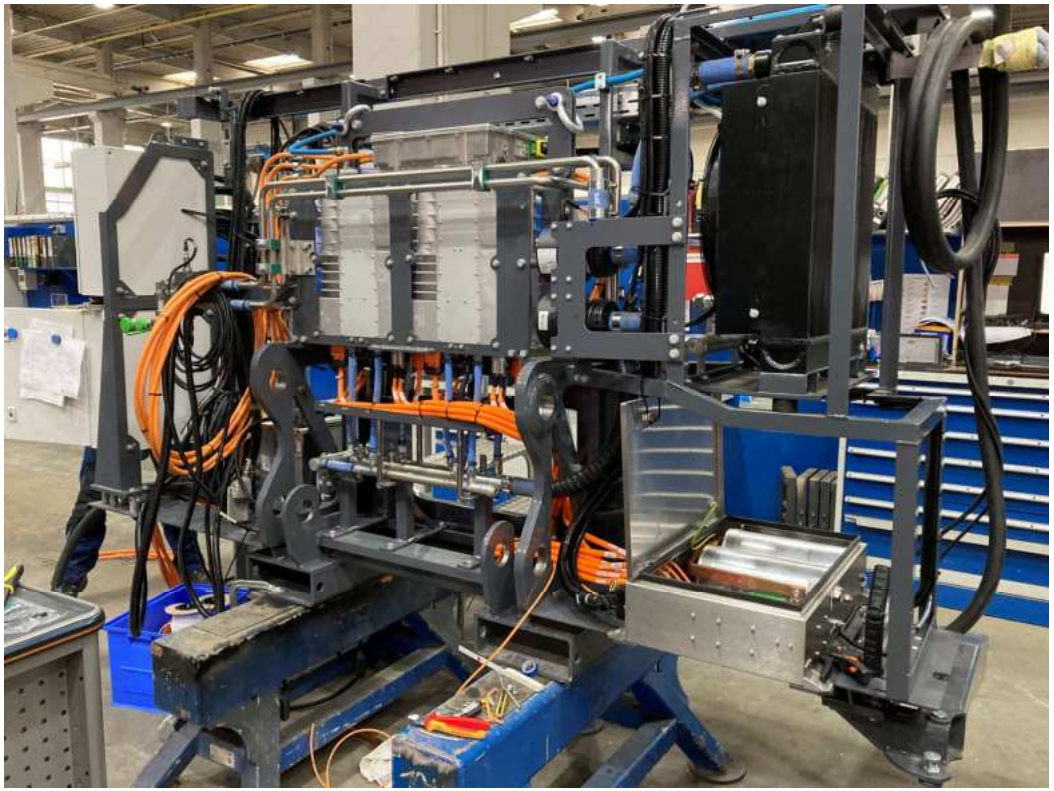


Counterweights from BS65R/RS

- Min 3x 2,5 t
- Max 1x 4,9 t + 3x 2,5 t

Hybridization

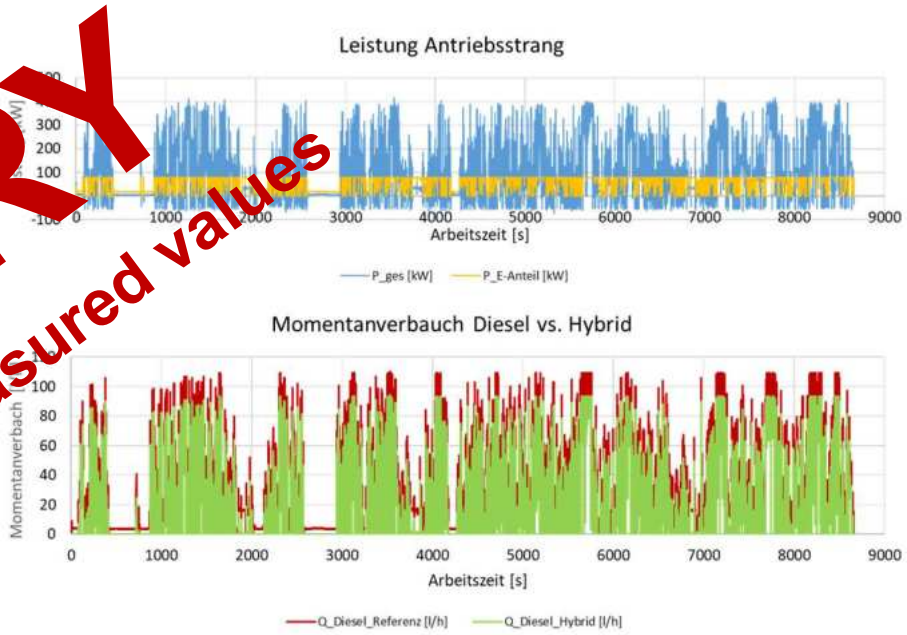
Hybrid-Module in production



Hybridization

RG19T *HYBRID* on BS61eh New (theoretical estimation of reduction of fuel and CO_2)

Average fuel consumption:	**25,0 l/h** (more than recorded)
Reduction Hybrid:	**12,3 l/h (≙ 61,5 kWh)**
Total fuel consumption Hybrid:	**12,7 l/h (+ 61,5 kWh)**
CO_2 Reduction:	**33 kg/h**



50% less diesel and carbon dioxide (CO_2)

Base carrier (EEP) BS 61 eh

Max. System-Power:	**510 kW**
Max. Diesel engine Power:	430 kW
Max. Electric Power at gear:	80 kW (CCR-socket 125A/400V AC)

Power-plug on the rear side of the upper carriage.

Hybridization

RG19T *HYBRID* on BS61eh New ➔ Validation test in Aresing with MR95AVM sheet piling

RTG Rammtechnik GmbH / Bauer Maschinen GmbH

Hybridization

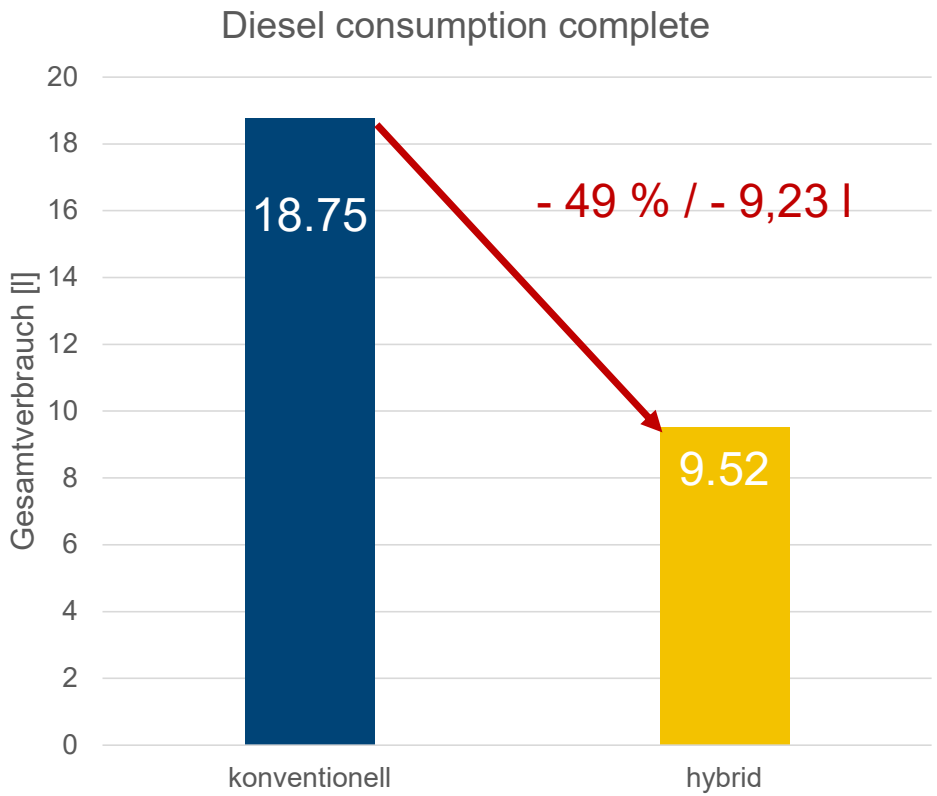
RG19T *HYBRID* on BS61eh New ➔ Validation test in Aresing with MR95AVM sheet piling

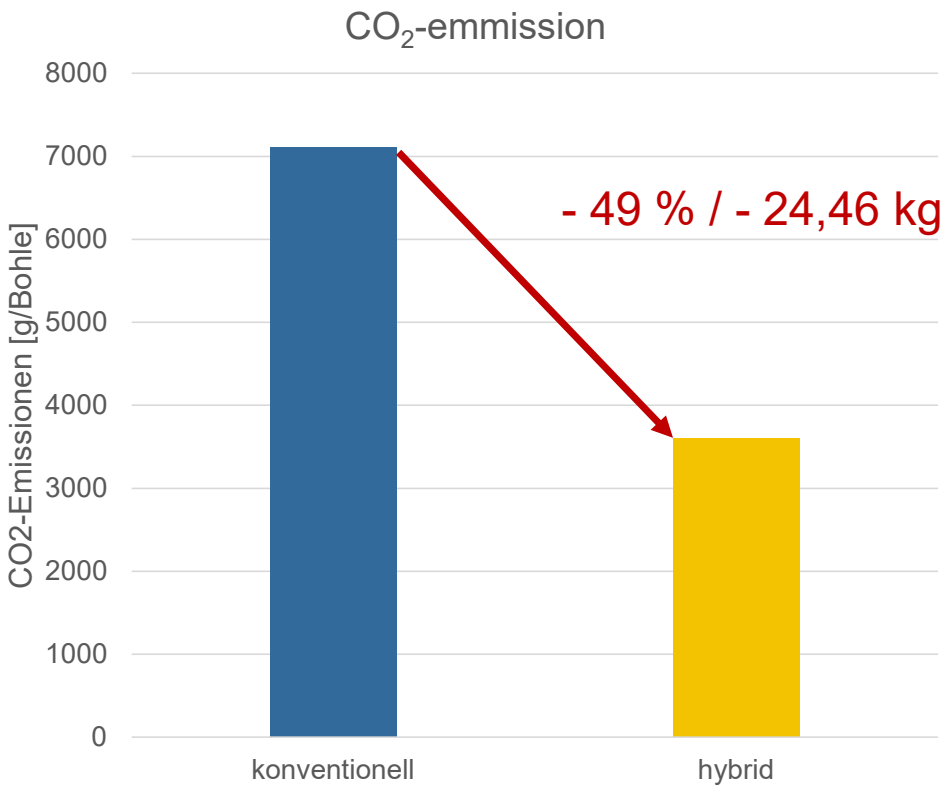
7x

Lifting the sheet pile → Driving the sheet pile → Pulling the sheet pile → Put down the sheet pile

Hybridization

RG19T *HYBRID* on BS61eh New ➔ real values, measured in Aresing





Job site FKU Berlin

BAUER SPEZIALTIEFBAU JOB SITE in Berlin/Germany

Target

- Excavation pit watertight
- Combination of **Mixed in Place wall**, **contiguous pile wall** and **BAUER-LWS-Silicate-gel-bottom**
- After the production of the pit wall starts the job of the ***eRG19T hybrid***
- Making of suspension-filled holes with vibrator and tube within a specified modular grid
- Insertion of injection lances to create the silicate-bottom for a watertight pit also from the bottom side.

