

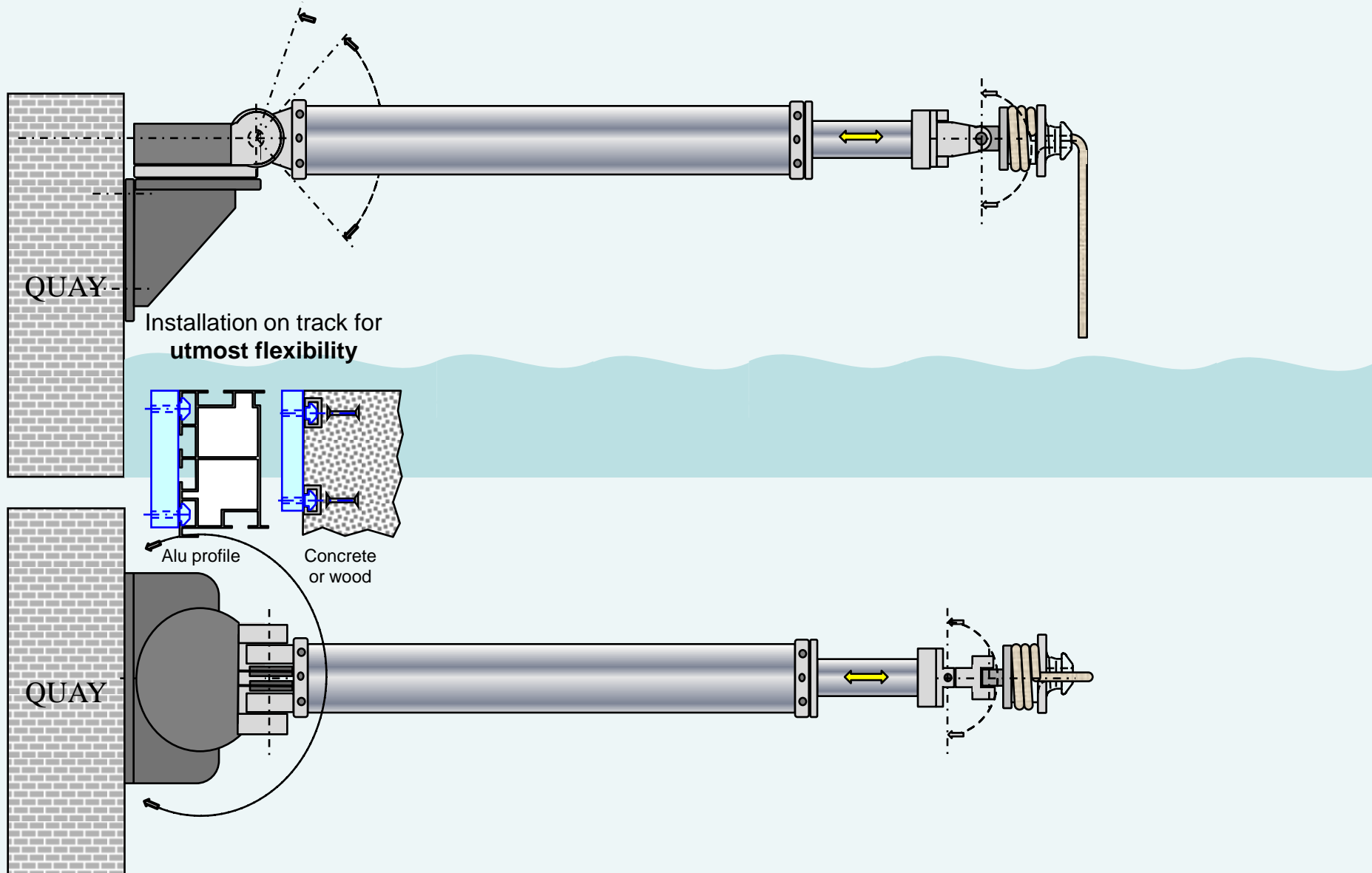
# DualDocker reduces forces on the cleats !

Why?

The yacht lies stable at her berth  
Kinetic energy is eliminated from the start  
Therefore no braking forces

Additional Information (formulae, results):

	Yacht weight: <b>10 t</b>			Yacht weight: <b>50 t</b>		
	v [m/s]	Braking distance [m]	Braking force [kg]	v [m/s]	Braking distance [m]	Braking force [kg]
<p>Kinetic energy:  <b><math>E_{kin} = m v^2 / 2</math></b></p> <p>Braking force :  <b><math>F = 2(E_{kin}/distance)</math></b></p> <p><small>E<sub>kin</sub>...kinetic energy [Joule]  m ... mass [N]; 1 kg = 9,81 N  V ... velocity [m/s]  F ... brake force [N]; 1 kg=9,81 N  distance ... braking distance [m]</small></p>	0,1 m/s	0,5 m	200 kg	0,1 m/s	0,5 m	1 000 kg
		0,3 m	333 kg		0,3 m	1 667 kg
		0,1 m	1 000 kg		0,1 m	5 000 kg
	0,3 m/s	0,5 m	1 800 kg	0,3 m/s	0,5 m	9 000 kg
		0,3 m	3 000 kg		0,3 m	15 000 kg
		0,1 m	9 000 kg		0,1 m	45 000 kg
	0,5 m/s	0,5 m	5 000 kg	0,5 m/s	0,5 m	25 000 kg
		0,3 m	8 333 kg		0,3 m	41700 kg
		0,1 m	25 000 kg		0,1 m	125 000 kg



**DualDocker Technology:**

- Docking system with high damping capacity, without play, regardless of water level
- High damping capacity
- Full instant damping capacity without time delay
- Fully mechanical, no energy source needed (no hydraulics, no oil, no gas, no pneumatics !)

