Forklift Truck Training Course R2

altix

Arbeiten in der Höhe

Additional Module R2: Side-Seat & Four-Way Forklift Trucks

Training for operators of industrial trucks, Category R

Training in accordance with EKAS Guideline 6518

Design category R2

- Cross-seat (sideways seating position)
- Ideal for long loads (e.g. timber, pipes)
- Lateral load handling
- Suitable for narrow aisles
- Good manoeuvrability
- High stability with long loads
- Efficient use of warehouse space
- Precise handling of bulky goods

Types

How much does a forklift cost?

50,000 – 75,000 Fr.

40,000 – 60,000 Fr.

Types

Side-seated reach truck

- **No reach mast**
- **Load supported by forks and wheels** (no counterweight)
- **Cross-seat orientation** relative to the direction of travel
- For use on **level surfaces** only
- **Plastic wheels without tread** → not suitable for uneven terrain

Types

High-rack forklifts

- Typical **warehouse equipment for narrow aisles**
- For use on **level floors** only
- **Reach mast**: extend forwards, pick up load, retract → manoeuvrable
- Suitable for **high lift heights** (up to approx. 12 m or more)
- **Drive**: 1 steered wheel or all-wheel drive
- **Brakes**: new models → all wheels; older models → usually only the drive wheel

Types

Multi-directional forklifts

- Drive off in any direction without having to turn round
- Select direction of travel at the touch of a button
- Suitable for long loads
- Load is placed on the wheel arms

Types

Four-way forklifts

- Suitable for **long loads and large panels**
- **Direction of travel freely selectable** (forwards, sideways, diagonally)
- **No need to turn round** → ideal for confined storage areas
- Available as **3- or 4-wheel models**
- **High load capacity** (up to approx. 20 t) and **lift height** (up to approx. 10 m)
- Indoors: usually **electric**; outdoors: **diesel/gas**
- From approx. 7 m: **Man-Up cab recommended**

Types

- Will we be allowed to operate these forklifts after completing this course?
- **PLEASE NOTE!** For models like these, check with the manufacturer R2 or R3. Red f

Wheel-supported / Cantilevered

- Cantilever
- The load is located outside the wheels

Wheel-supported / Cantilever

- **Wheel-supported**
- The load is located within the wheels
- The load is supported by the wheels
- Equipped with wheel arms

Learning objectives

- Understand the differences between wheel-supported and cantilever forklifts, as well as Category R2 versus R3

- Describe the operating principle and use of **straddle and four-way forklift trucks**

- Recognise and explain the differences between guidance systems (inductive / rail-guided) and operating modes (Man-Up / Man-Down)

Task

Complete the worksheet (stacker parts)

Parts of the side-seating reach truck

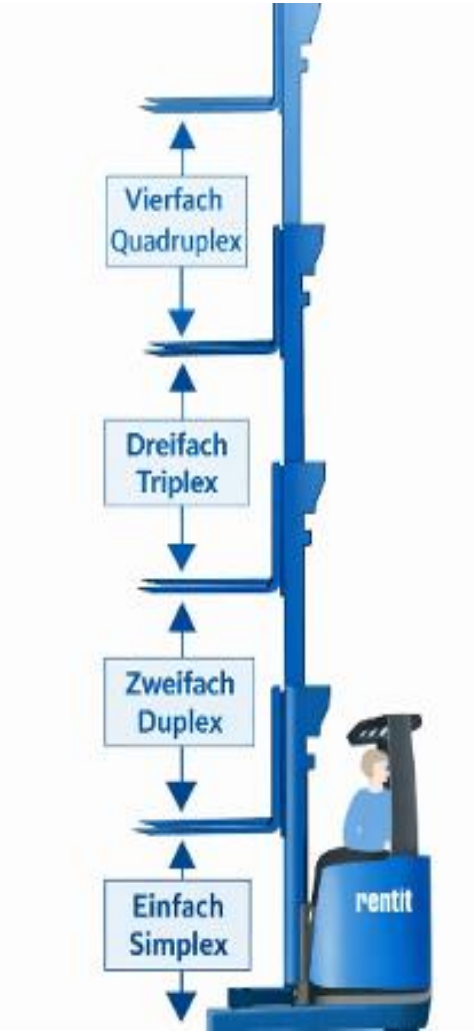
Design and operation

- Are straddle forklifts also suitable for outdoor use?

- These industrial trucks are intended exclusively for indoor use. As high-rack forklifts are not suitable for outdoor use, they are fitted with small wheels made of solid rubber or polyurethane.