Job site FKU Berlin

BAUER SPEZIALTIEFBAU JOB SITE in Berlin/Germany

Quelle: Optima-Aegidius Group of Companies:

- 32.200 qm GIF
- 55 m Gebäudehöhe
- 1,35 m Raster
- 14 Stockwerke
- Leed Gold/Wired Score geplant
- Lichte Raumhöhen 3,02 - 6,20 m
- 2.300 qm Dachgärten / Themengärten
- 4.100 qm Freifläche mit Waldbiotop
- E-Ladesäulen
- Carsharing-Plätze
- 273 PKW Stellplätze
- 500 Bike Stellplätze mit Duschen und Spinden
- High-Speed Internet (Glasfaser)
- Lobby mit Galerie

Job site FKU Berlin

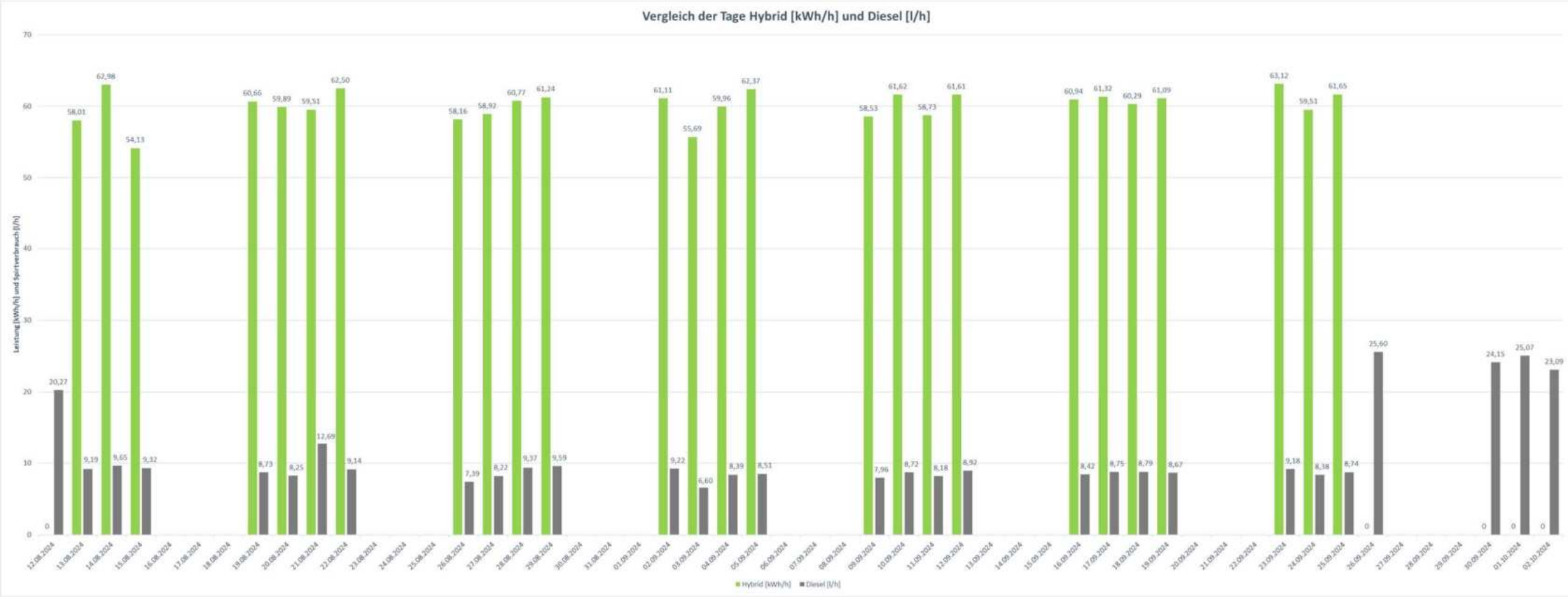
eRG19T *hybrid* #500 on BS61eh

on Job site

in Berlin “Friedrich Krause Ufer”

Job site FKU Berlin

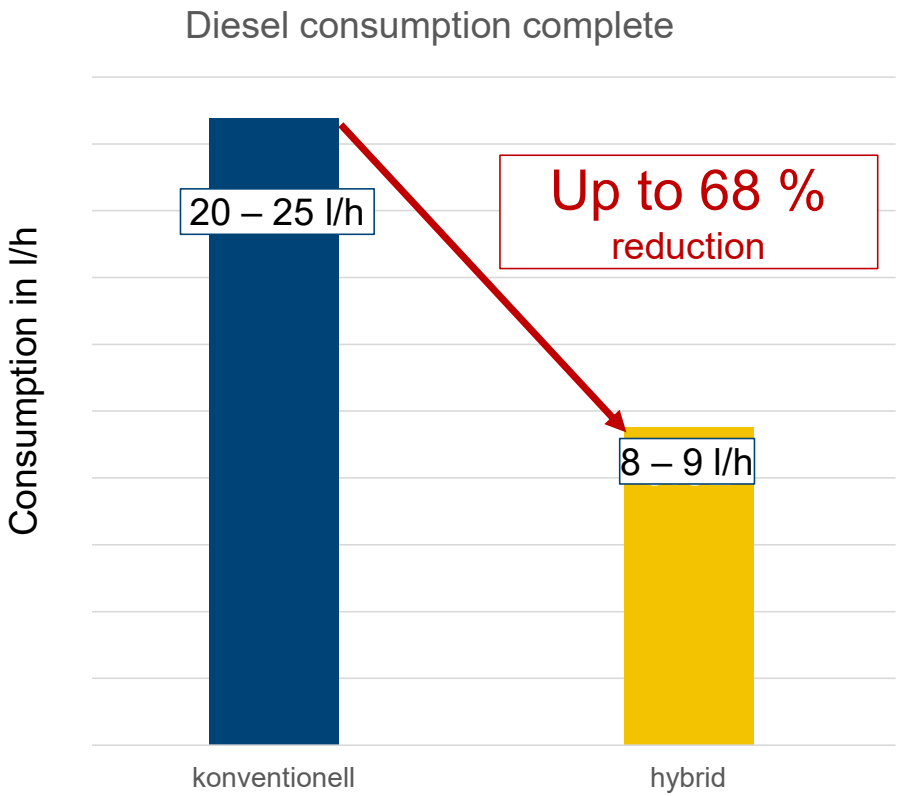
RG19T *HYBRID* on BS61eh ➔ real values, measured on Job site in Berlin

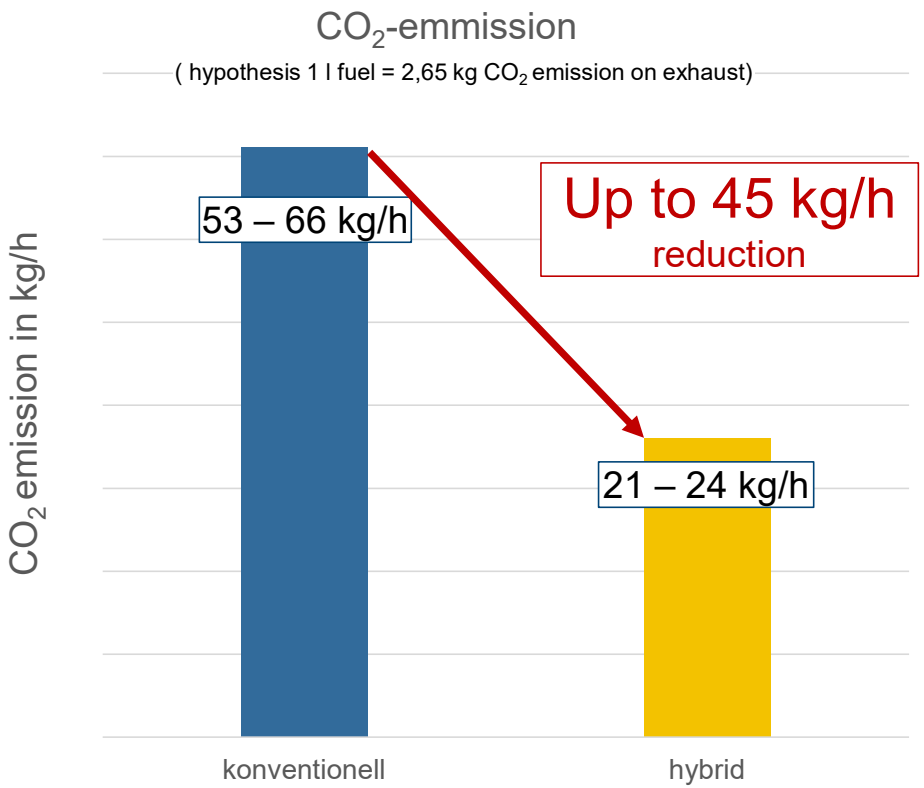


RTG Rammtechnik GmbH / Bauer Maschinen GmbH

Job site FKU Berlin

RG19T *HYBRID* on BS61eh New ➔ real values, measured in Berlin on Job site





Hybridization

Modular *hybrid* line

Telescopic rigs

RG 14 T	RG 16 T	RG 16 T	RG 19 T	RG 21 T
BS 55 R	BS 55 RS	BS 65 RS	BS 65 RS	BS 65 RS
BS 61 eh	BS 61 eh	BS 61 eh	BS 61 eh	BS 61 eh