**Convenience & safety:**

DualDocker offers high level of convenience and safety

- Minimum level of motion
- Utmost safety during a storm

**Construction guidelines:**

- Operational reliability: the construction is simple, safe and sound.
- Maintenance free & durable (choice of material , dimensioning in elastic range,surface)

Choice of material: Durability and resistance regarding salt water and UV impact

Dimensioning: Max. tolerated force impact + min. 100 % 'reserve' must lie within the **elastic** range

That means handling of max. tolerated force/stress is guaranteed over a long period of time without problems

Surface: We have had excellent experience with saltwater resistant (hard) anodised aluminium alloy

The surface is hard-wearing, saltwater and UV resistant and looks good

## Material overview:

Type of material	Specification	DualDocker warranty	Expected lifetime	Wear & tear	Material fatigue
Aluminium alloy	6060 / T66 & 6082 / T6	2 years	10 years + (*)	low risk	very low risk
Damping elements	Polyurethane	2 years	15 years + (*)	very low risk	low risk
Slide guides	synthetic material	2 years	10 years + (**)	low risk	very low risk
Bolts etc	stainless steel 1.4571	2 years	15 years + (*)	very low risk	very low risk

Remarks (\*): Depending on local conditions. Requirement: No surface damages; regular maintenance

Remarks (\*\*): Slide guides are subject to 'wear and tear': Life time depends on local conditions and level of stain.

## Additional INFO:

**Aluminium anodised** is state-of-the-art and is being used successfully in many technical fields

**Polyurethane** is being used (and has been over many decades) successfully in the marina industry

**Slide guides** are ordered from certified suppliers ( they have been proven successful under harsh conditions in trucks, ships etc)

**Bolts and other connecting parts** are secured (Loctite or snap ring)

**Joints** are -for safety reasons-not welded, but bolted or glued and riveted

## Risk parts:

- Construction and dimensioning will not allow any risk parts
- DualDocker systems are maintenance free (see also instructions for visual checks)
- Material and all parts are purchased from certified suppliers (QM ISO 9001). Documented inspection and test records
- All DualDocker arms undergo a documented final inspection

## Environmental impact:

DualDocker systems are environmentally friendly. They operate quietly, self-sufficiently and without the use of oils or other lubricants

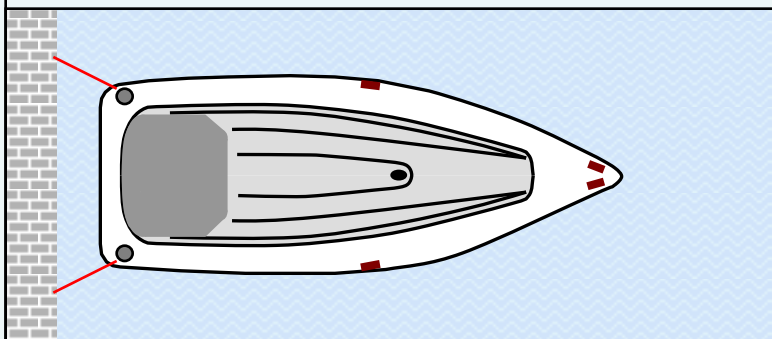
## Additional valid documents:

Technical and commercial offer, Installation Instructions, Operating Manual, Maintenance Instructions, Securing Instructions, CE Declaration of Conformity, General Terms and Conditions

## **STANDARD METHOD**

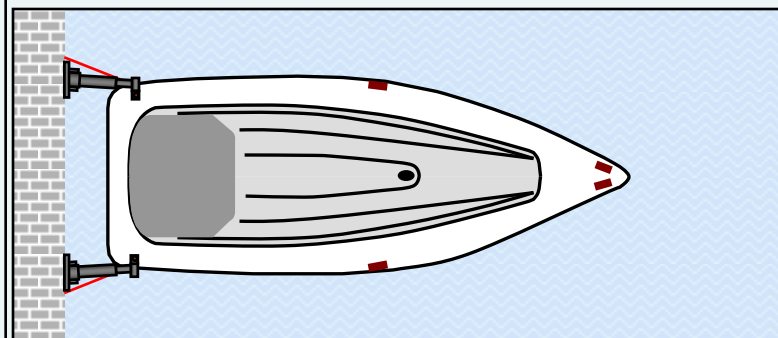
**(interface = ball or ball cleat adapter)**