Structure and operation

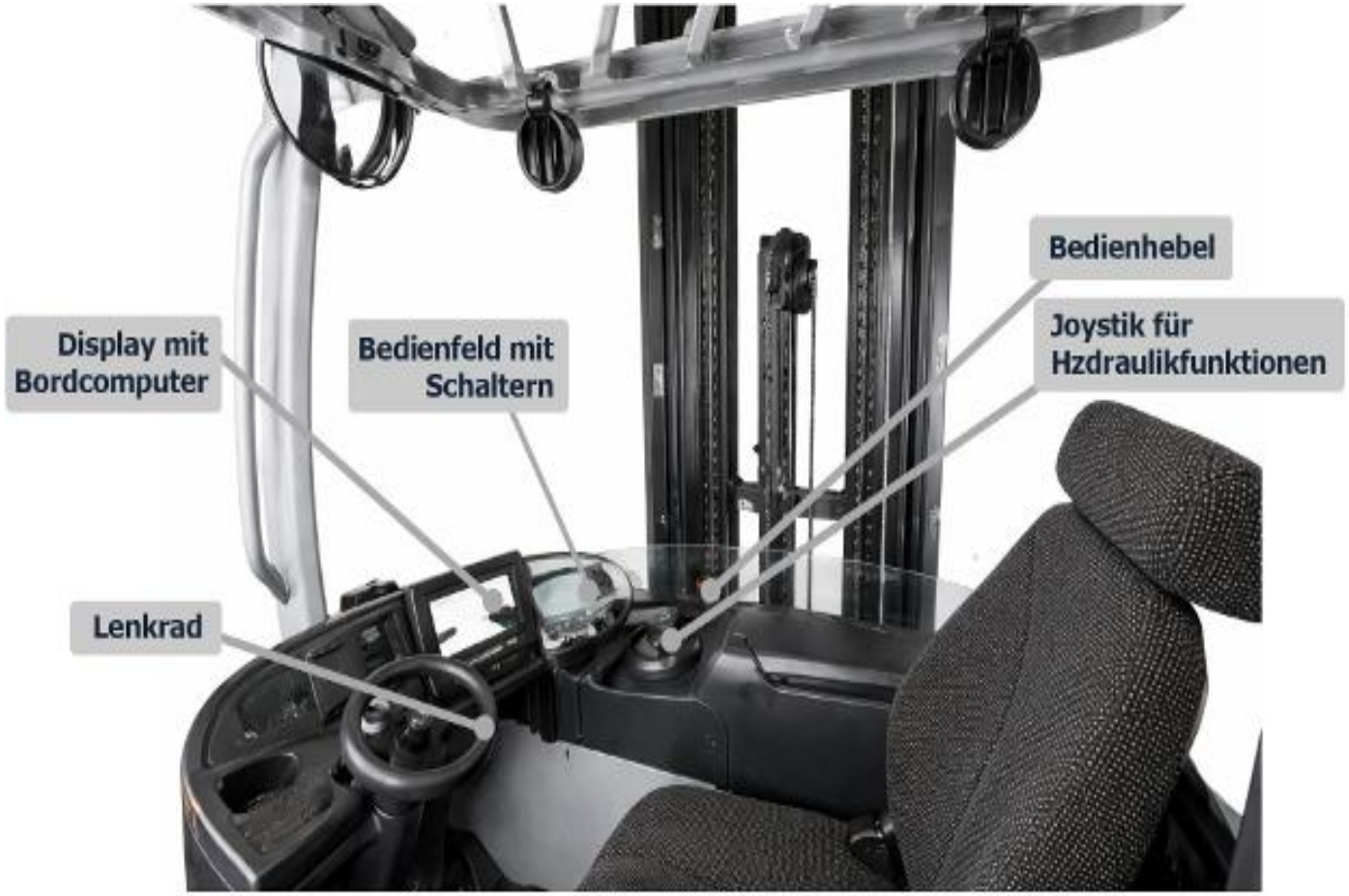
- **Lifting masts – structure & operation (compact)**
- **Simplex**: single mast, approx. 1.8 m lifting height
- **Duplex**: two mast sections, almost double the lifting height (standard)
- **Triplex / Quadruplex**: for great heights, up to over 16 m
- **Important:**
- Significant overall height even when retracted
- Sufficient clearance height required in halls



Structure and operating principles

- **Normal lift:** Load is lifted, mast moves upwards → total height of the forklift increases
- **Transport free lift:** Forks lift approx. 40 cm without any movement of the mast Afterwards: the inner mast section extends
- **Full free lift**: The load is lifted, whilst the mast remains at the same height → ideal for low clearance areas (e.g. halls, gates)

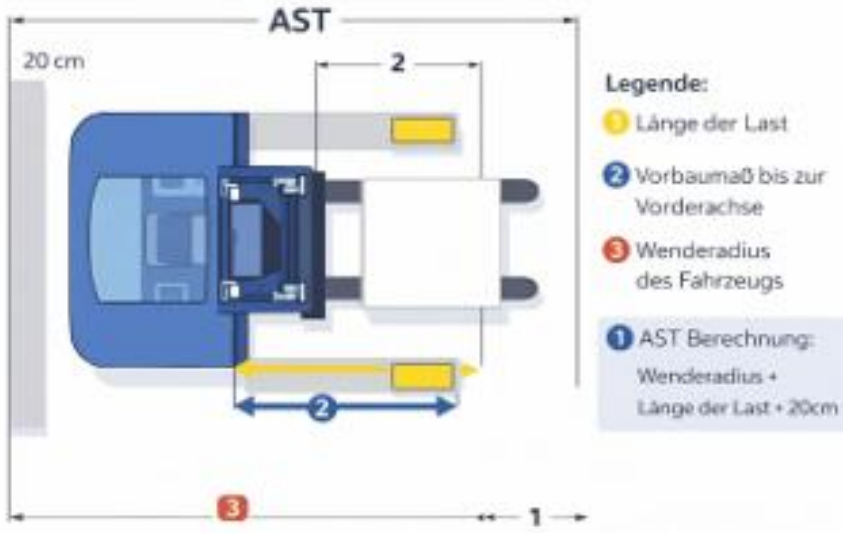
Controls


Display mit Bordcomputer
Bedienfeld mit Schaltern
Bedienhebel
Joystik für Hzdraulikfunktionen
Lenkrad

Working width

What is the aisle width?

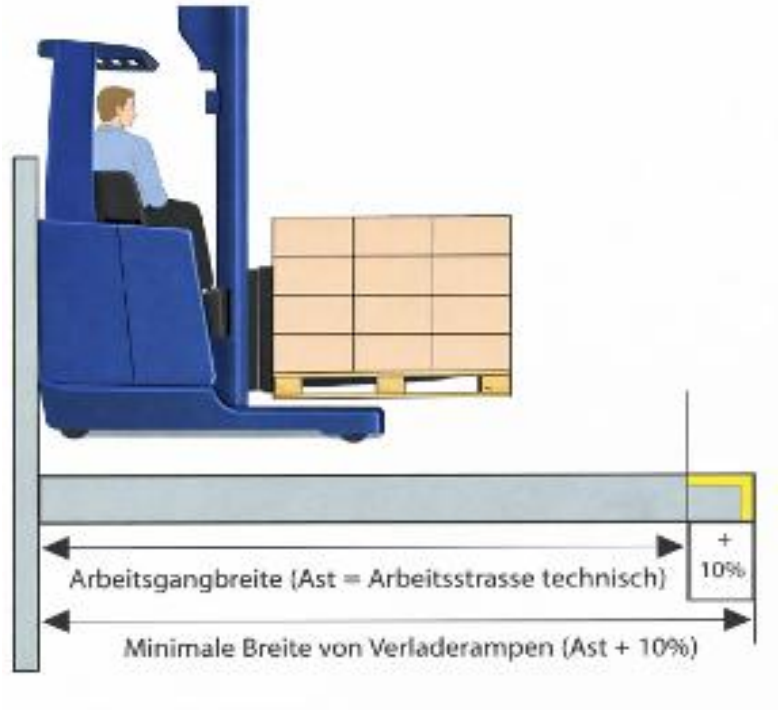
- Aisle **width**: the minimum width required for a forklift to pick up and manoeuvre a load
- **FORMULA**: Minimum AST / Length of the forklift truck + Length of the load + 20 cm