Fixed leader rigs

RG 18 S	RG 22 S	RG 25 SC	RG 27 S
BS 65 RS	BS 65 RS	BS 90 RS	BS 90 RS
BS 61 eh	BS 61 eh		

Hammer/DTH rig

RM 20
BT 55 S

Roll out *hybrid* rigs third quarter 2024

RTG Rammtechnik GmbH / Bauer Maschinen GmbH

1.2

RTG Press and Predrill

RTG Press and Predrill system

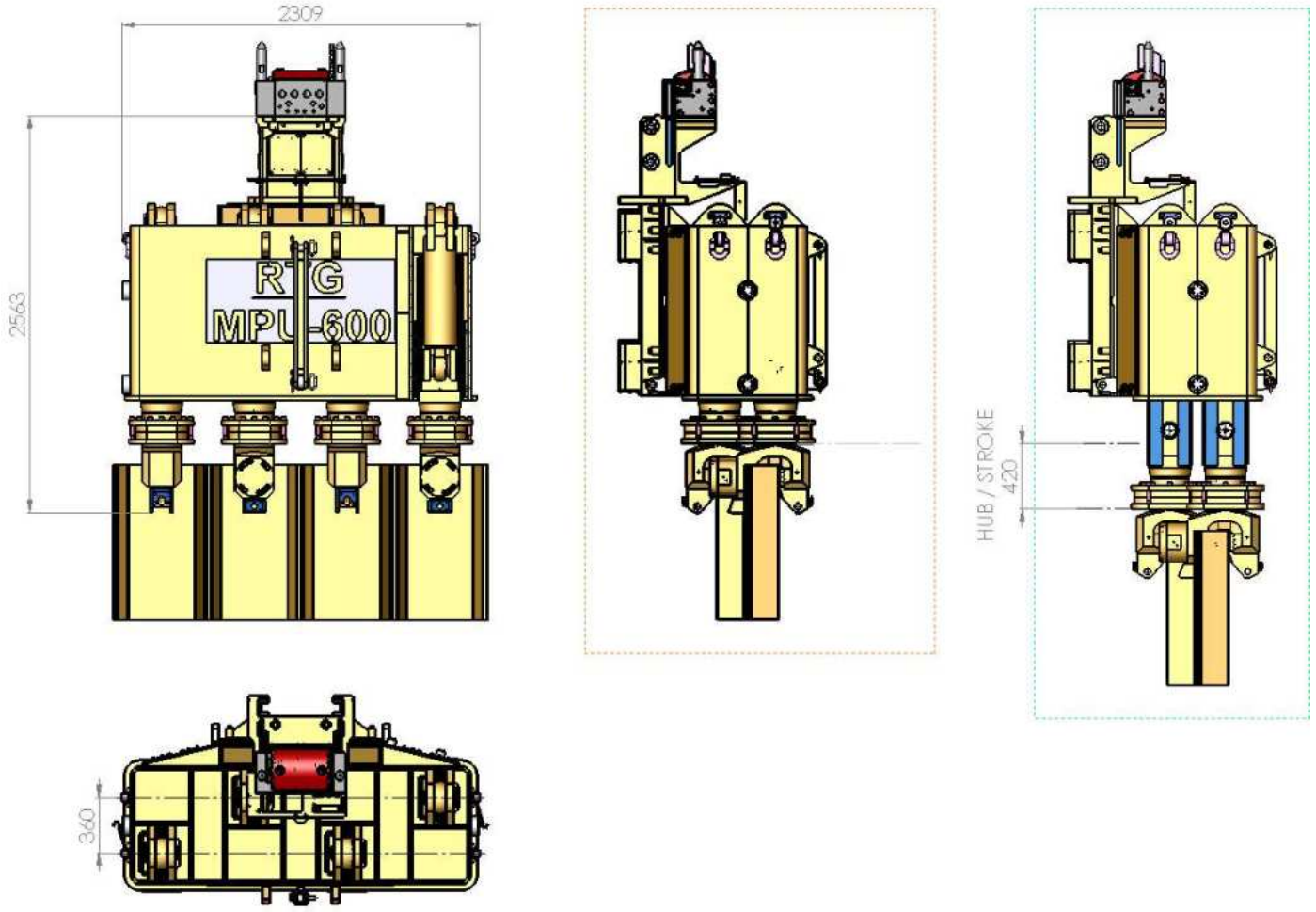
RTG Rammtechnik GmbH

RG 16T with MPU 600

RTG Rammtechnik GmbH

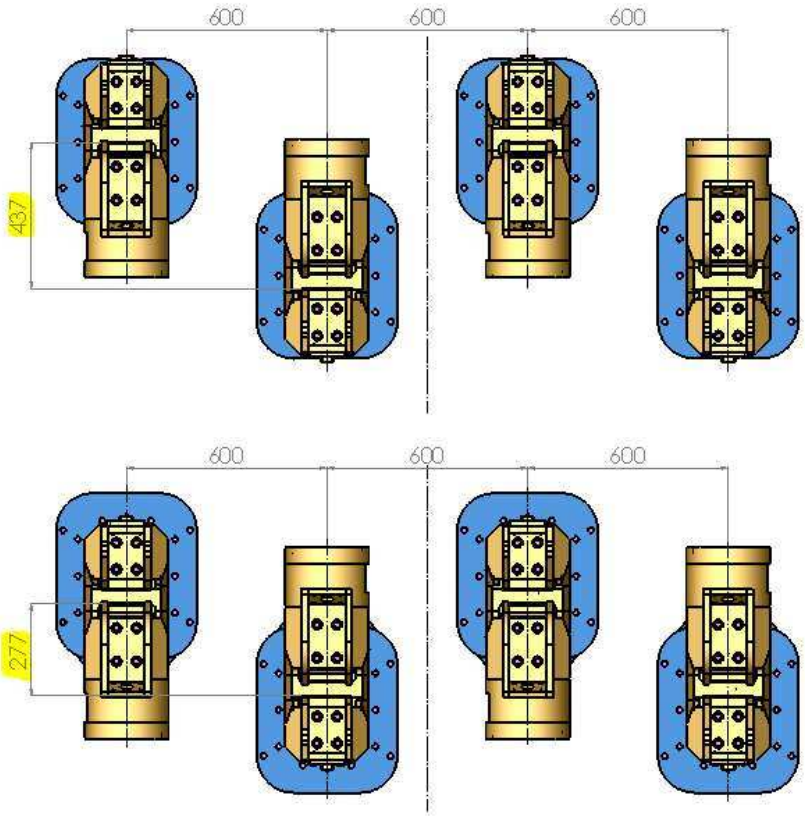
Sheet pile press new development for Japan