- 1.) Put customised stern line over DualDocker ball



- 2.) Position yacht under the DualDocker with the aid of pulley or engine

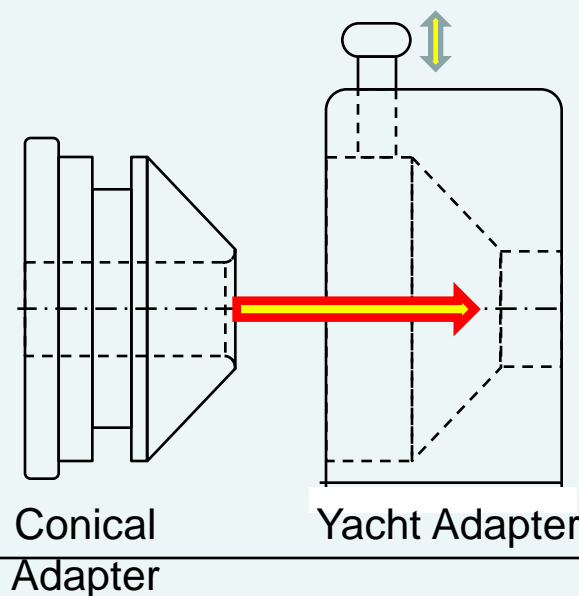
- 3.) Connect DualDocker with yacht



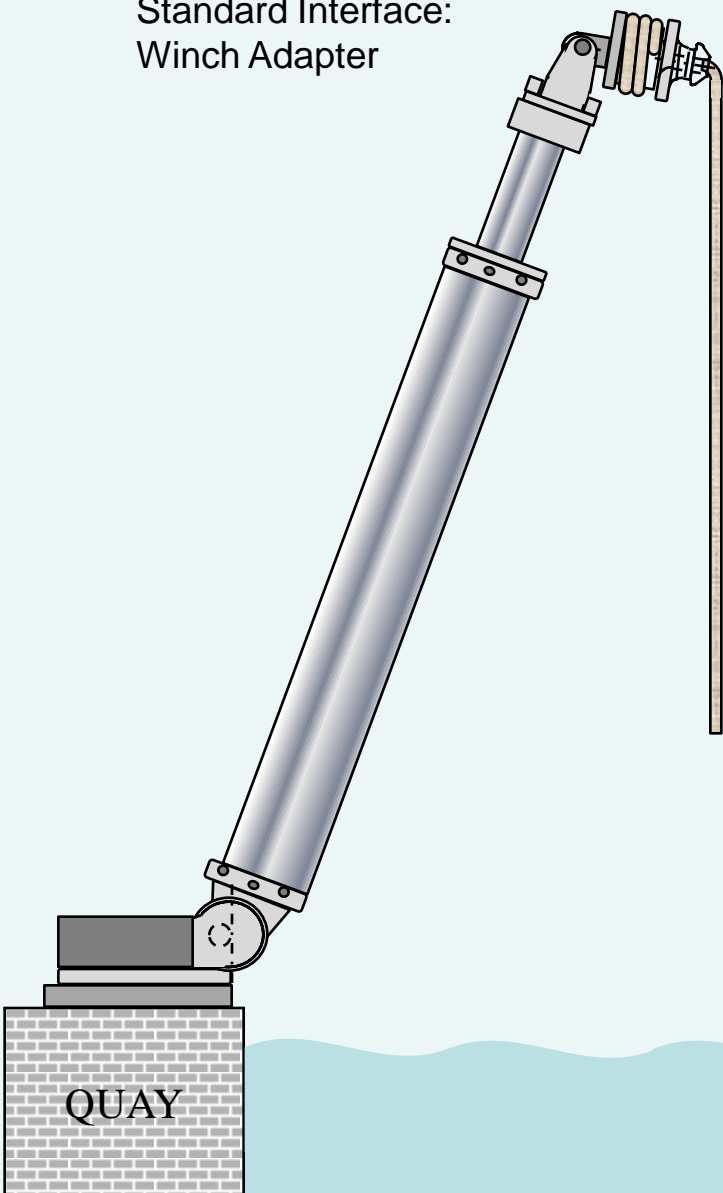
## **WINCH METHOD**

**(interface = conical adapter)**

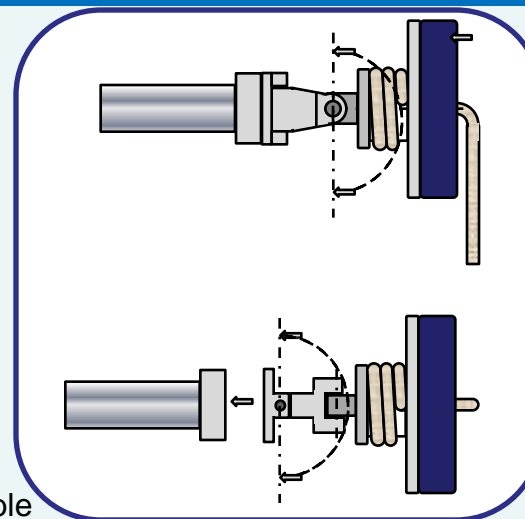
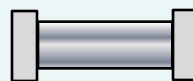
- 1.) Feed guide rope through yacht adapter
- 2.) Put guide rope on winch
- 3.) Pull yacht in position with winch and connect with conical yacht adapter
- 4.) Secure manually or electrical