Working width

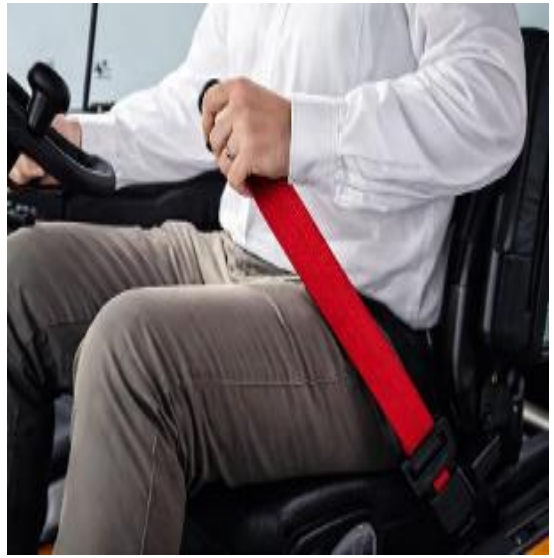
How is the working width determined for loading ramps?

- **FORMULA**: Length of the forklift + length of the load + 20 cm + 10 %



Safety features

- Blue Spot
- Seat belt
- Driver’s safety roof



Design and Operation (High-rack forklift)

- Man-down
- With this design, the operator remains on the ground at the control station. (Man-down) Only the forks and the lift mast are raised.

Structure and operation

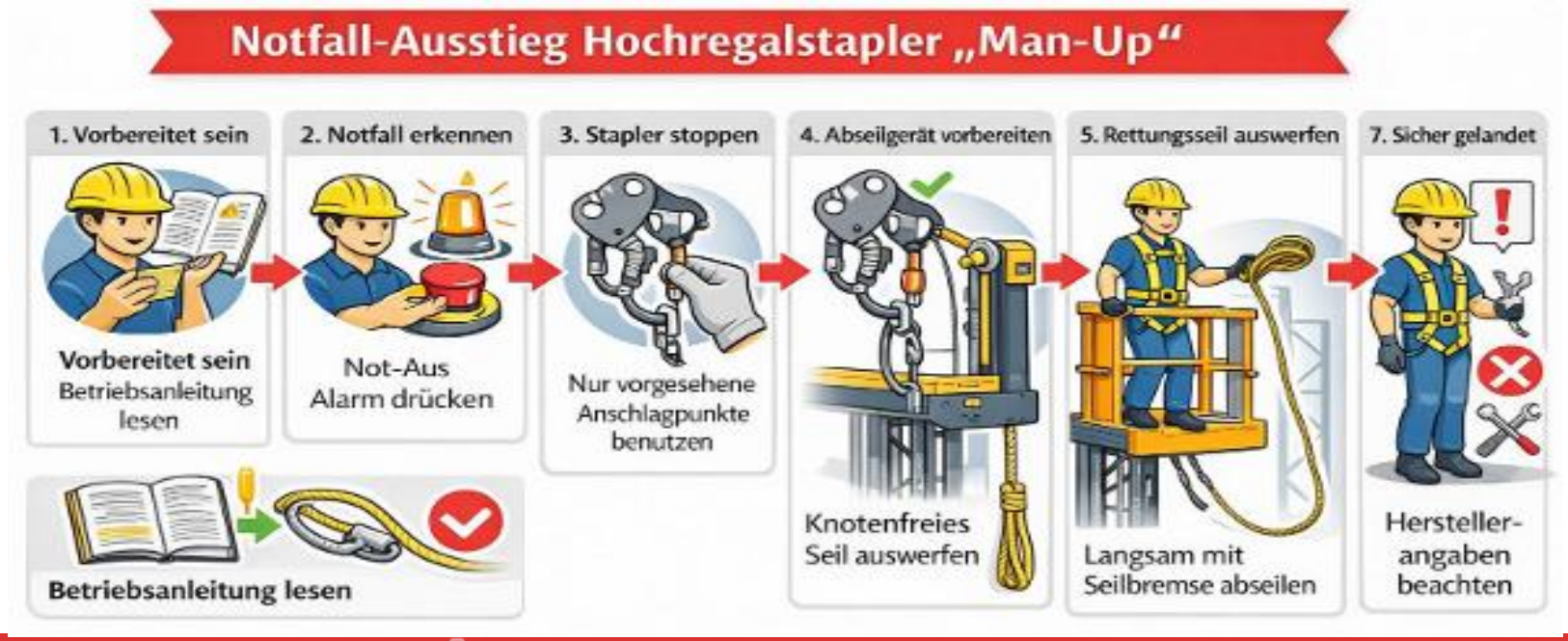
- Man UP
- The operator can use the control station on the mast to travel upwards (Man-up). From there, they can carry out order-picking tasks or supervise the storage and retrieval of goods.

Design and operation

- What are the key points to bear in mind when using the Man UP variant?

Wichtig:

- Make sure you know the rescue plan!



