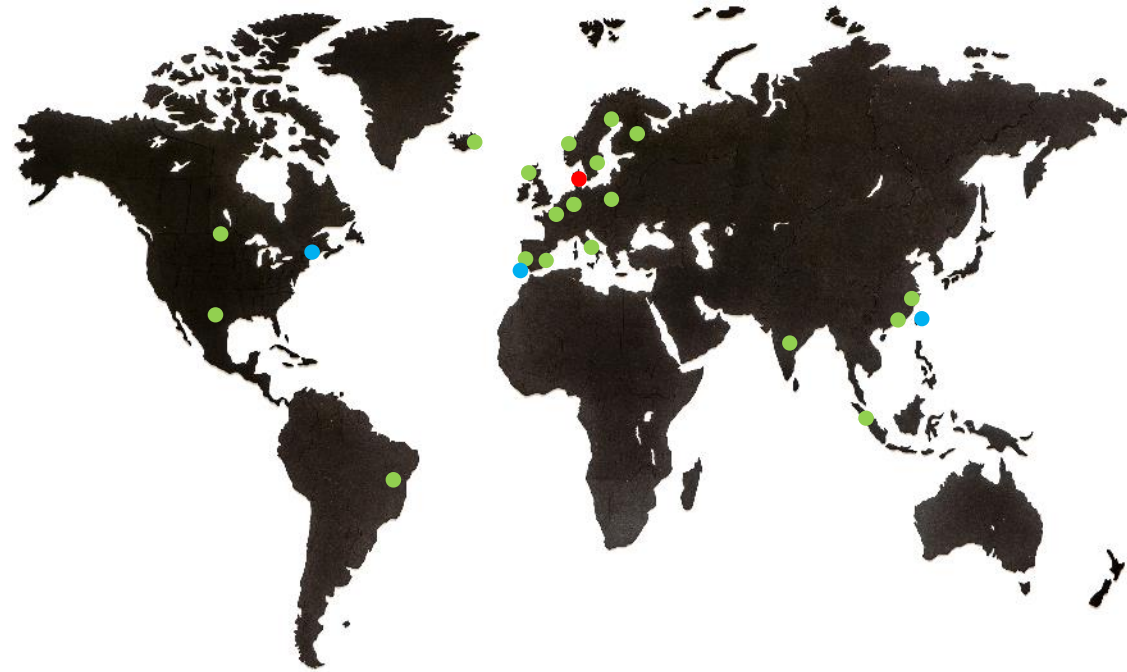


# SPECIALIZED EQUIPMENT FOR FLANGE MILLING

Foundation Ex 2022 – CNC Onsite A/S

# Who we are

- Established 2012
- Focused on the Wind Turbine Industry
- Service customers globally with In-situ work
- Specialists in onsite (in situ) high precision machining



- Headquarter - Denmark
- Subsidiary under establishment/investigation (USA / Taiwan / Portugal)
- Workplaces

## What we do

Onsite high precision machining

- Up tower repair
  - Yaw ring
  - Broken bolts/threads
  - Rotor lock
  - Generator shafts
  - Torque arms
  - Housings
- Blade root end repair (inserts)
- Flange milling

## What we offer

- Highly specialist technicians (GWO)
- Short response time
- Full flexibility
  - All inclusive
  - Buy/lease equipment (incl. training of operators)



# Flange milling examples

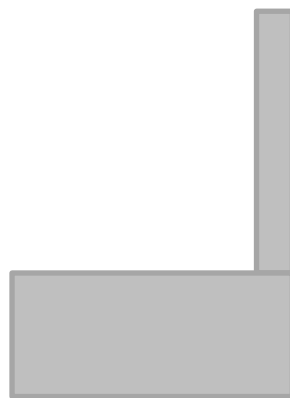
- Monopiles (MP)
- Transition Pieces (TP)
- Towers
- Tower stands
- Sea fastening
- Transport frames



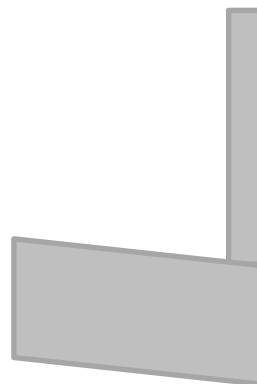
# Current machine types

Type	Cæsar	Asterix	Obelix	Goliat
Flange size	Ø1.800 – Ø4.000	Ø2.000 – Ø6.500	Ø2.400 – Ø10.000	Ø6.000 – Ø10.000
Position	Horizontal / vertical	Horizontal / vertical	Horizontal	Horizontal / vertical