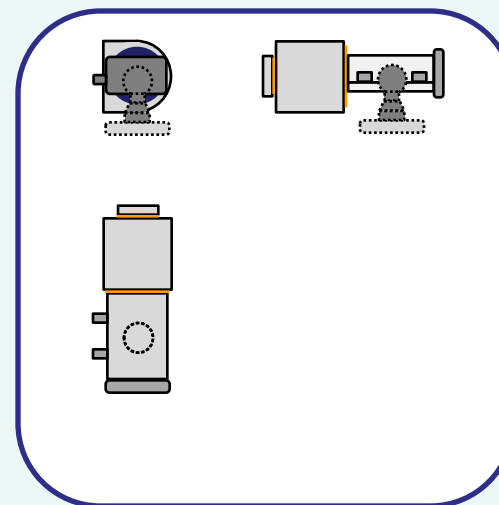
Standard Interface:  
Winch Adapter



Extensions possible

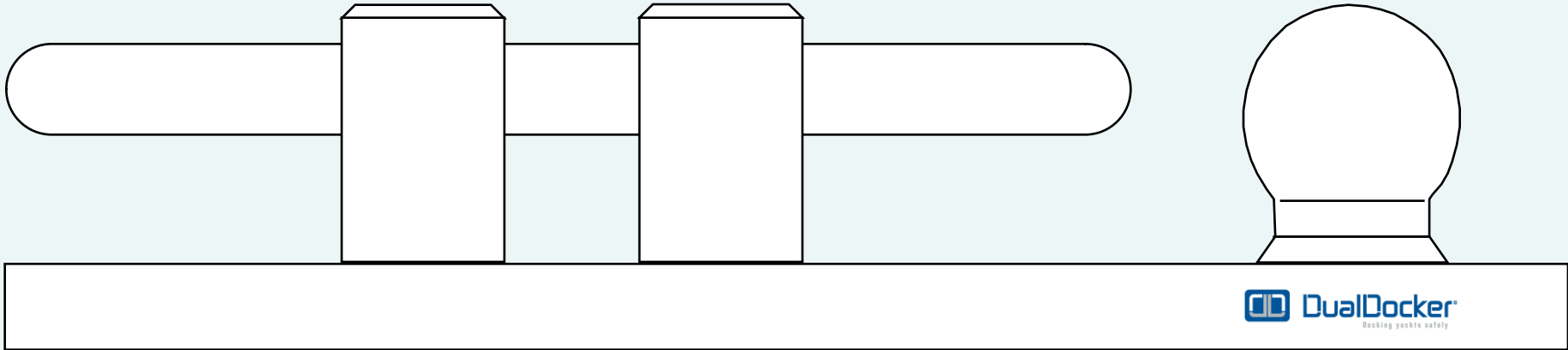


Alternative  
Interface:  
Universal Soft  
Adapter

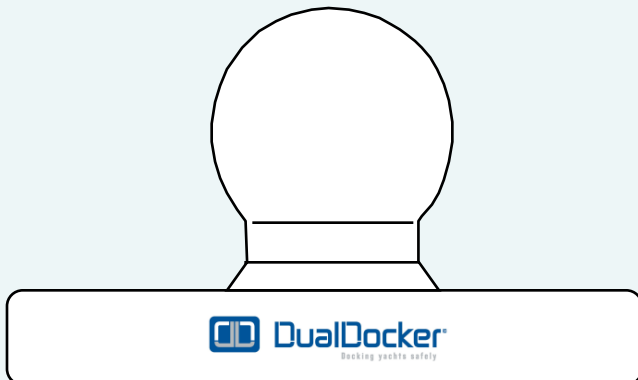


Alternative  
Interface:  
Ball Adapter

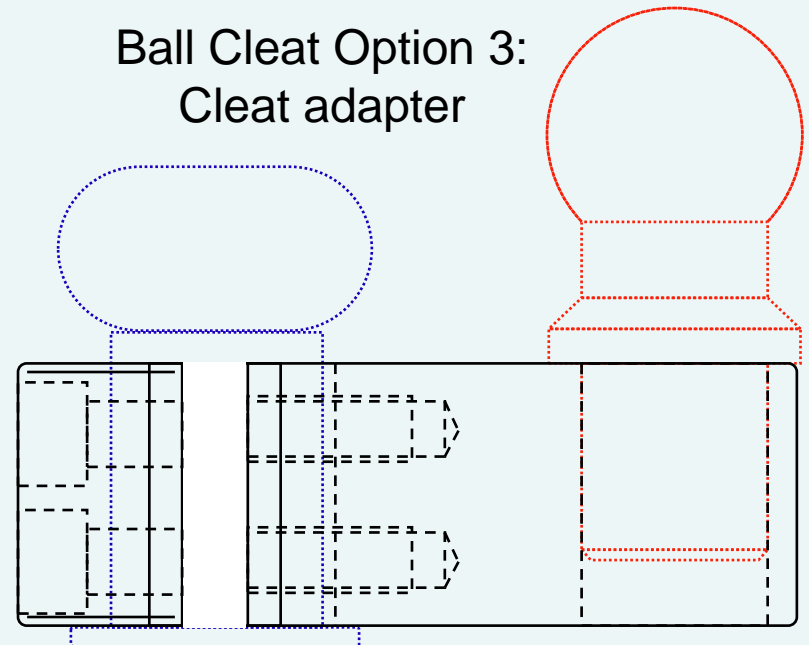
## Ball Cleat Option 1: Exchange of stern cleat for ,combi cleat‘



## Ball Cleat Option 2: Installation of DualDocker ball



## Ball Cleat Option 3: Cleat adapter







### Option A

Exchange old stern cleat for  
**DualDock combi-cleat.**

Available for cleats fixed from above or below.

**NEW 100% flexibility:**

The **modular design** covers a wide range of different sizes and hole distances.

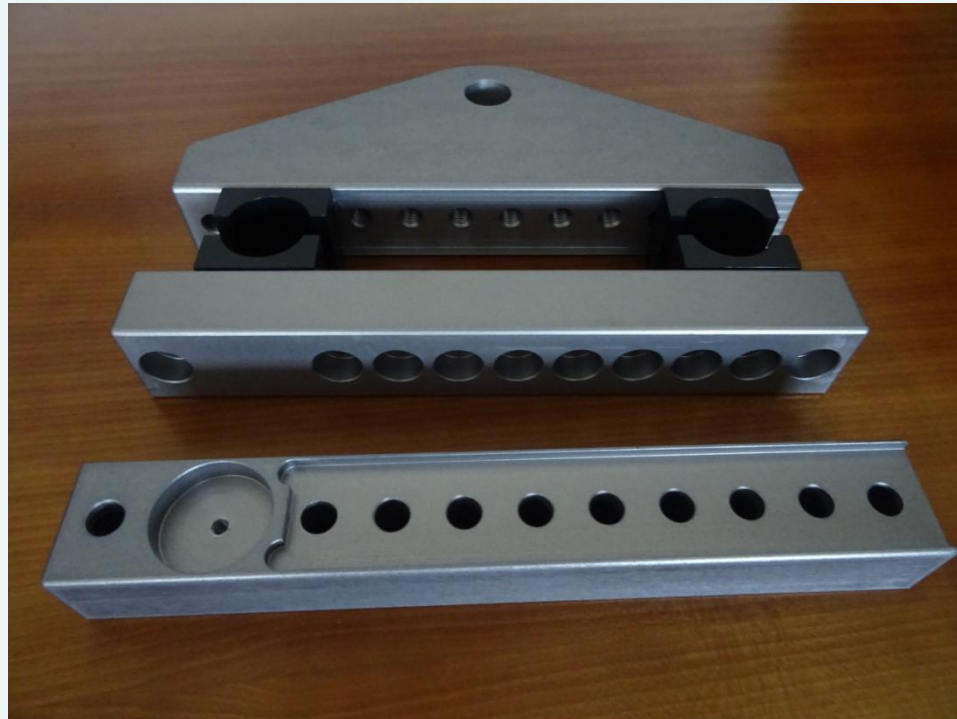




### **Option B**

Install the DualDock ball  
at any desired position





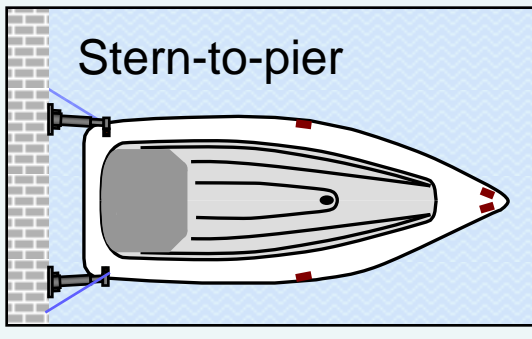
### Option C

Install your tailor-made **DualDock cleat adapter**.

Available for all types of cleats.