High-bay racking guidance systems

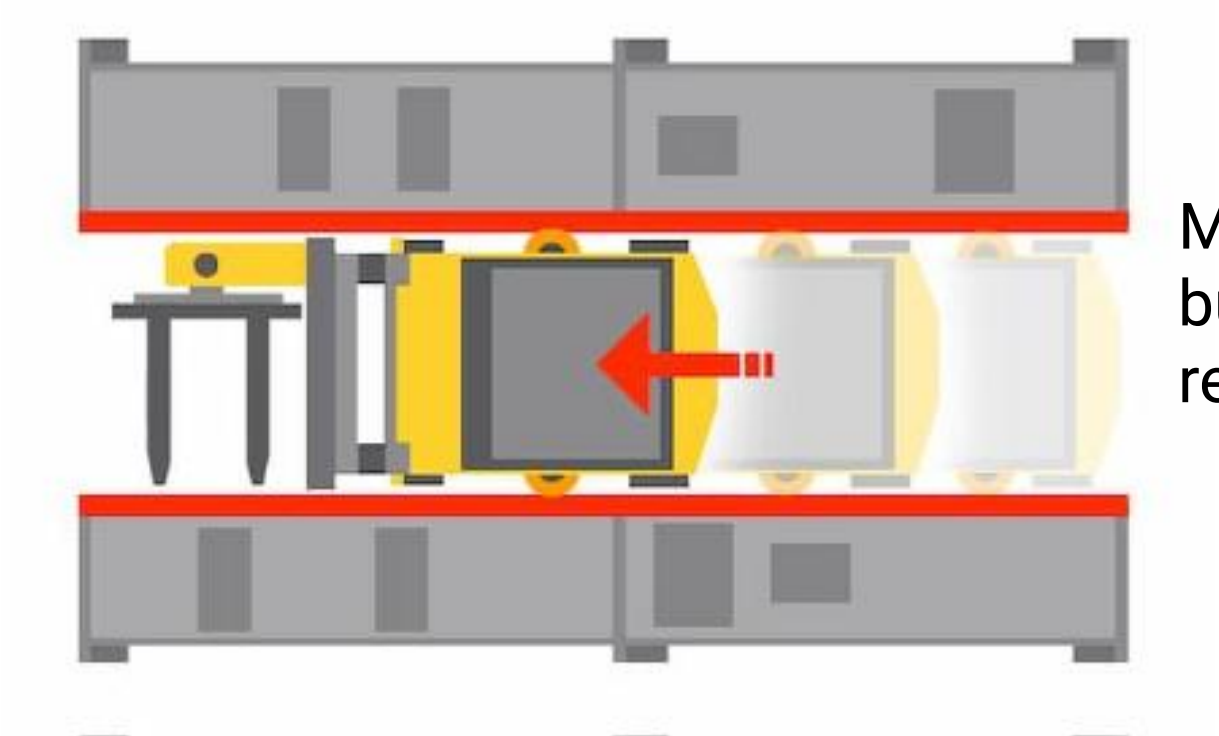
- High-bay forklifts cannot turn round whilst operating. To pick up loads from both sides of the racking, the entire lifting mechanism is rotated. The rotation and swivel unit enables the load to be turned automatically in very confined spaces and helps to prevent damage to the racking system.
- The use of high-bay and narrow-aisle forklifts can significantly reduce the required aisle width. Compared with other industrial trucks, savings of up to 50 per cent can be achieved.

High-bay racking guidance systems

- **Rail-guided system**
- Riding on a floor rail
- Steering is controlled automatically
- The forklift follows the rail as it moves along the aisle
- **Inductive system**
- Traversing the guide line laid in the floor
- The system activates automatically
- The forklift follows the specified path
- **Note**
- When switching from manual to inductive mode, jerky movements may occur

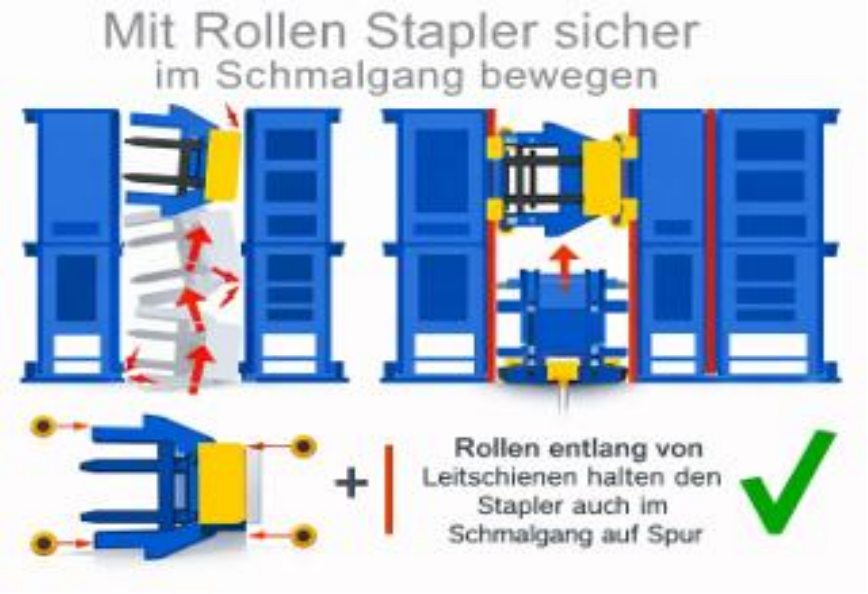
High-bay racking guidance systems

Rail-guided guidance systems



Metal rails offer the simplest solution, but the space on the lower shelves is restricted

High-bay racking guidance svstems



Controls


Display einzeichnen
Zahlen Code wird beispielsweise zum einschalten des Staplers verwendet.
Zweihandbedienung

Learning Outcome Assessment

- Understand the differences between wheel-supported and cantilever forklifts, as well as between categories R2 and R3

- Describe the operating principle and use of **straddle and four-way forklift trucks**

- Recognise and explain the differences between guidance systems (inductive / rail-guided) and operating modes (Man-Up / Man-Down)

Learning objectives

- **Stability & Center of Gravity:** Understand the tipping edge triangle; recognise and calculate the influence of the load's Center of gravity on stability.

- **Commissioning & Decommissioning:** Be able to carry out correct commissioning and decommissioning procedures.

- **Load-bearing capacity:** Understand and correctly apply load-bearing capacity diagrams.