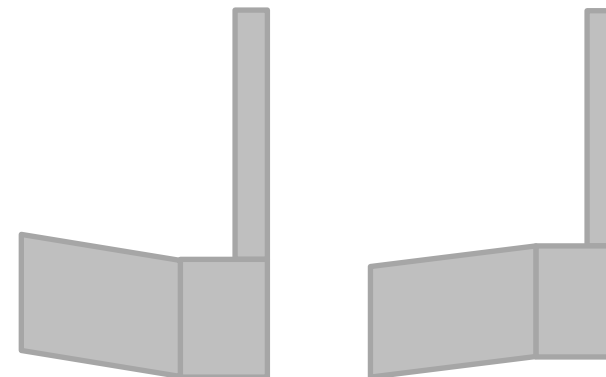
## Machining possibilities:



Flat



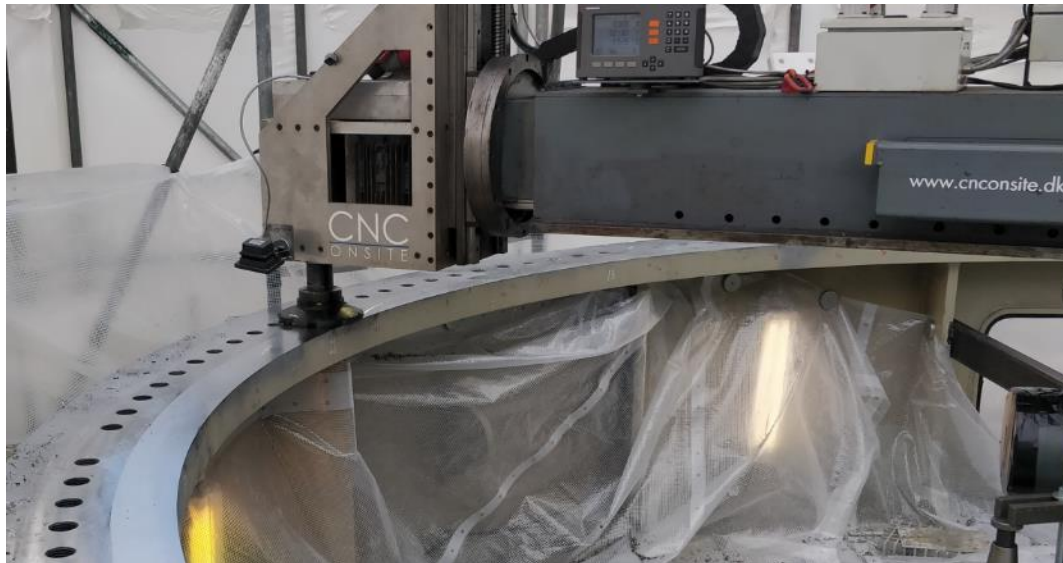
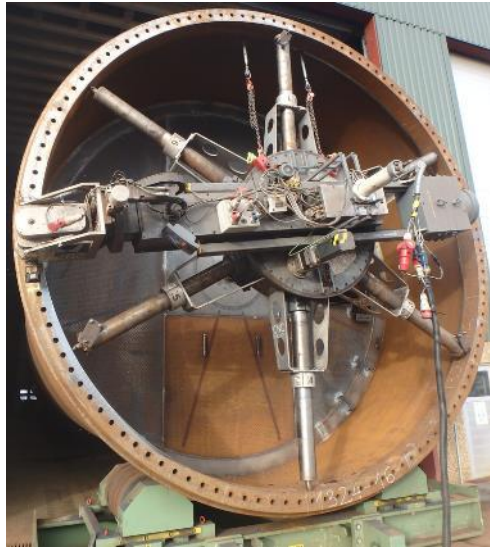
Tilted