**NEW** 100% flexibility:

The **modular design** covers a wide range of different cleat sizes and shapes.

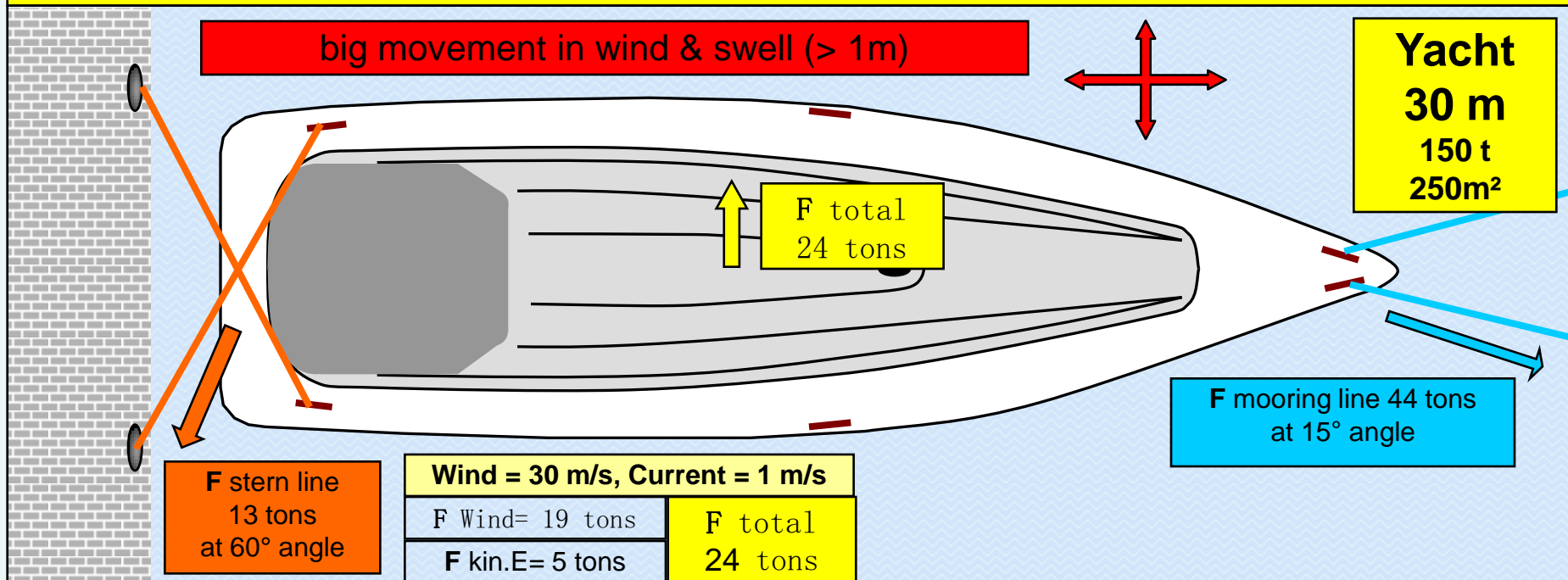
 <p>Stern-to-pier</p>		1 T	2 T	5 T	10 T	15 T	20 T	> 20T
	Yacht length	< 30'	< 45'	< 60'	< 70'	< 80'	< 90'	Upon request
	Yacht weight	< 5 t	< 10 t	< 30 t	< 100 t	300 t	1000 t	
	m <sup>2</sup> exposed to wind	10	20	50	100	150	200	

 <p>Parallel-to-pier</p>		1 T	2 T	5 T	10 T	15 T	20 T	> 20T
	Yacht length	< 50'	< 65'	< 80'	< 90'	< 100'	< 110'	Upon request
	Yacht weight	< 10 t	< 20 t	< 60 t	< 200 t	600 t	2000 t	
	m <sup>2</sup> exposed to wind	20	40	100	200	300	400	



	1 T	2 T	5 T	10 T	15 T	20 T	> 20 T
Min. arm length	0,6 m	1,2 m	1,2 m	1,4 m	1,6 m	1,6 m	Upon request
Max. arm length	1,2 tm	3,2 m	4 m	4,5 m	5 m	5 m	

## Conventional med mooring: 2 stern lines & 2 bow lines



Swinging Speed = 0,1 m/s ; breaking distance = 0,3 m ; **F kin.E = 5 tons**

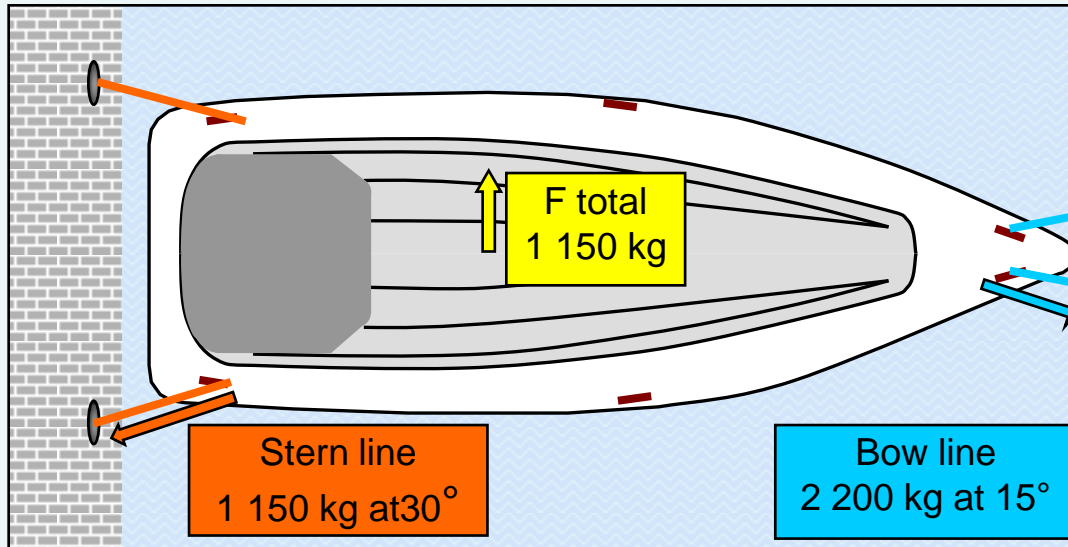
Swinging Speed = 0,2 m/s ; breaking distance = 0,5 m ; **F kin.E = 12 tons**