Commissioning

- What is involved in commissioning and decommissioning?
  - Battery check
  - Visual inspection
  - Functional check

- How often should these be carried out?
  Once a month
  Once a week
  Once a year
  Daily before use

Every day before use

Commissioning

- Please read pages 20 and 21 of R2

Various batteries

Lithium-Ionen-Batterie

Traktionsbatterie (Blei-Säure)

Lithium-Ionen-Batterie	Traktionsbatterie (Blei-Säure)
Hohe Energiedichte → längere Laufzeiten bei gleicher Größe	Günstiger Anschaffungspreis
Geringes Gewicht → besser für mobile Geräte und Fahrzeuge	Robust und zuverlässig
Sehr geringe Selbstentladung	Einfache Ladegeräte
Wartungsfrei	Gut geeignet für hohe Stromstärken (z. B. Stapler)
Hoher Anschaffungspreis	Schwer und unhandlich
Empfindlich gegen Überladung, Tiefentladung und hohe Temperaturen	Regelmäßige Wartung erforderlich (Kontrolle des Säurestands)
Spezielle Ladegeräte erforderlich	Geringere Energiedichte → kürzere Laufzeiten
Brand- und Explosionsrisiko bei unsachgemäßer Handhabung	Enthält giftige und korrosive Säure Höhere Selbstentladung
Höhere Selbstentladung	Höhere Selbstentladung

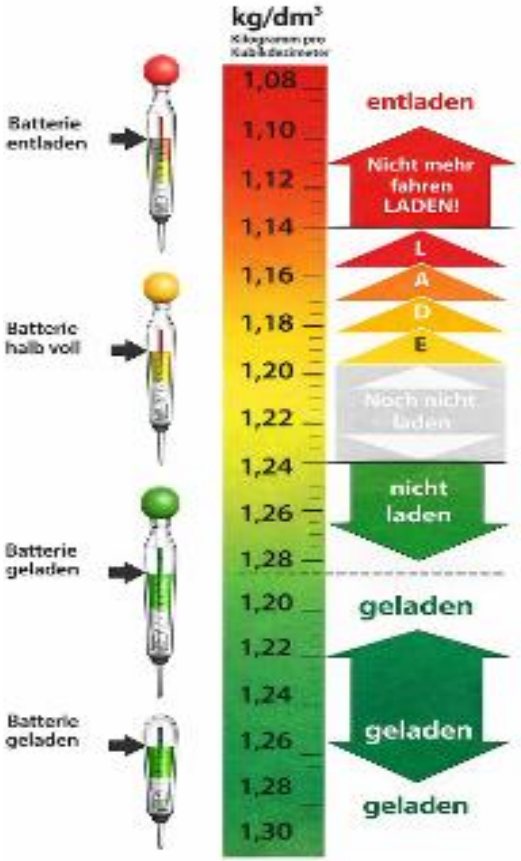
Battery check

- Switch off the charger, unplug it
- Personal protective equipment
- Measure the specific gravity
- Check the fluid level (top up with distilled water)
- Check the cleanliness of the battery surface
- Remove gloves correctly and dispose of them
- Make an entry in the logbook

Measuring the battery's state of charge

- Acid density is measured in **kg/dm³**

- Fully charged: 1.24 – 1.30 **kg/dm³**
- Recharge if below 1.20 **kg/dm³**
- Deep discharge below 1.14 **kg/dm³** **damages the battery**



During the measurement, the float in the acid tester must not touch either the top or the bottom of the housing.

Battery check

It is very important to wear the correct PPE when checking the battery

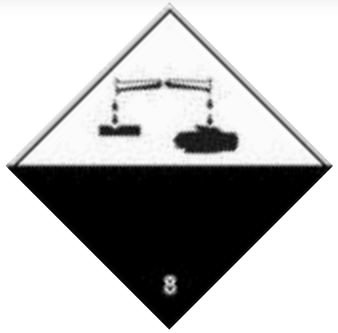
In the event of contact with battery acid

1. Rinse eyes immediately with an eye wash for approx. 15 minut
2. Always seek medical attention

!!

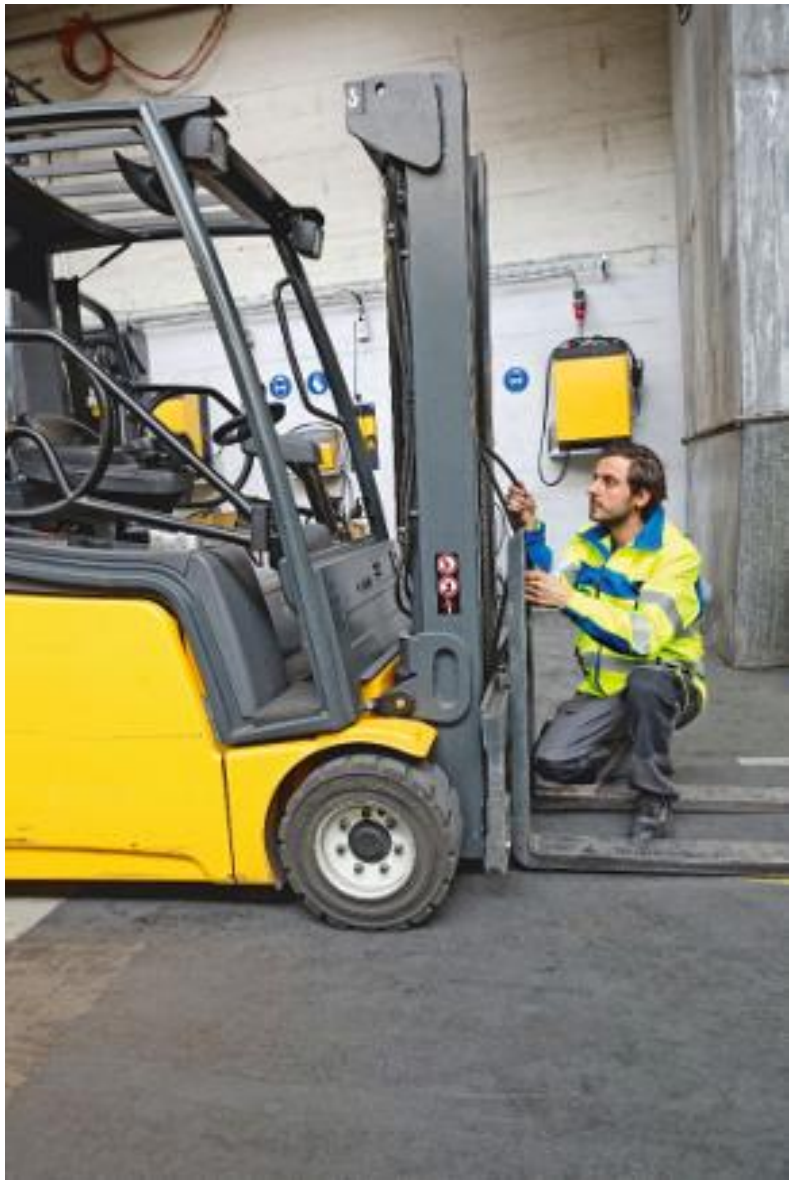
Possible consequences?