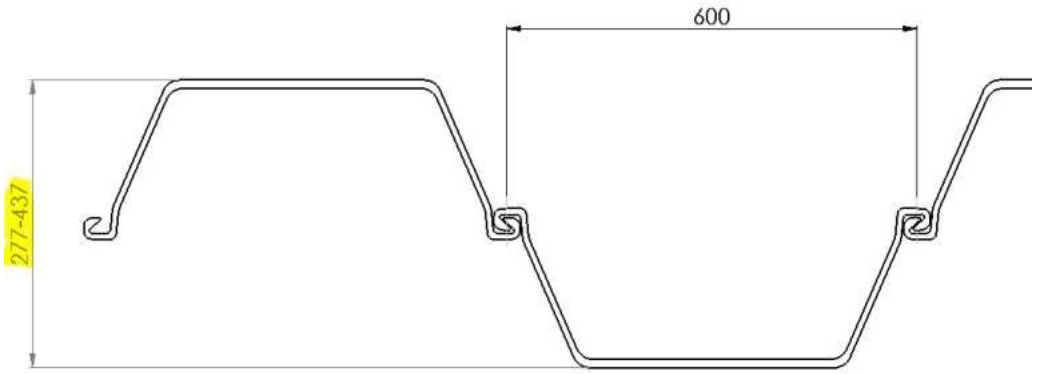
MPU 600 -2023



Sheet pile press new development for Japan

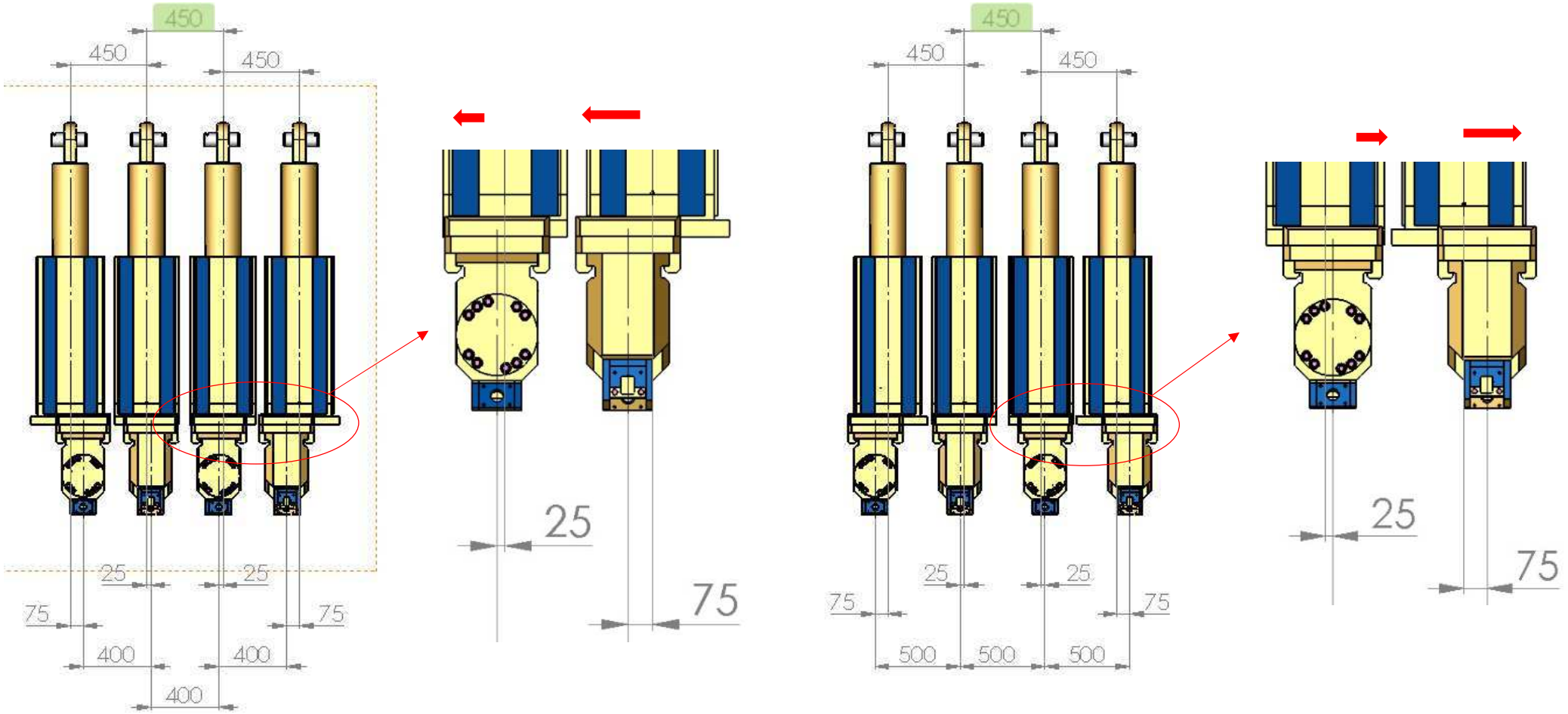
MPU 600 -2023





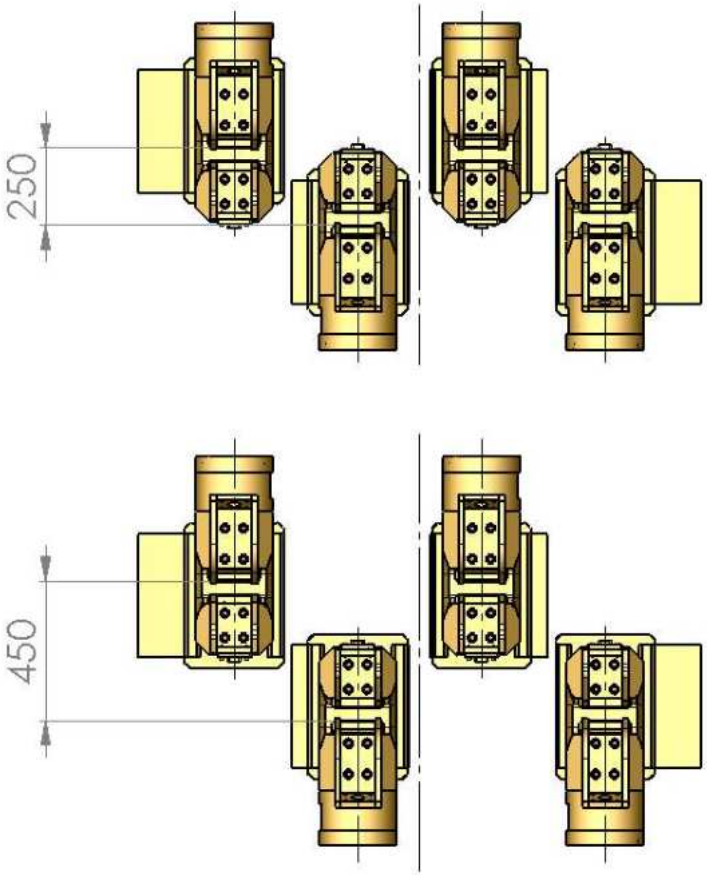
Sheet pile press new development for Japan

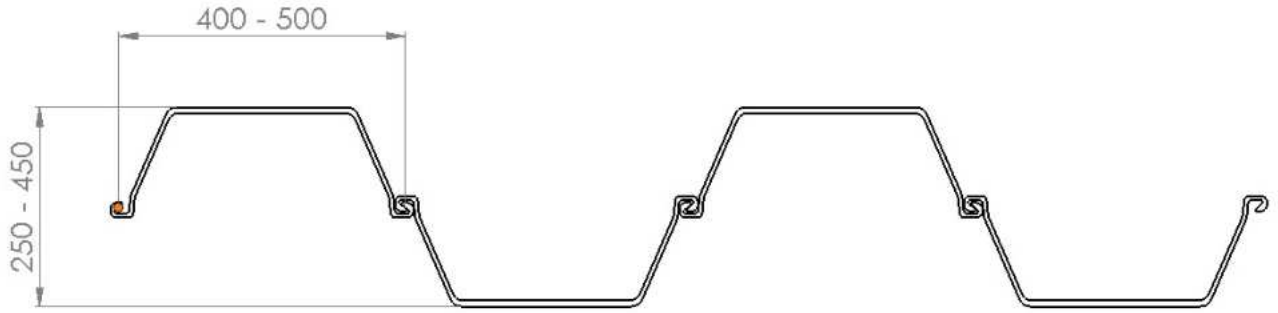
New Concept!



Sheet pile press new development for Japan

New Concept!





Sheet pile press new development for Japan

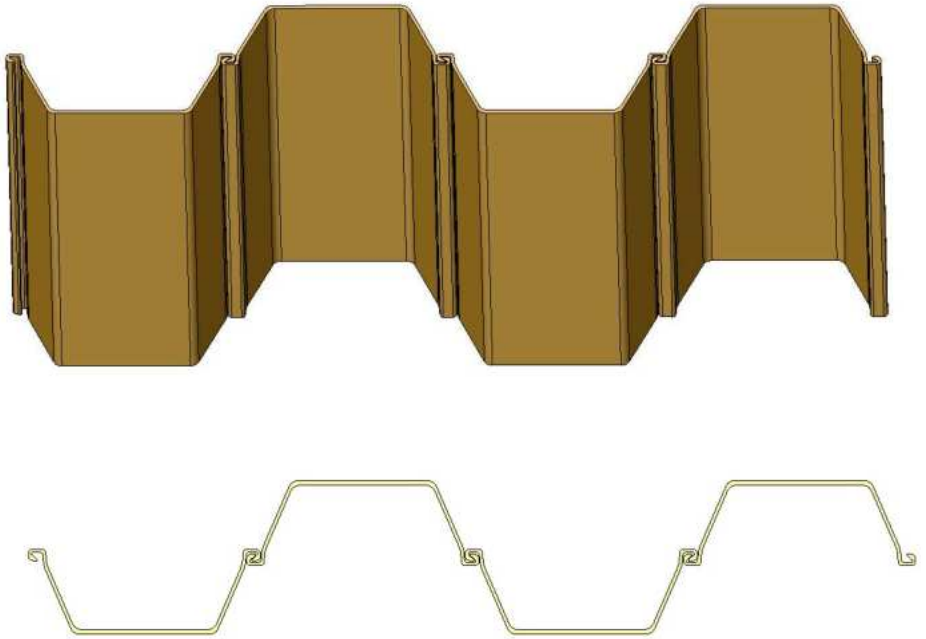
New Concept!

Features of the new concept:

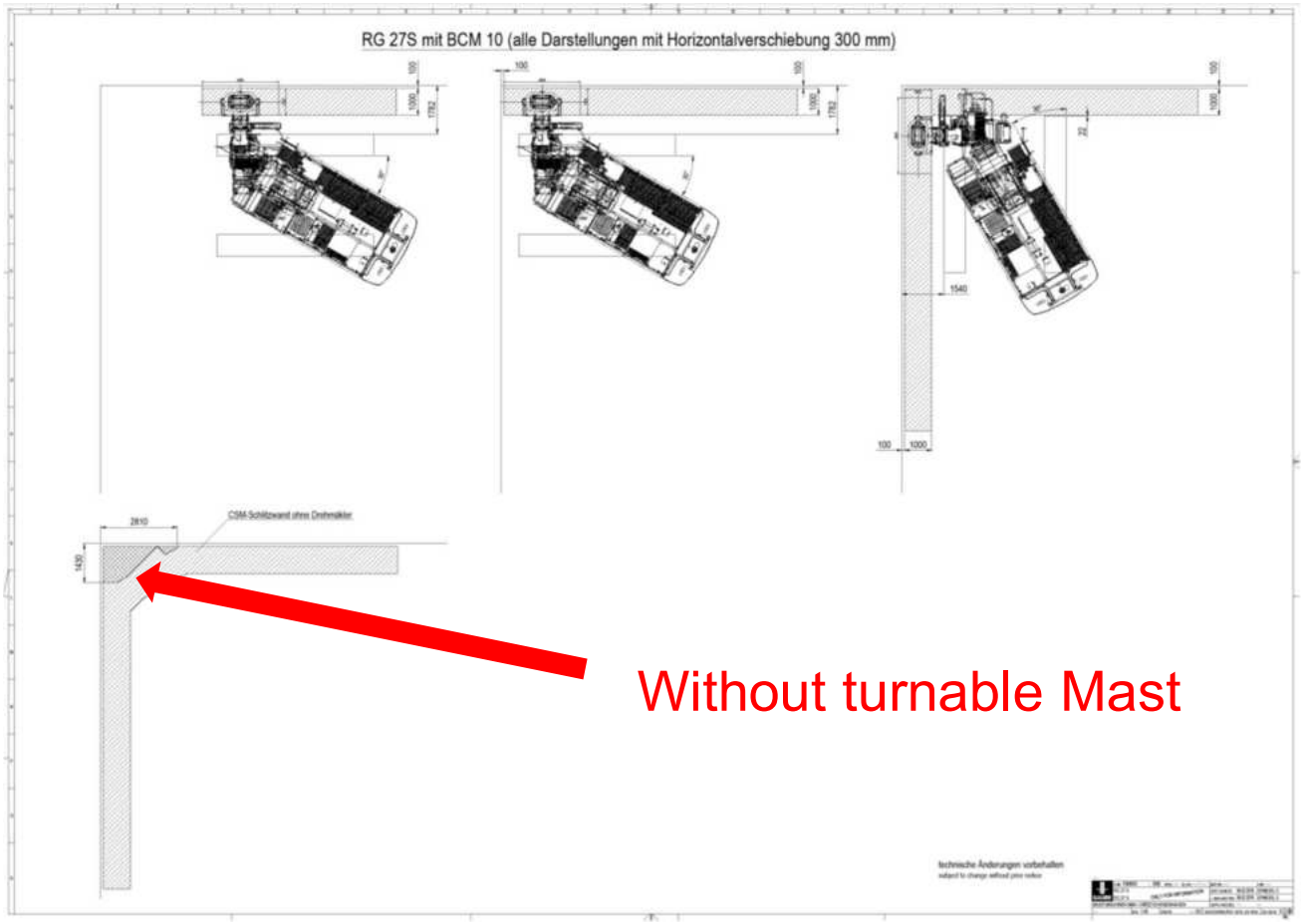
-Only 2 base frames/ 1x for 600 mm profiles,
1x for 400 to 500 mm profiles