Swinging Speed = 0,3 m/s ; breaking distance = 0,7 m ; **F kin.E = 20 tons**

Swinging Speed = 0,5 m/s ; breaking distance = 1,0 m ; **F kin.E = 40 tons**

**Innovation !!**

## 2 DualDocker arms at the stern, NO BOW LINES

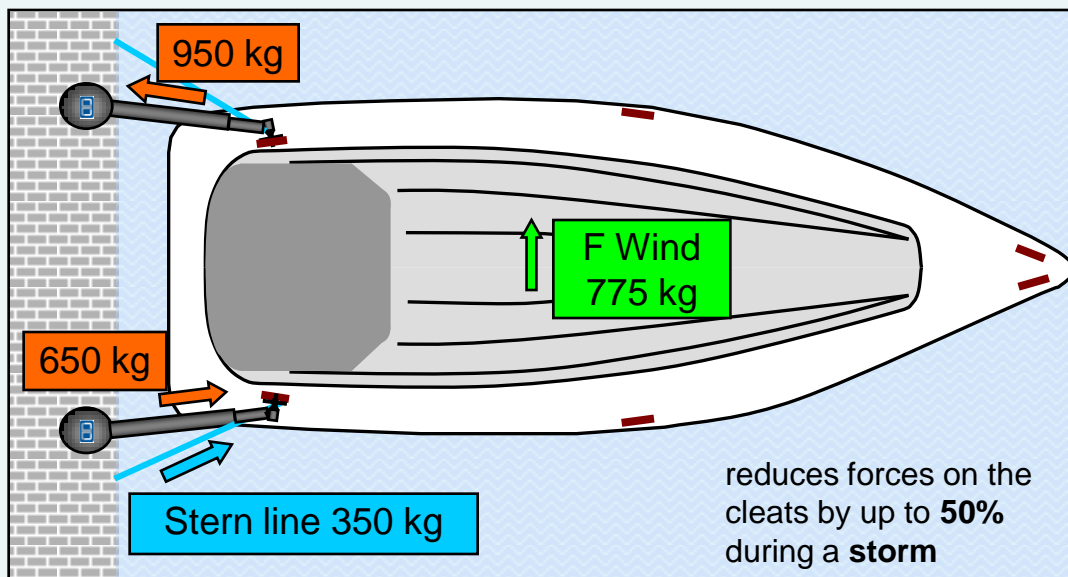


### Conventional Method:

- 2 stern lines and 1 or 2 bow lines
- Yacht jerks between ropes
- High forces on cleats due to 'bad angles' of ropes.

### Calculation Basis:

- 50 foot yacht
- 10 tons of weight
- 20 m<sup>2</sup> of area exposed to wind
- 50 knots (~force 9) wind speed



### DualDocker Method:

- 2 arms and 2 spring lines
- Yacht lies stable and without play at her berth
- Forces are spread on 4 different spots
- Forces on the cleats are reduced by up to 50% !



# Innovation !!

## 2 stern lines & 2 DualDocker telescopic piles (bow)

small movement in wind & swell (~0,5 m)