Battery check



Visual inspection

- Service Adhesive
- Lifting mast, lifting chain & lifting cylinder
- Hydraulic connections, lines & cylinders
- Fork carriers & loading forks
- Wheels, tyres & wheel fastenings
- Chassis and operator canopy
- Lighting



Functional check

- Driver’s seat & steering wheel adjustment
- Restraint system
- Unlocking the emergency switch & start-up procedure
- Lifting mechanism, mast tilt, side shift
- Foot brake, counter-current brake, parking brake and coasting brake
- Horn
- Fluid leaks (after driving off)

Commissioning

- What should I do if, for example, oil is leaking from the vehicle?

Report / Take out of service / Mark

TAKE IT OFF THE ROAD

MARK

REPORT

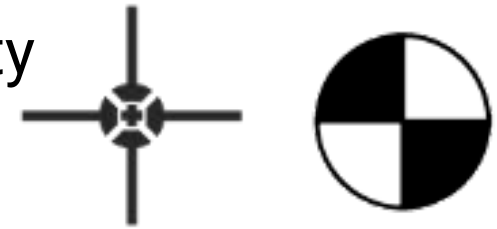
Decommissioning

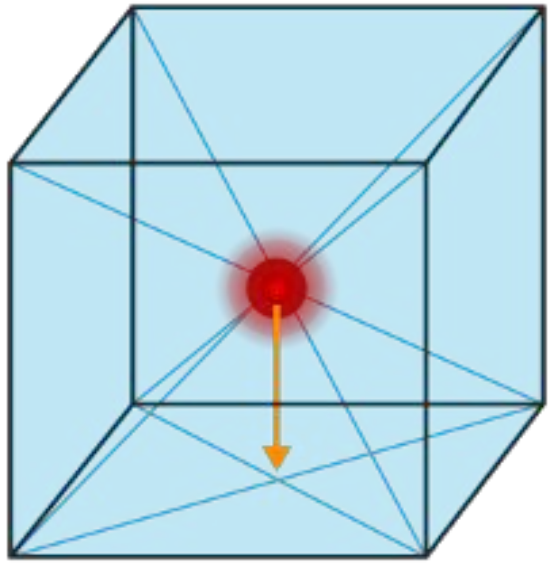
- Use designated parking spaces
- Park the vehicle in a parallel position
- Apply the parking brake
- Lift mast vertical, forks horizontal, side shift in neutral
- Take out of service, emergency stop on
- Remove the key

Center of gravity of bodies

- Centre of mass
- The total mass of a body is concentrated

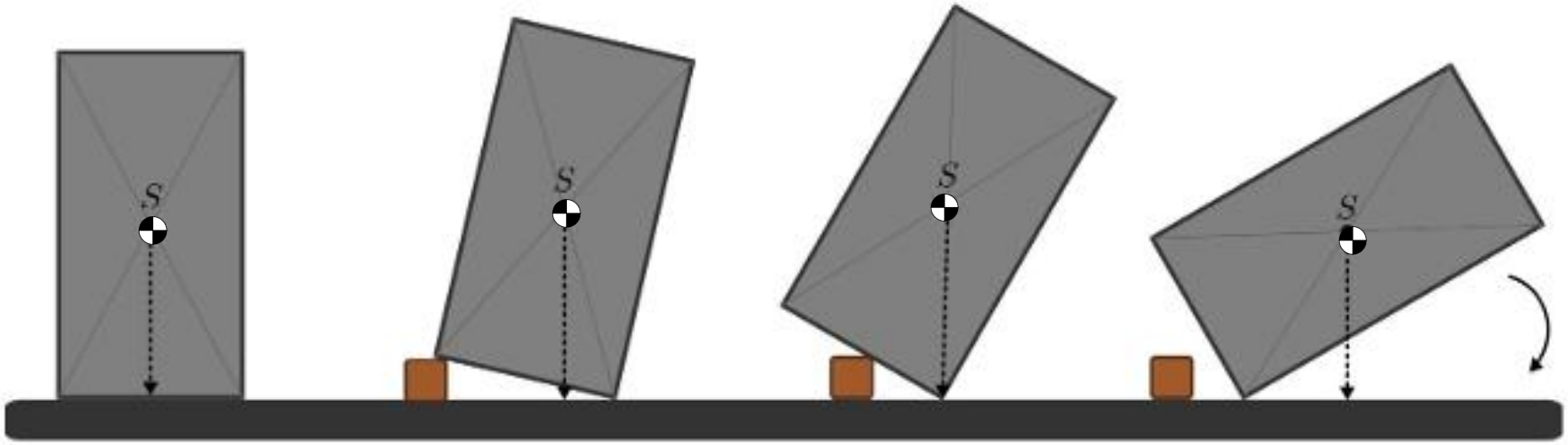
- Center of gravity Symbols





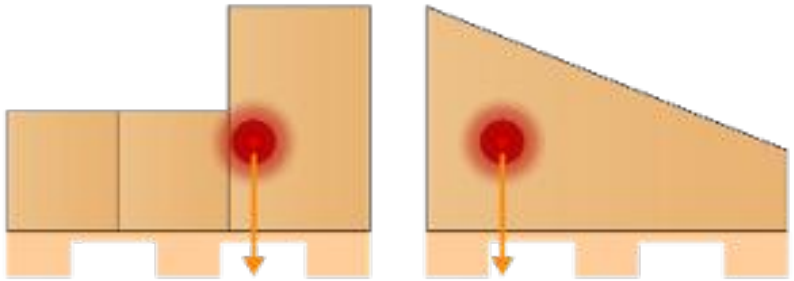
The stability of objects

- The lower the Center of gravity, the more stable the object
- An object tips over as soon as its Center of gravity lies outside the line of gravity (base of support).