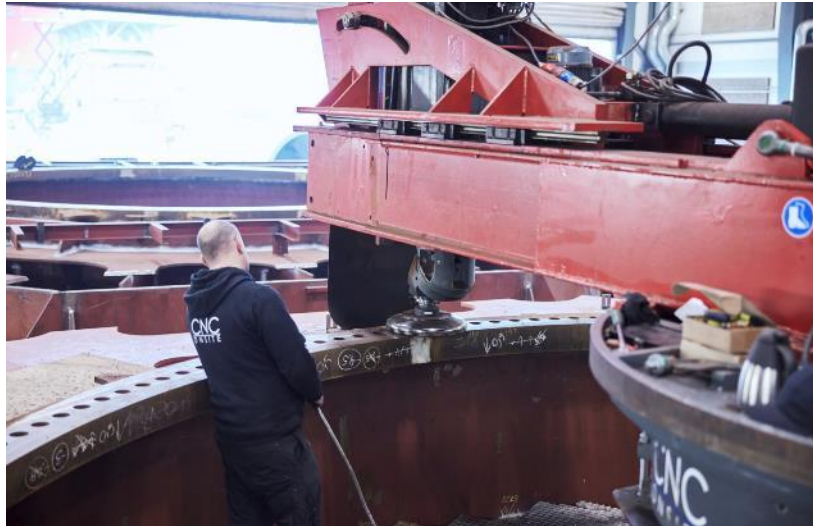
Double Tilted



# Asterix $\varnothing 2.000 - \varnothing 6.500$



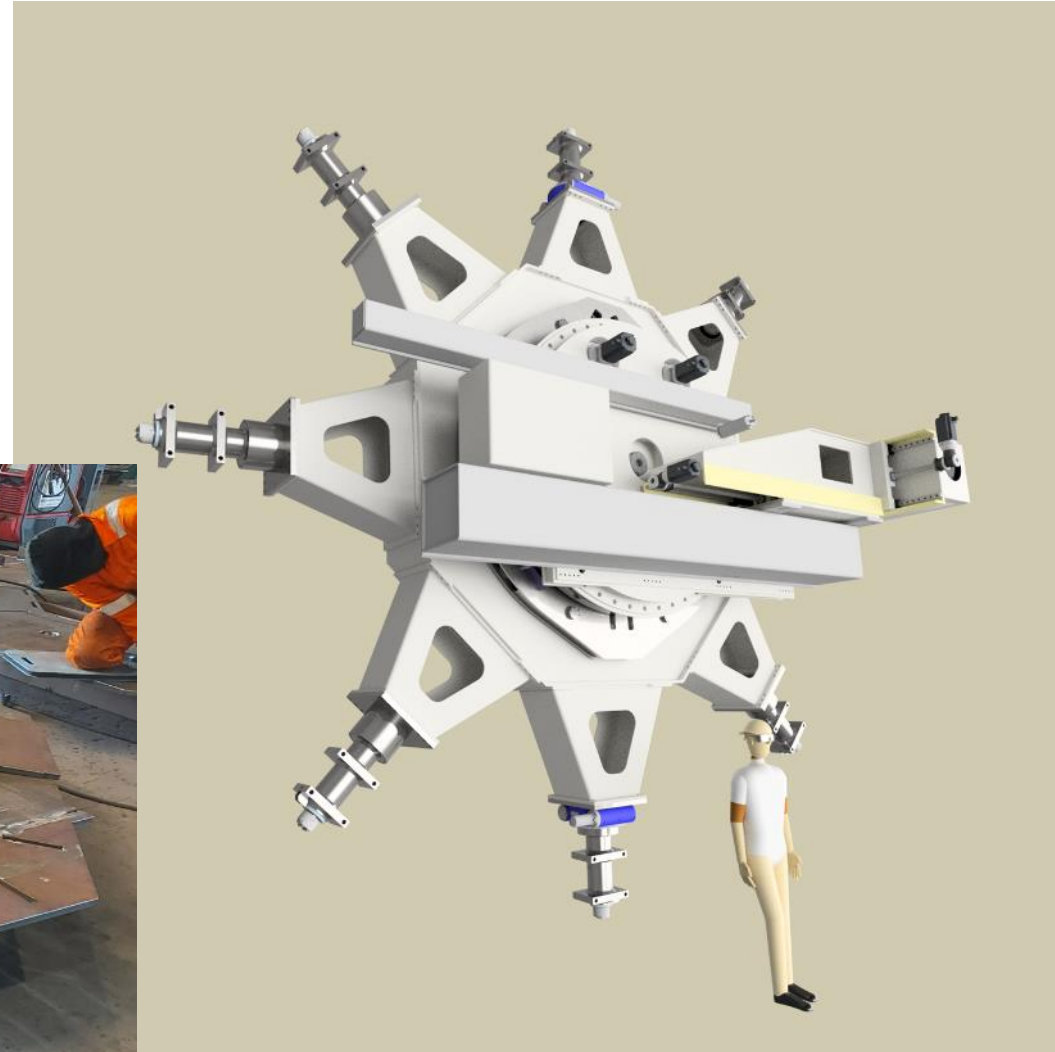
# Obelix $\varnothing 2.400 - \varnothing 10.000$