-Change between 400 and 500 profiles without much effort

-Higher press-in speed/ min. 16m/s



Advantage Turnable Mast



RTG Press and Predrill system

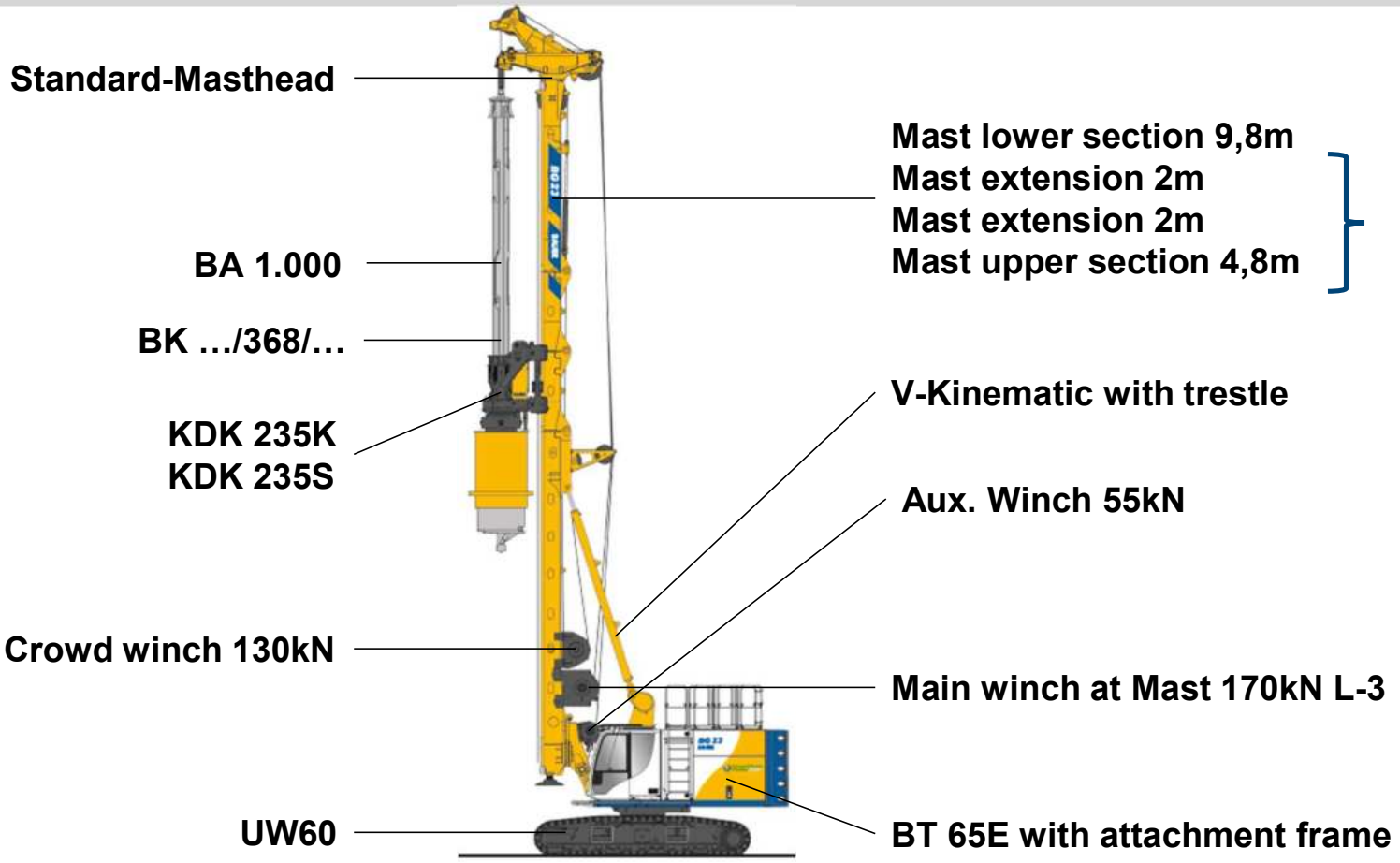
RTG Rammtechnik GmbH

2

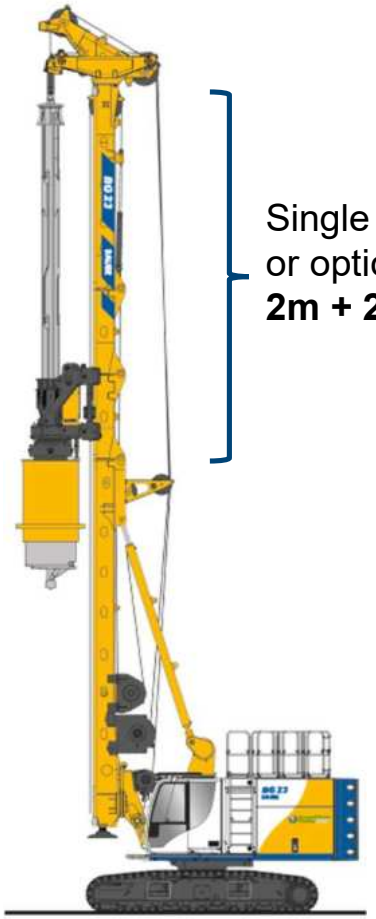
Drilling rigs

- BG 23 V
- BG 45 V made for Japan

BG23V robust V kinematics



BG23V



Single section **8,8m**
or optional
2m + 2m + 4,8m

Technical Parameter

	BG847
Drill-Ø uncased cased	**1700 mm** **1400 mm**
Drill Axis	**1000 mm**
Drilling Depth	**~ 50,8 m**
Max. Torque	**235 kNm**
Engine Power	**225 kW*** **186 kW****
Max. Height	**21,3 m**
Additional Features	**Tier 4 final + Stage V** **new / actual upper carriage electr. control EEP** **Assistent systems B-Tronic 4.4**

Energy-Efficient Power EEP

* Stage V / Tier 4 final
** ORA

BG23V - Multi-Purpose-Rig

Kelly Drilling

Cased Kelly Drilling
Installation with Oscillator

CFA
Continuous Flight
Auger Drilling

FDP
Full Displacement Piling
(Standard or Lost Bit)

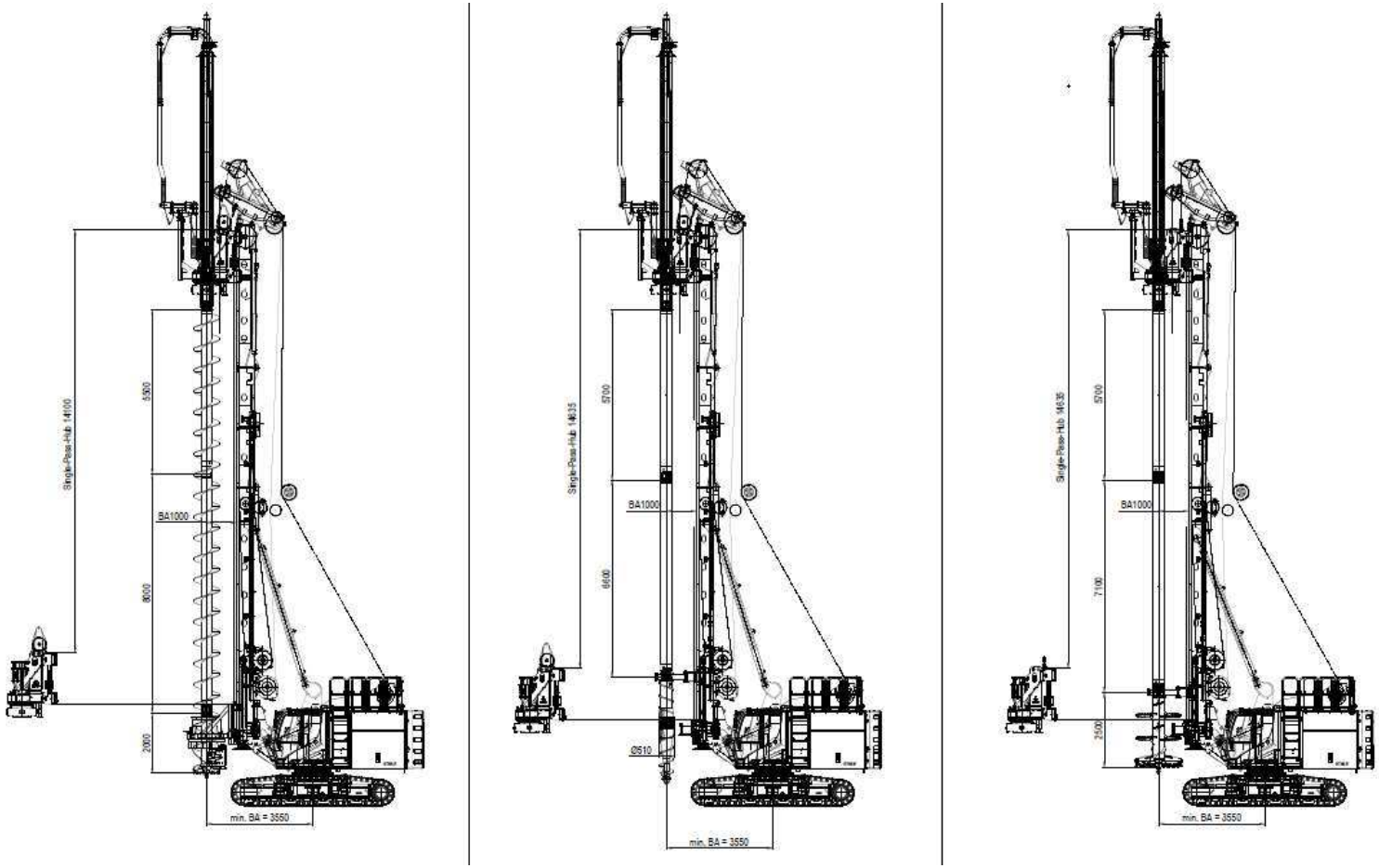
FoW
Front of Wall

VD*
Vibro Displacement

SCM
Single Column Mixing

HDI*
Jet Grouting

BG23V - Multi-Purpose-Rig



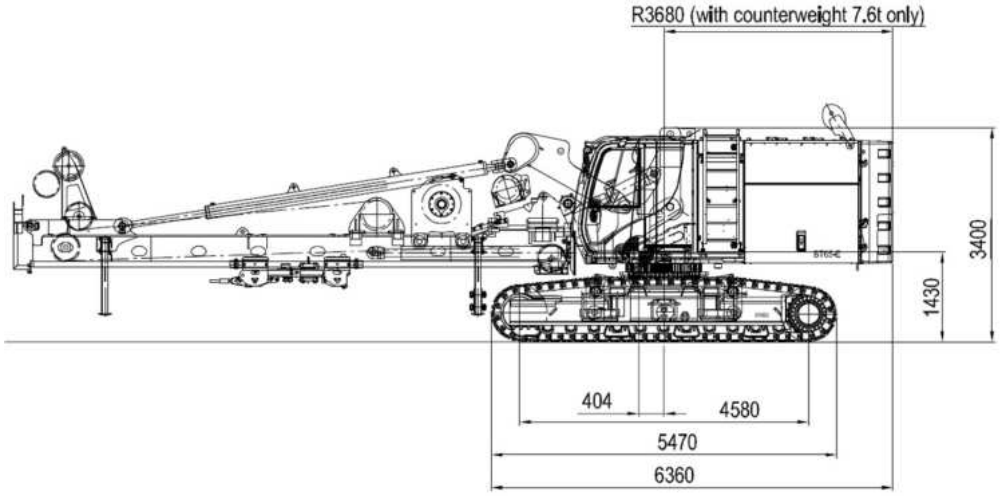
Approx. **19,6m** CFA drilling depth with 6m Kelly extension and approx. **20,1m** FDP/SCM drilling depth with 6m Kelly extension

BG23V

Transport units

Transport weight: **52,6t**

UW60G, BT65
V-kinematic
7,6t counterweight
170kN main winch
130kN crowd winch
55kN auxiliary winch