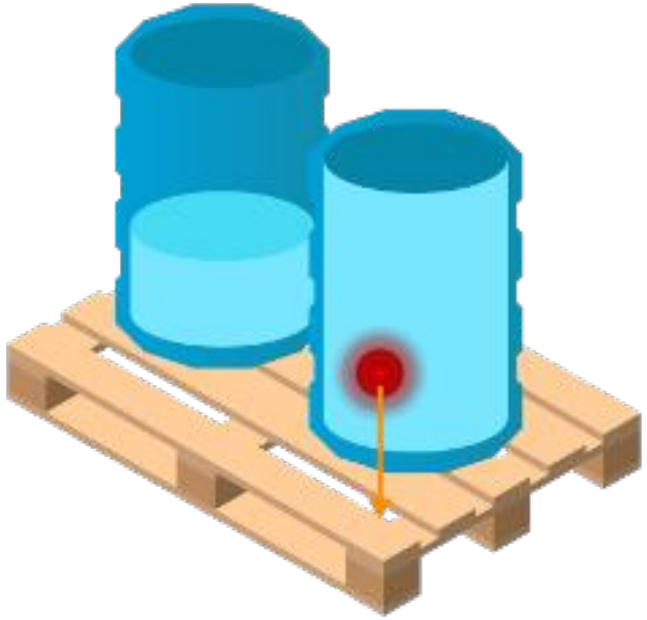


Center of gravity of objects

The Center of gravity shifts towards the heavier parts of the load

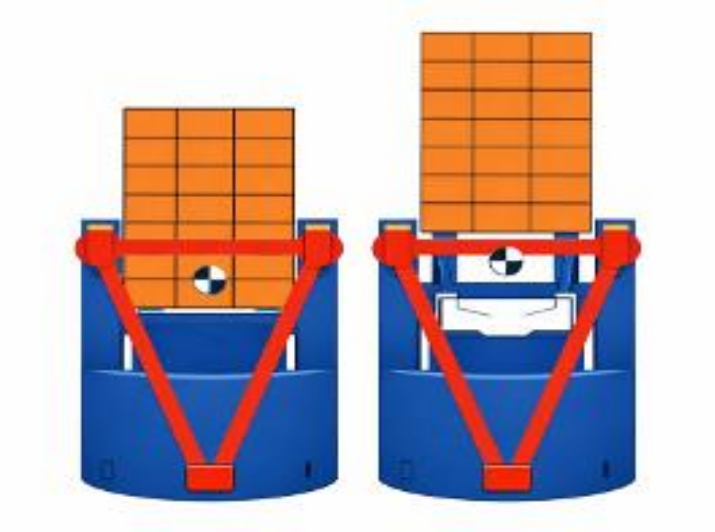


Center of gravity towards the full barrel



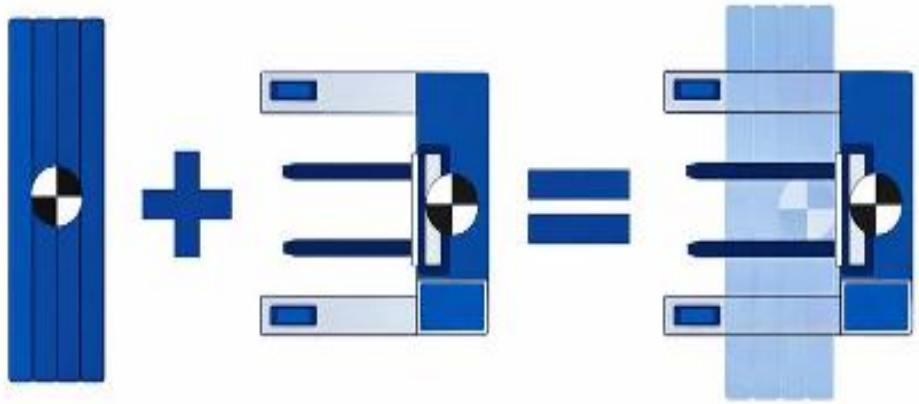
Stability

- Center of gravity closer to the tipping edge → **reduced stability, higher risk of tipping**
- Center of gravity outside the tipping edge triangle → **forklift tips over**
- Unladen: **the Center of gravity is located centrally within the vehicle**



Stability

- When loaded: **Center of gravity is lower and more central**
- Further away from the tipping edges → **greater stability**
- **Lower risk of tipping**



Lifting loads

Loads that we cannot position under the fork back on the first attempt are lifted slightly, the missing distance is made up, the load is set down again and then positioned correctly under the forks.