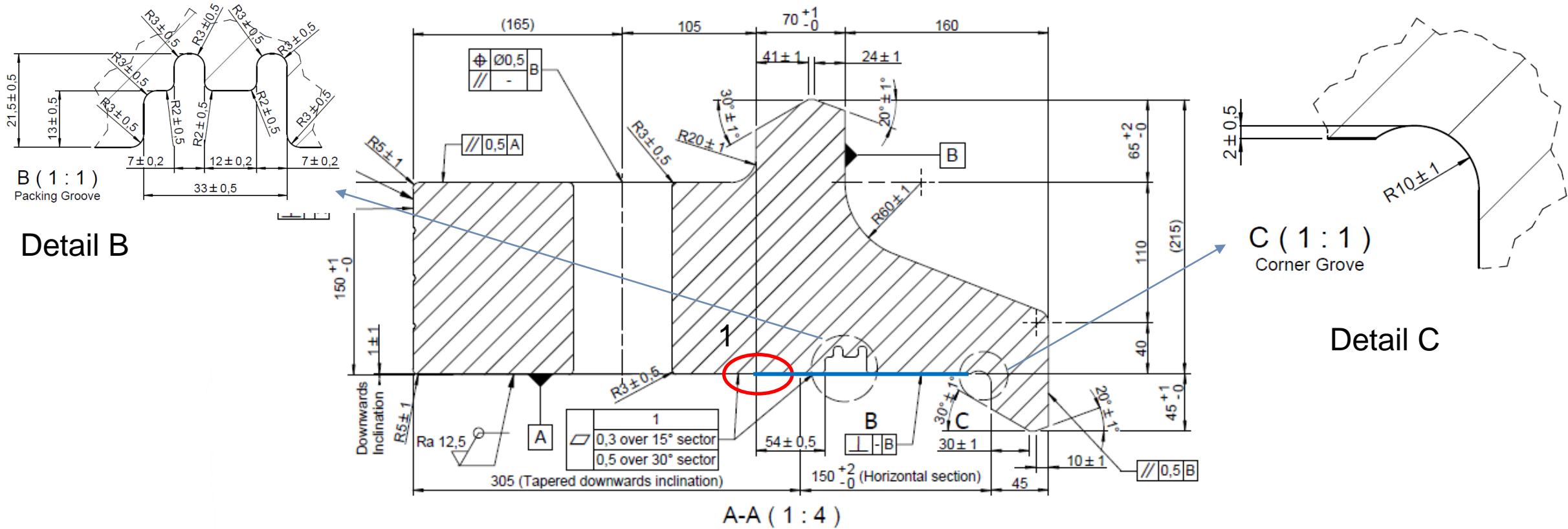
# Goliat $\varnothing 6.000 - \varnothing 10.000$

Goliat model is under construction and will be available autumn 2022.





# Challenges



1 – Transition between tapered and horizontal section.