**Yacht**  
 30 m  
 150 t  
 250m<sup>2</sup>

**F total**  
 20 tons

**F stern line**  
 11 tons  
 at 60° angle

**Wind = 30 m/s, Current = 1 m/s**

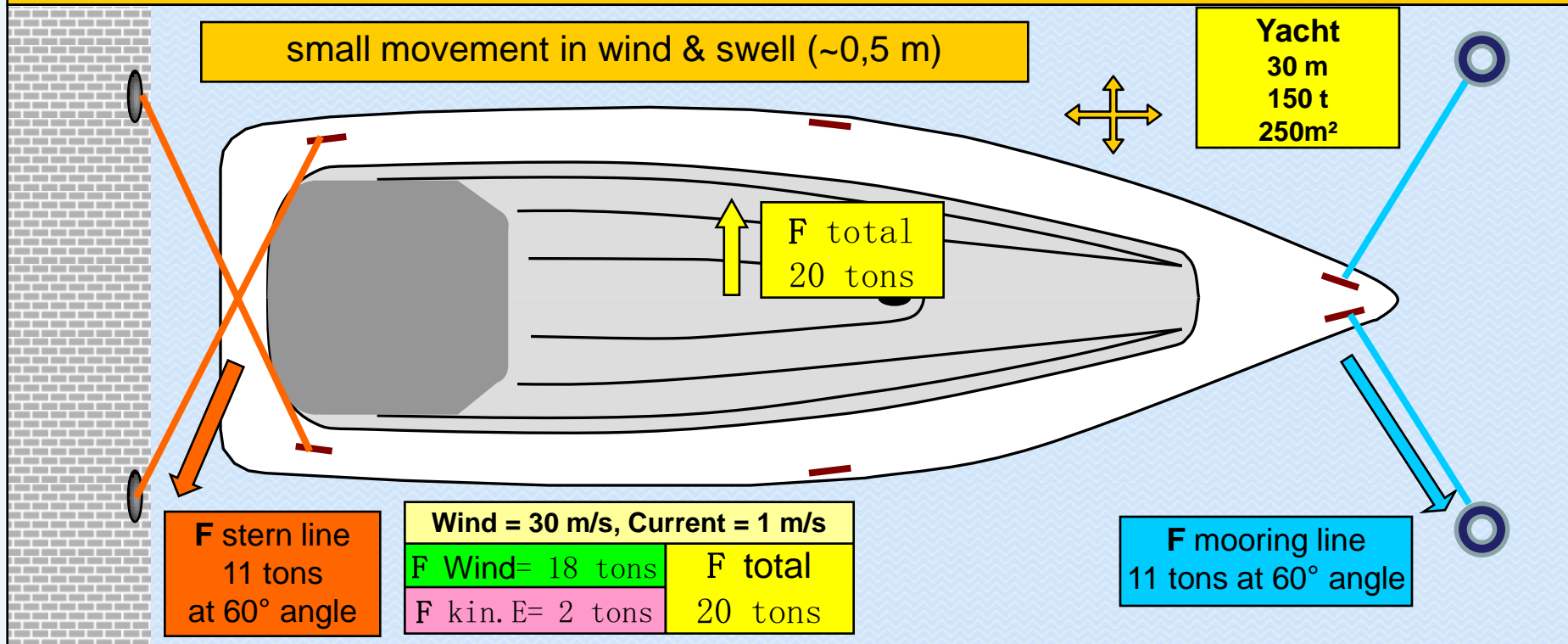
**F Wind= 18 tons**

**F kin. E= 2 tons**

**F total**

**20 tons**

**F mooring line**  
 11 tons at 60° angle



**Innovation !!**

2 DualDocker arms at the stern and 2 DualDocker telescopic piles (bow)

**very small movement in wind & swell (<0,2 m)**

**DualDocker**  
Docking securely

**Yacht**  
30 m  
150 t  
250 m<sup>2</sup>

**F total**  
18 tons

**F stern line**  
10 tons

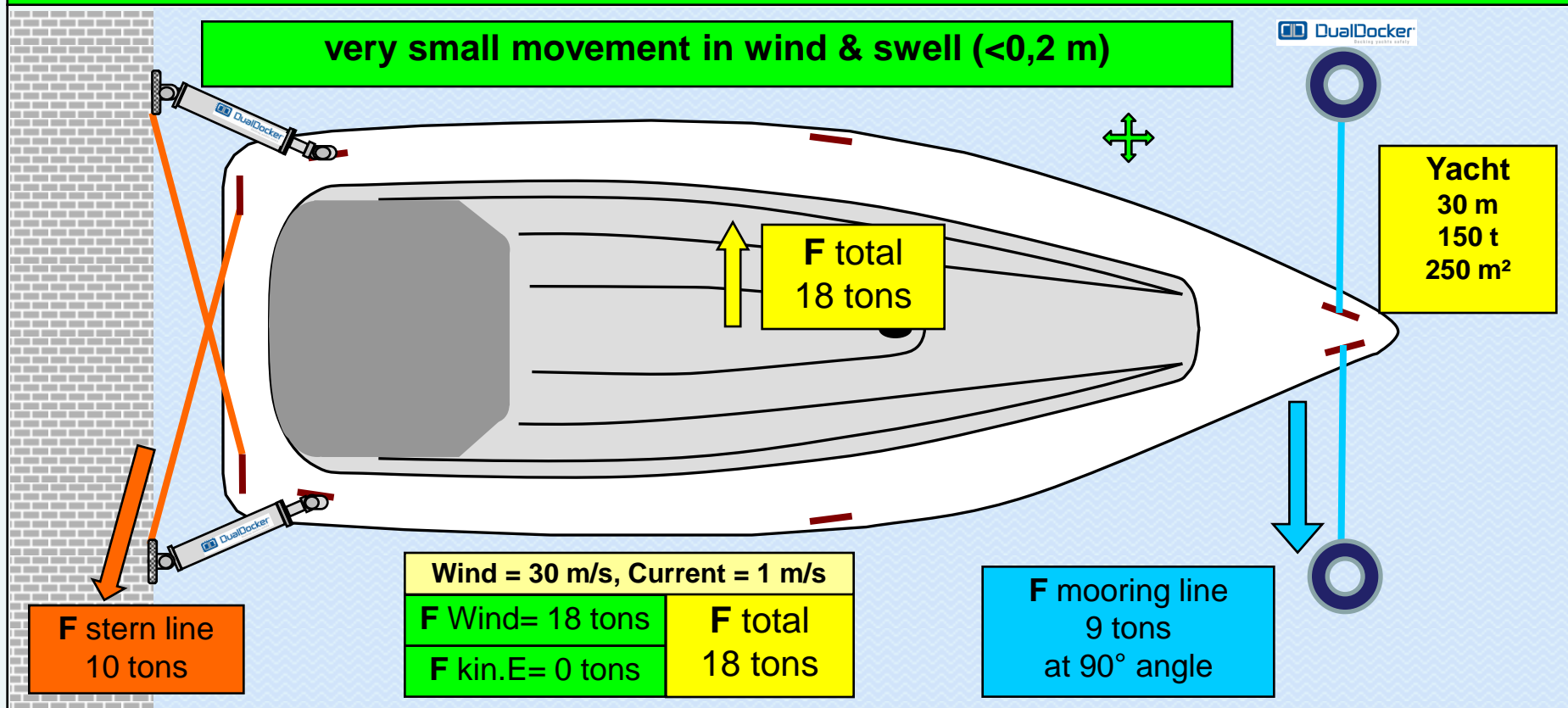
Wind = 30 m/s, Current = 1 m/s

**F Wind=** 18 tons

**F kin.E=** 0 tons

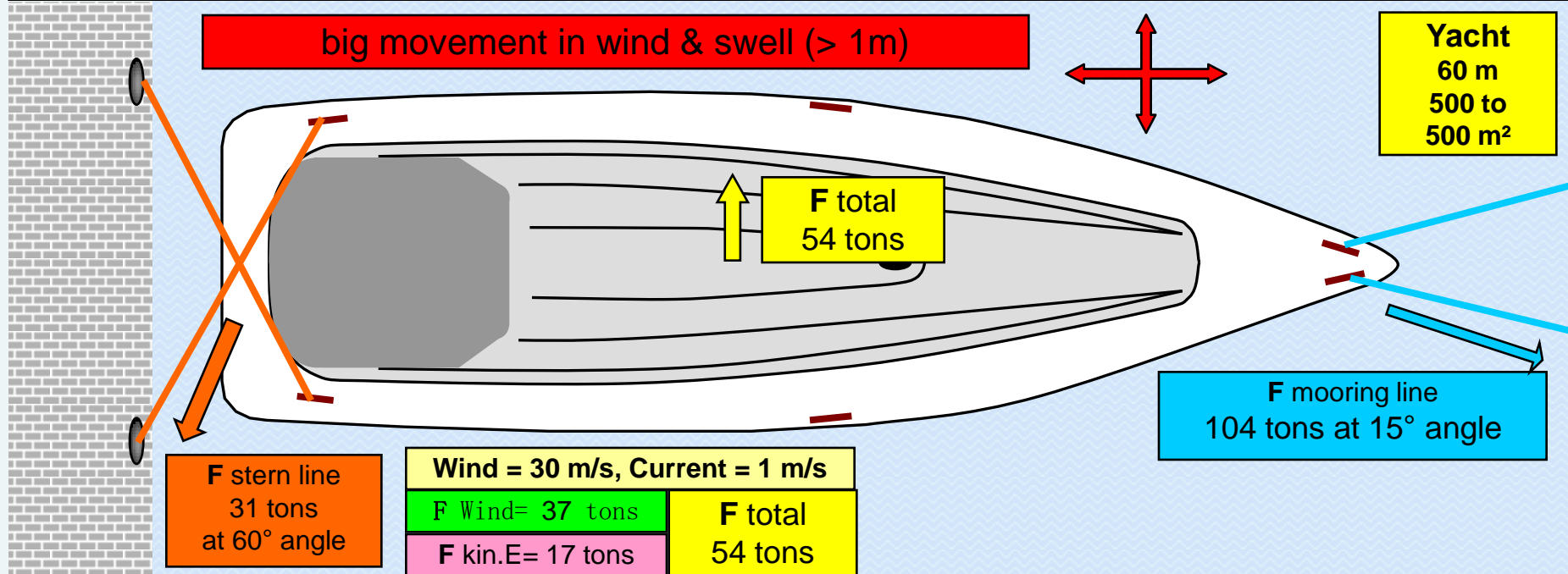
**F total**  
18 tons

**F mooring line**  
9 tons  