Easy assembling and disassembling

Mobilization package

Hydraulic pins at

- **Mast connection**
- **Back stay cylinder**
- **Support threstle**

BG23V

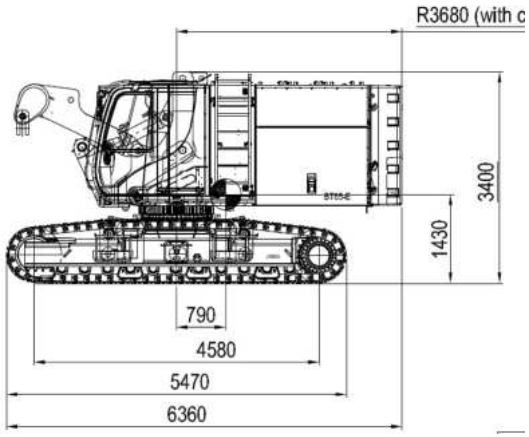
Transport units

Transport weight: **41,8t**

UW60G, BT65

V-kinematic

7,6t counterweight



BG23V

Transport units

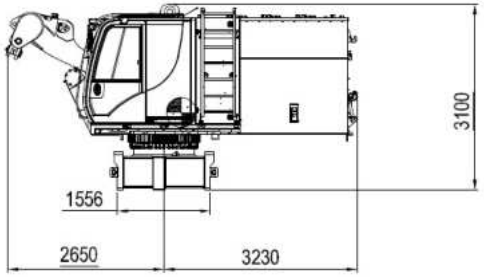
Transport weight: **22 t**

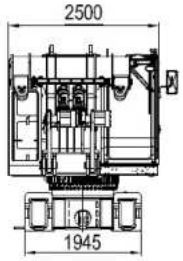
UW60G, BT65

V-kinematic

without 7,6t counterweight

without crawlers





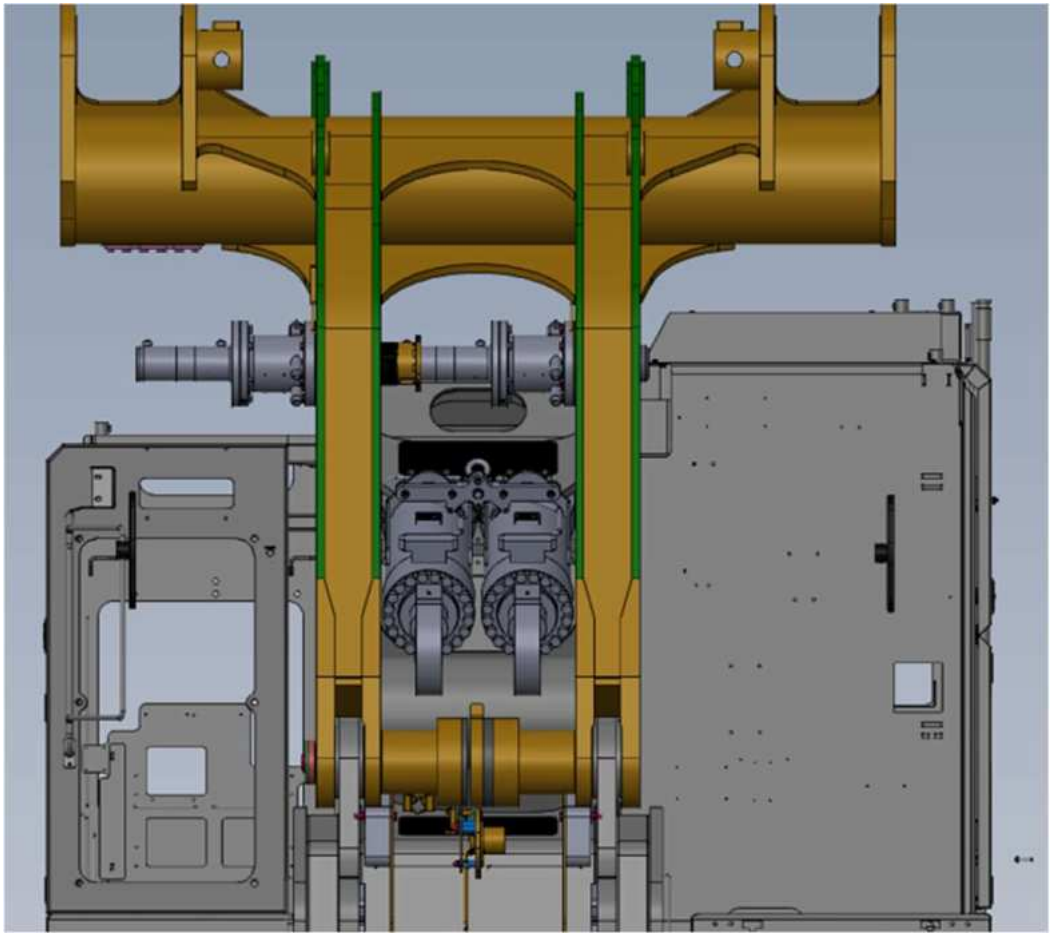
BG45 Japan configuration

Special configuration

- **Undercarriage UW110F** instead of UW 130
- BS95 with 3x4.9t + 2x2.5t
- Mast lower part + 3.1m Variomastsegment + 5m Mast extension, **no mast upper part**
- **Mobilization package**
- **"short" Kelly hydraulic hose package**
- Mast support cylinder
- **Single-layer 265kN main winch** instead of 380 kN main winch
- 232kN Crowd Winch
- 100kN Auxiliary winch
- Standard-Masthead
- Drill axis 1,300 mm
- Basic sledge with hydraulic pins
- Rotary drive KDK460S with 470mm Kelly equipment and multi-cardan joint ring
- Kelly bar BK420/470/4/32
- Special measures for transport

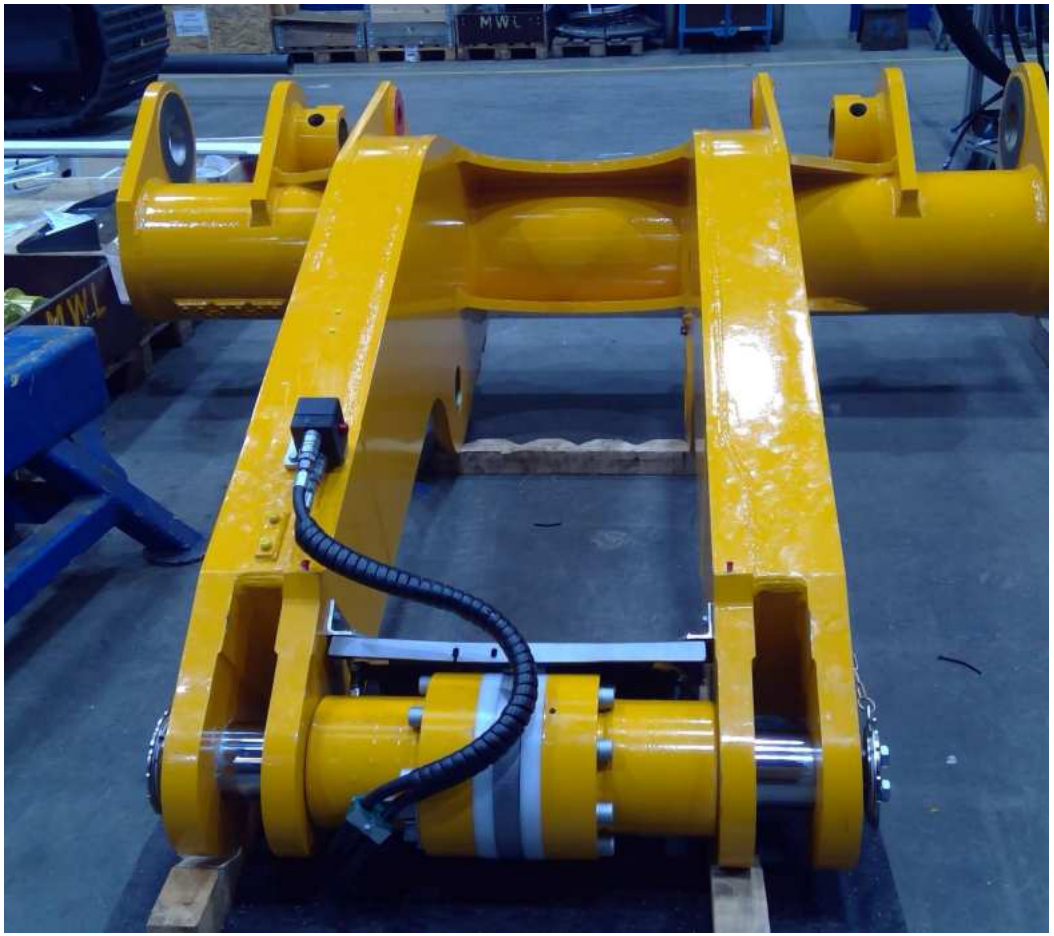
Mobilization package also for support threstle

Hydraulik pins also at lower part of support threstle



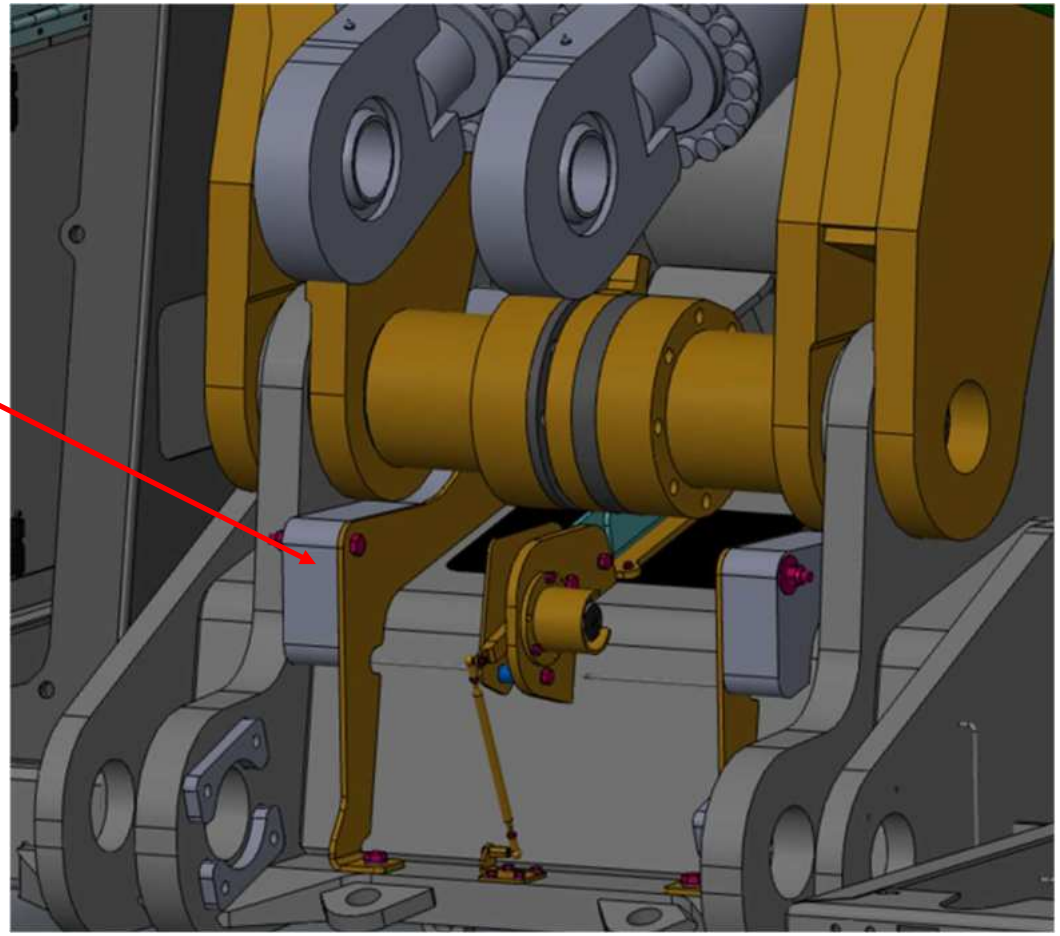
Mobilization package also for support threstle