Time consuming to re-establish detail B and C

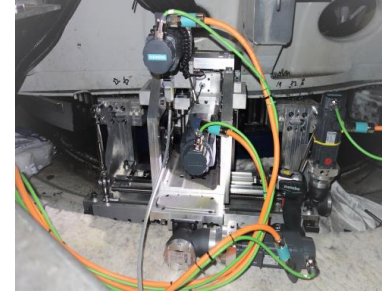


# Up tower repair - overview

- Yaw ring repair
- Rotor lock repair
- Broken bolts
- Damaged threads
- Damaged shafts / bearing fits
- Damaged housings



Yaw ring repair



Rotor lock repair



Broken bolts / damaged threads

# Yaw ring repair

## Challenges

- Teeth get worn or brake
- Yaw ring exchange is expensive and time consuming

## Solution

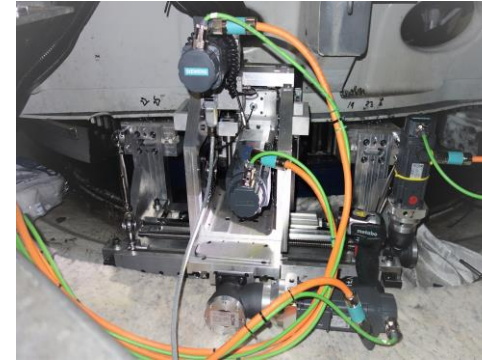
Full CNC controlled machine. Can remove worn/damaged sections and a new segment can be bolted in place

Benefits:

- No disassembly of turbine
- No use of cranes
- Reduced downtime
- No bottlenecks
  - Crane availability
  - Spare part availability
- Not depending on weather windows
- Less coordination required



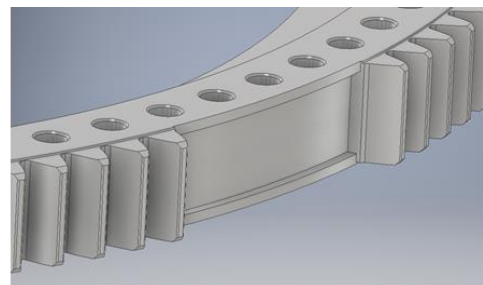
Damaged area



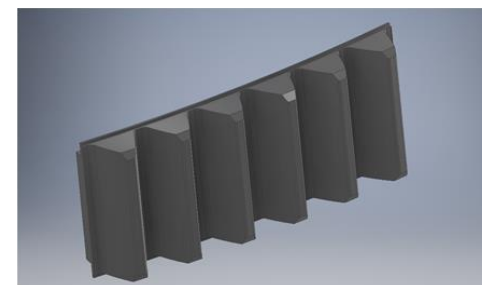
Machine mounted



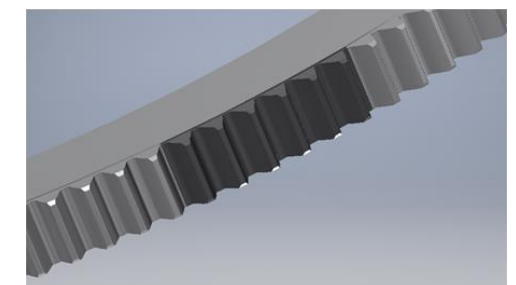
New segments



Step 1  
Milling the damaged area



Step 2  
Freeze the segment and  
mount it with special tool



Step 3  
Fix the segment with bolts

# Rotor lock repair

## Challenges

Rotor lock hole can get worn or damaged.

- Rotor lock system not functioning correctly

## Solution

Mobile machine for up-tower repair.

Benefits:

- Can be repaired up-tower
- Ensure functionality of the system
- Stop further damage development



Damaged area



Machine mounted



Repaired rotor lock

# Broken bolts and damaged threads

## Challenges

Bolts can break and/or threads can be damaged which can be critical to the integrity of the structure

- Bolts placed in areas hard to access
- Standard equipment not suitable for up-tower use
- Not possible/very difficult to get the parts to a workshop



## Solution

Mobile machine for up-tower repair.

Benefits:

- Can be repaired up-tower
- Ensure integrity of the connection
- Stop further damage development

Depending on bolt size and accessibility CNC Onsite has several different machines that can be used.



# Blade root end repair

## Challenges

Blade Root Ends can be damaged due to breakdowns or wear and tear after years in operation.

- Loose inserts
- Bolts jammed or broken
- Flange end damages

## Solution

Full CNC controlled machine. Can remove old inserts and/or do flange facing with very high precision.

Benefits:

- Reuse of blades instead of scrapping
- Onsite repair solution
  - no transport
  - no disturbance of ongoing production
  - reduced down time of turbine
- Fast and proven process



Contact us for more information



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