at 90° angle





## Conventional med mooring: 2 stern lines & 2 bow lines



Swinging Speed = 0,1 m/s ; breaking distance = 0,3 m ;  $F_{\text{kin.E}} = 17$  tons

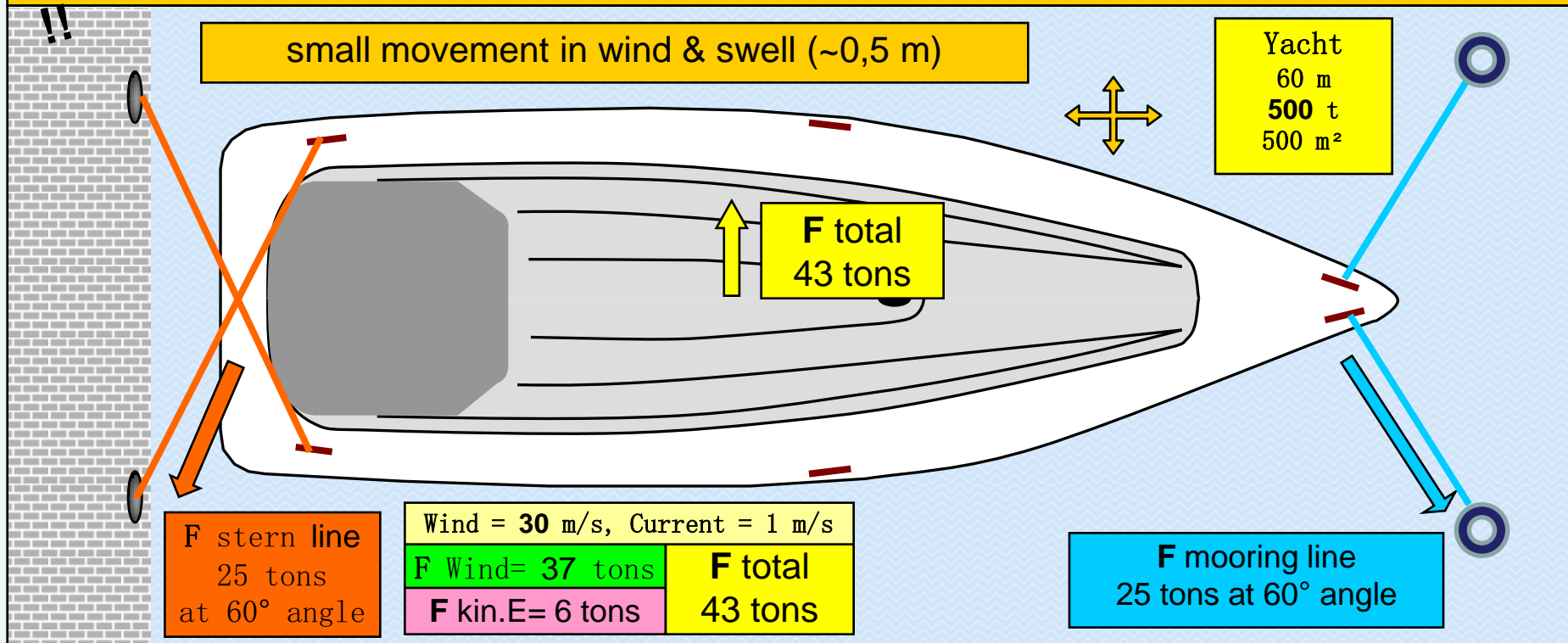
Swinging Speed = 0,2 m/s ; breaking distance = 0,5 m ;  $F_{\text{kin.E}} = 40$  tons

Swinging Speed = 0,3 m/s ; breaking distance = 0,7 m ;  $F_{\text{kin.E}} = 65$  tons

Swinging Speed = 0,5 m/s ; breaking distance = 1,0 m ;  $F_{\text{kin.E}} = 127$  tons

# Innovation

## 2 Stern lines & 2 DualDocker telescopic piles ( bow)



Swinging Speed = 0,05 m/s ; breaking distance = 0,2 m ; **F kin.E** = 6 tons

# Innovative Mooring Solutions & Berthing Stabilisers



## Damped, Secure & Eco-Friendly

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