Hydraulic locking pins
at support threstle

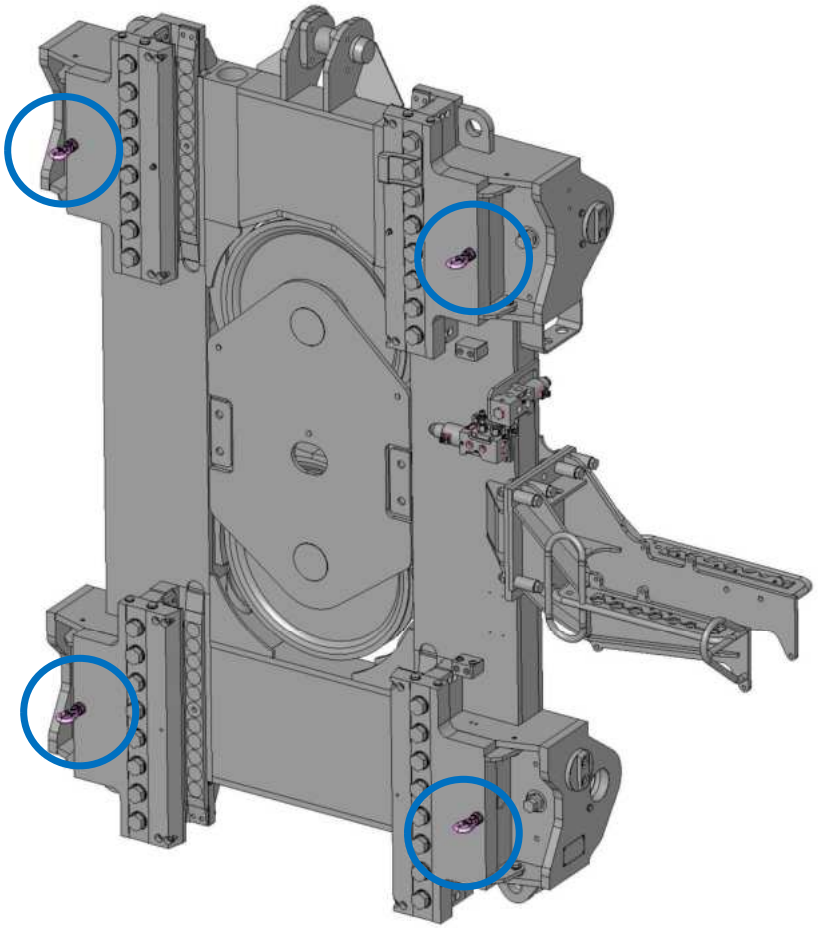


Mobilization package also for support threstle

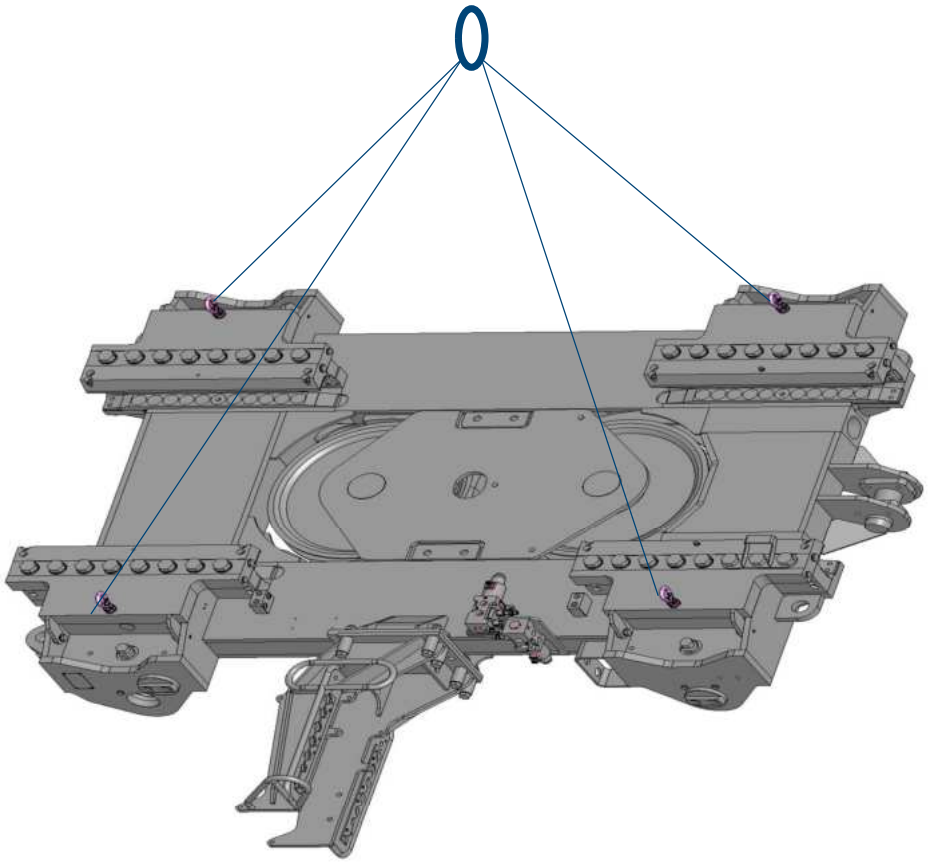
Centralizing of support threstle during assembling



Easy disassembling of base sledge

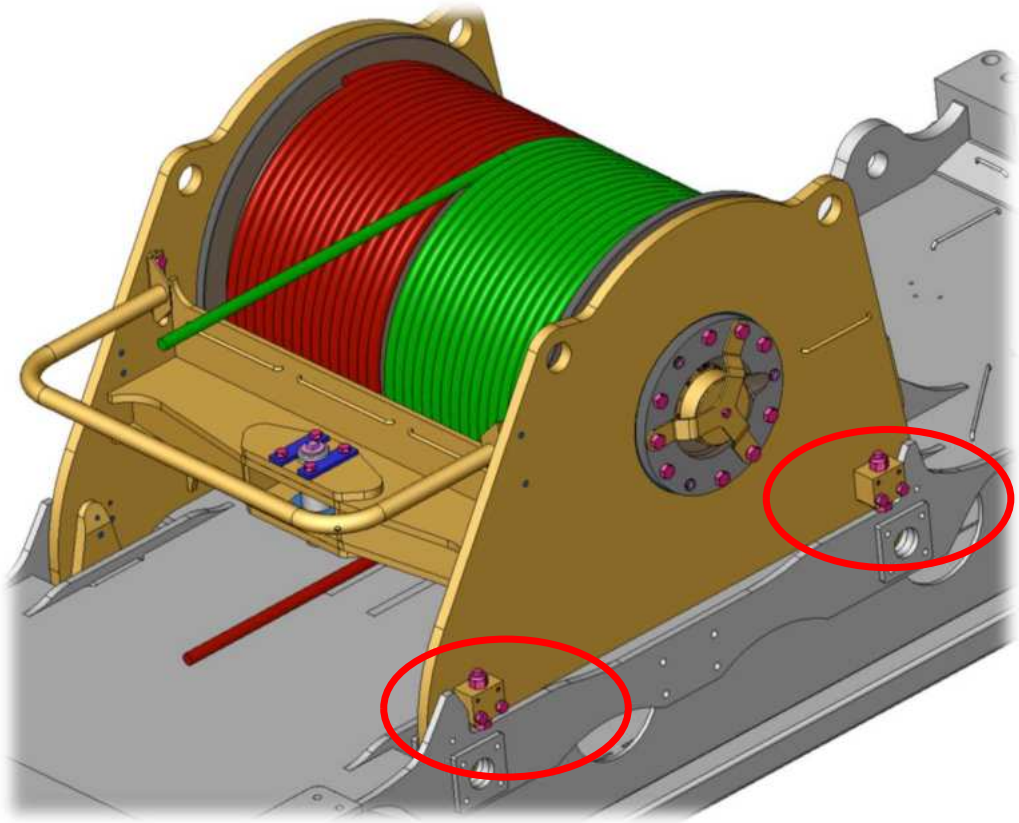


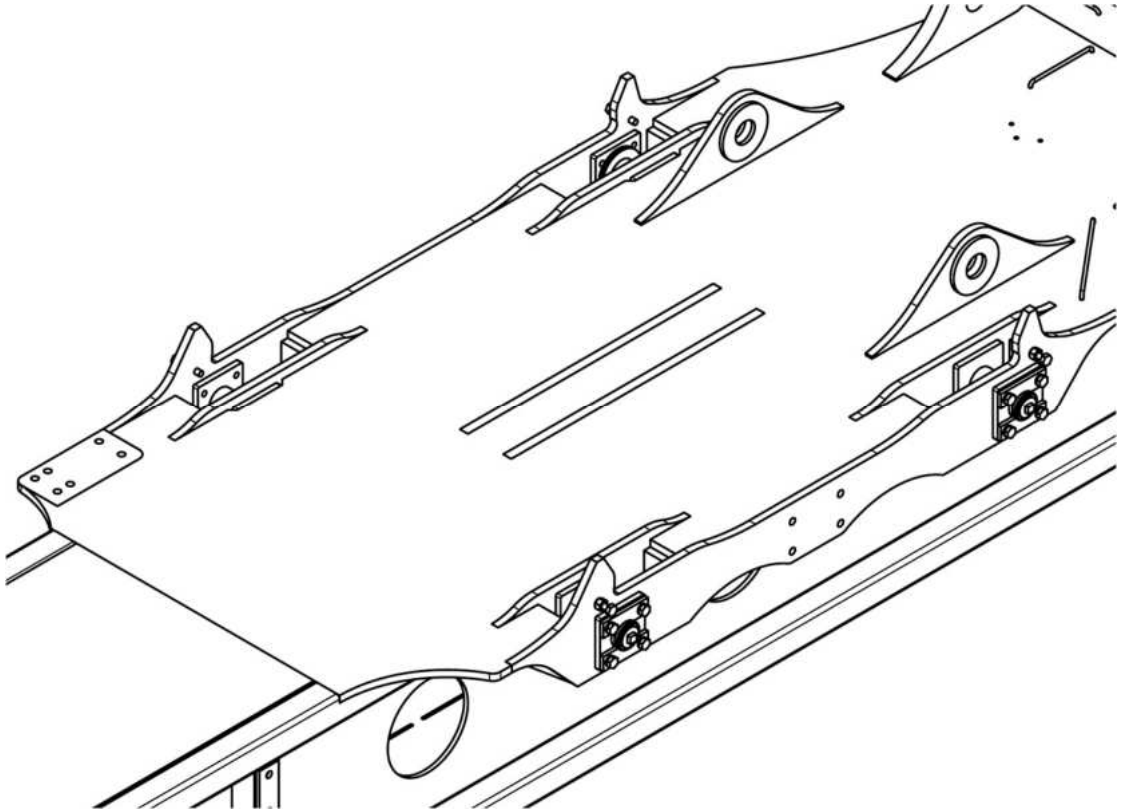
Easy disassembling of base sledge (horizontal mast)



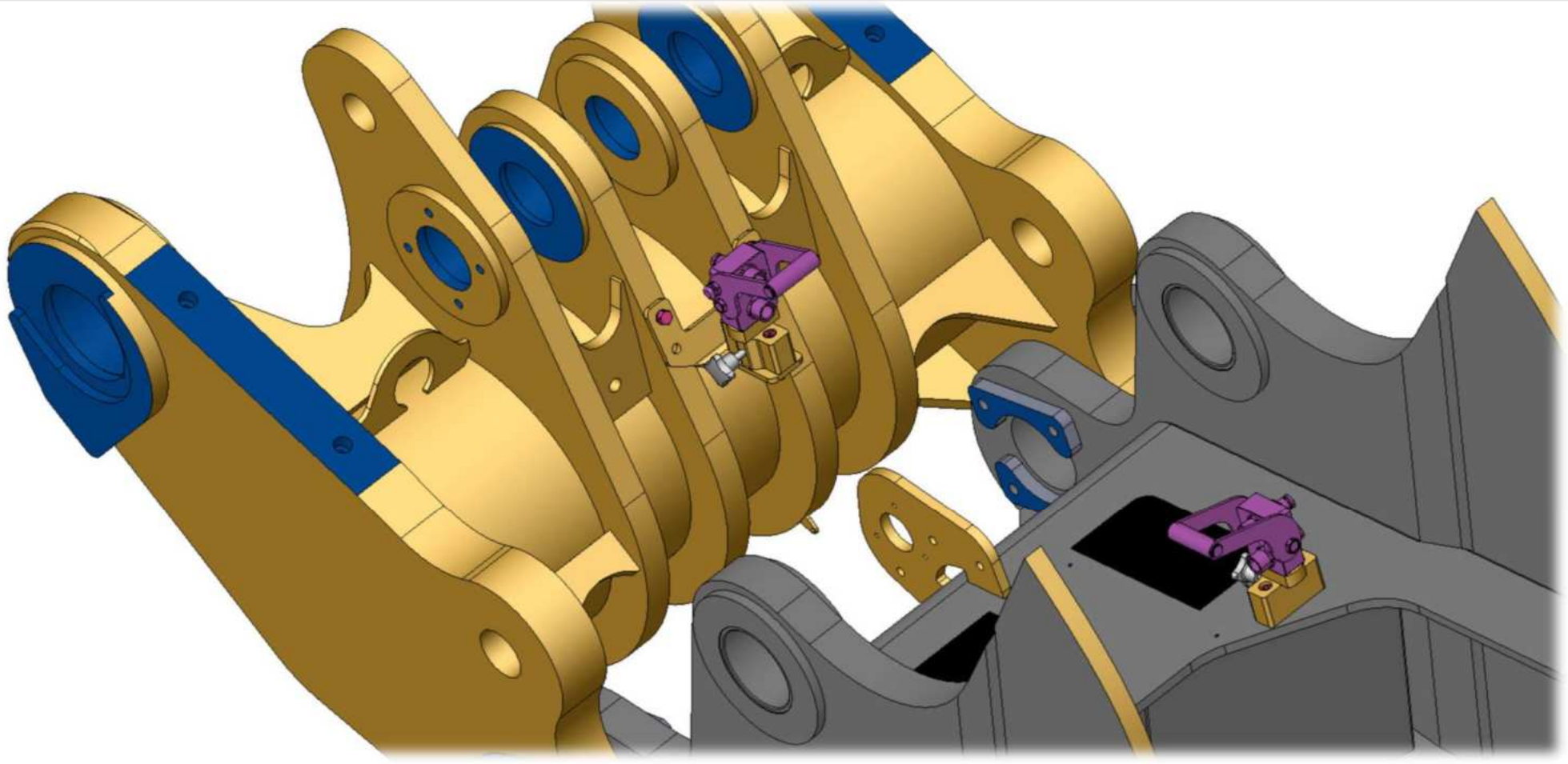
Easy diassembling and assembling in horizontal position

Easy disassembling of crowd winch (centralizers)





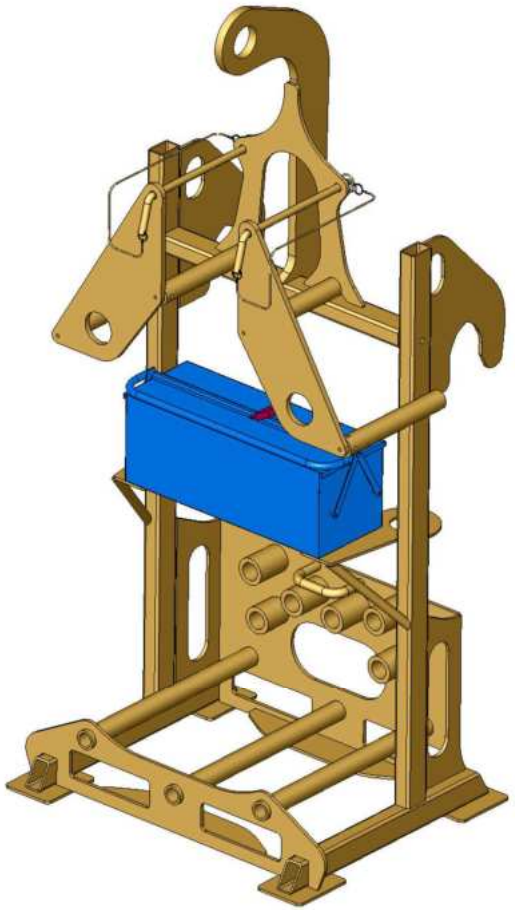
Hydraulic couplers at boom



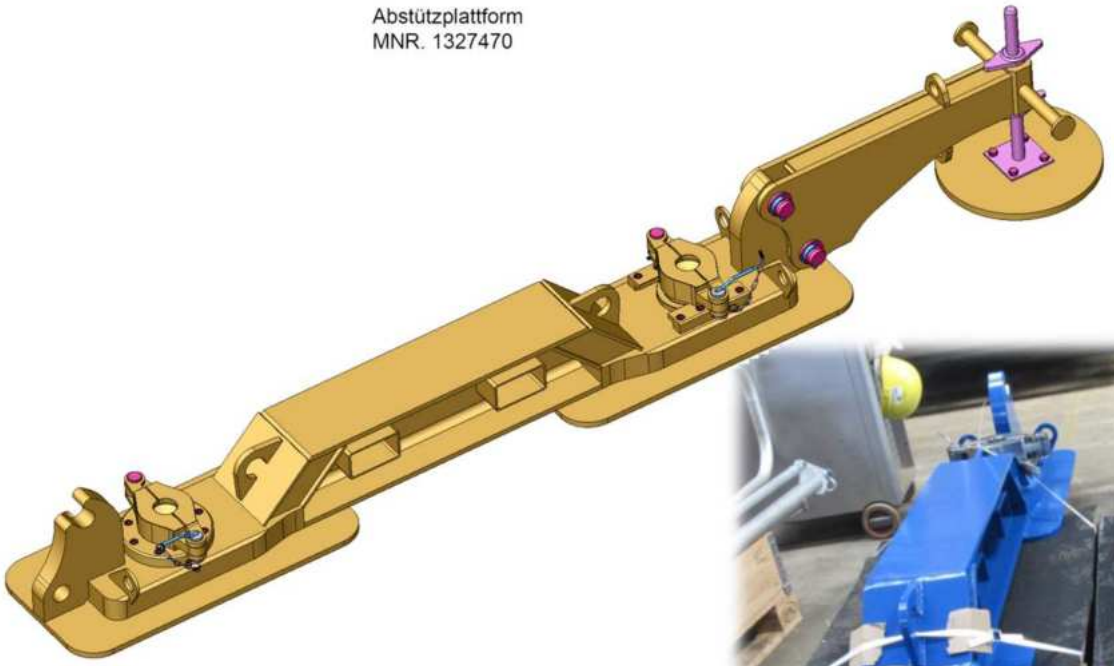
Hydraulic couplers at boom

Transport unit for upper crowd rope

Transportvorrichtung Vorschub kpl
MNR. 1293659



Jack up extension for stability during jacking



Jack up extension for stability during jacking

Jack up extension for stability during jacking

Jack up extension attached at one side

3 B-Tronic 5


Das sind 65 Zeichen. Das sind 65 Zeichen. Das sind 65 Zeichen. 65
08.Jan
10:05
X −2,50°
Y +0,35°
1,60 m
3,80
2,25
m/min
0,00
0,00
m/min
-51,20 m
-53,60 m
100
2,40 m
128,0
kNm
12,4
U/min
16,40 t
0,34 m
5,80 m
3/5

Flexible - like the daily business on your jobsite

5 layer for maximum flexibility:

- Focus Area:
  The drilling process in the focus.
- Controls:
  You can place the gauges, where You think there is the best place for it.
- Menu:
  The new menu bar always in front always the same.
- Notifications:
  One status bar for all important notifications.
- Quick-Functions:
  You want to create your individual direct access points? Pull the Quick-Functions up and use the additional buttons.

PASSION for PROGRESS