Load securing

- **Unsecured loads shift** when accelerating or braking
- For long loads: use **a wide fork spacing** for better load distribution
- **Bundle and secure** individual items (e.g. lashing s
- Check before loading: **securing, stability,**

Center of gravity

Riding technique

- **Common cause of accidents: poor visibility**
- If your view is obstructed → **reverse or ask someone to assist**
- Important: **Spot obstacles and people in good time** → reduce the risk of an accident

Riding technique

Driving on slopes and inclines requires particular caution

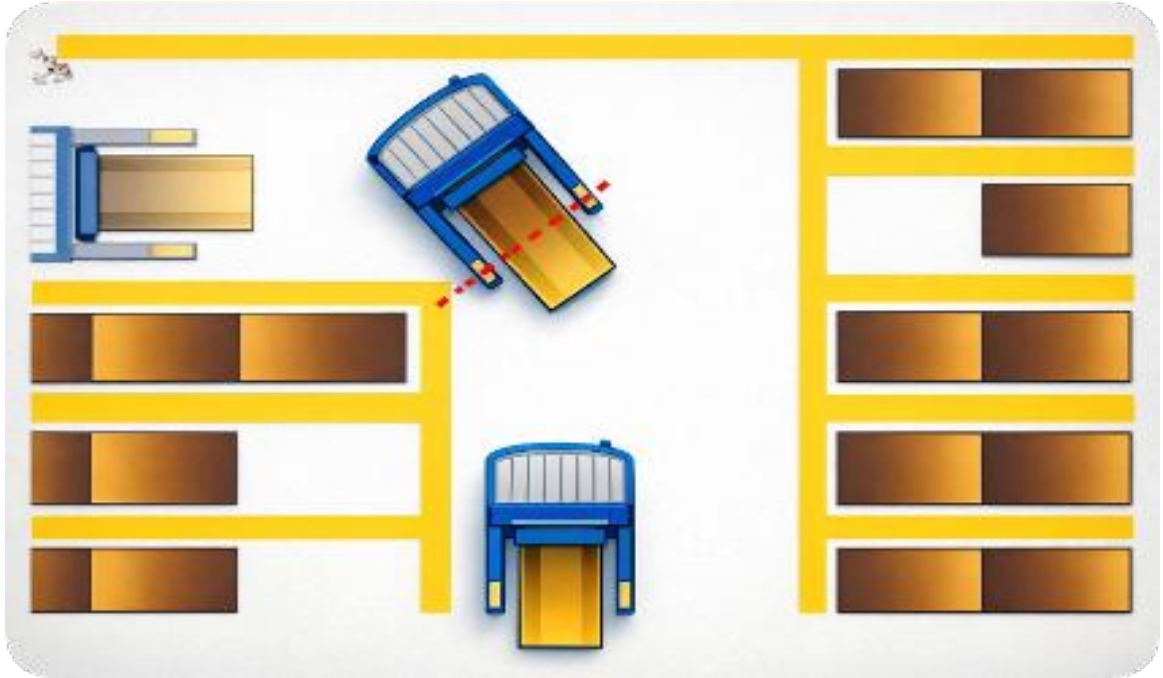
Transport: Side-seating reach truck

1. First, return any loads that are tilted backwards to a horizontal position.
2. Extend the mast as required and carefully lower the load until it rests securely.
3. Continue to lower the load until the forks are clear, then retract the telescopic mast.
4. When driving off, look behind you and only then set off.

Cornering

Where is the pivot point?

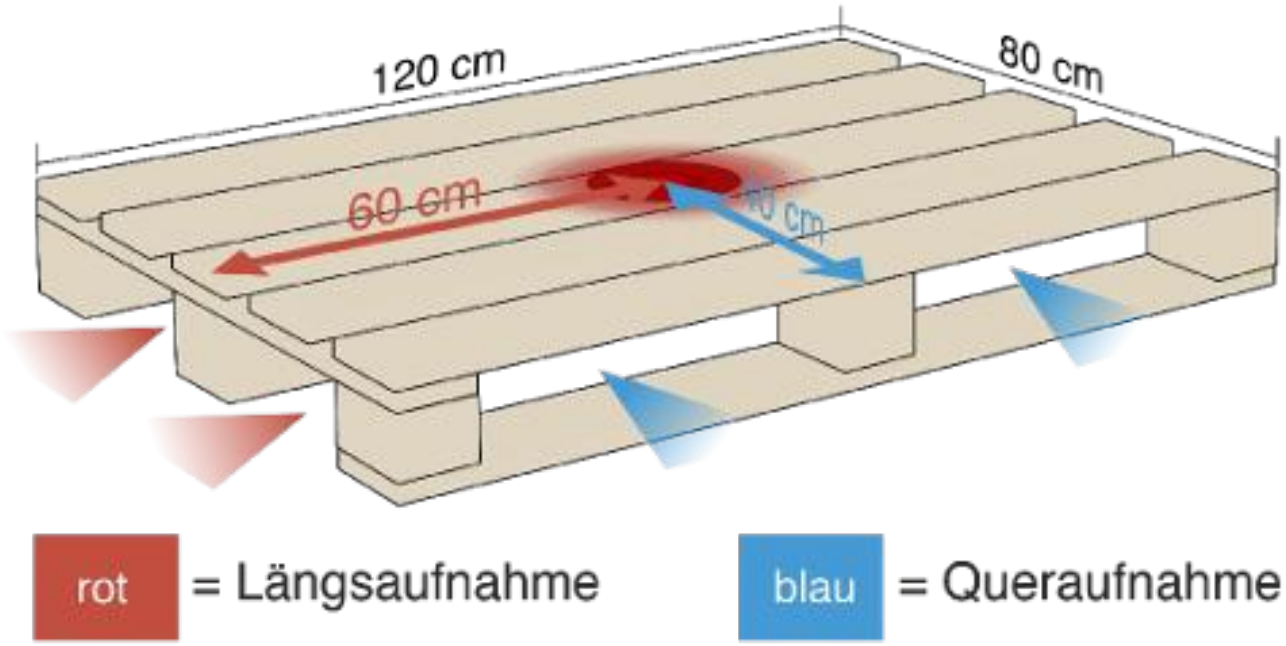
- On a reach truck, the vehicle's pivot point is located at the front wheels, in the centre of each wheel.



Load capacity charts

Grafische Darstellung	Abkürzung	Bedeutung
	Q	Maximal zulässige Last (Angabe in Kilogramm oder Tonnen)
	C/D	Abstand vom Gabelrücken bis zum Schwerpunkt der Last (Lastschwerpunktabstand) in cm oder mm Je nach Hersteller mit Buchstaben Coder Dgekennzeichnet
	H	Hubhöhe (in m, cm oder mm) (Bezeichnung auch H)

Distance from the centre of gravity



Calculation of the load centre of gravity distance

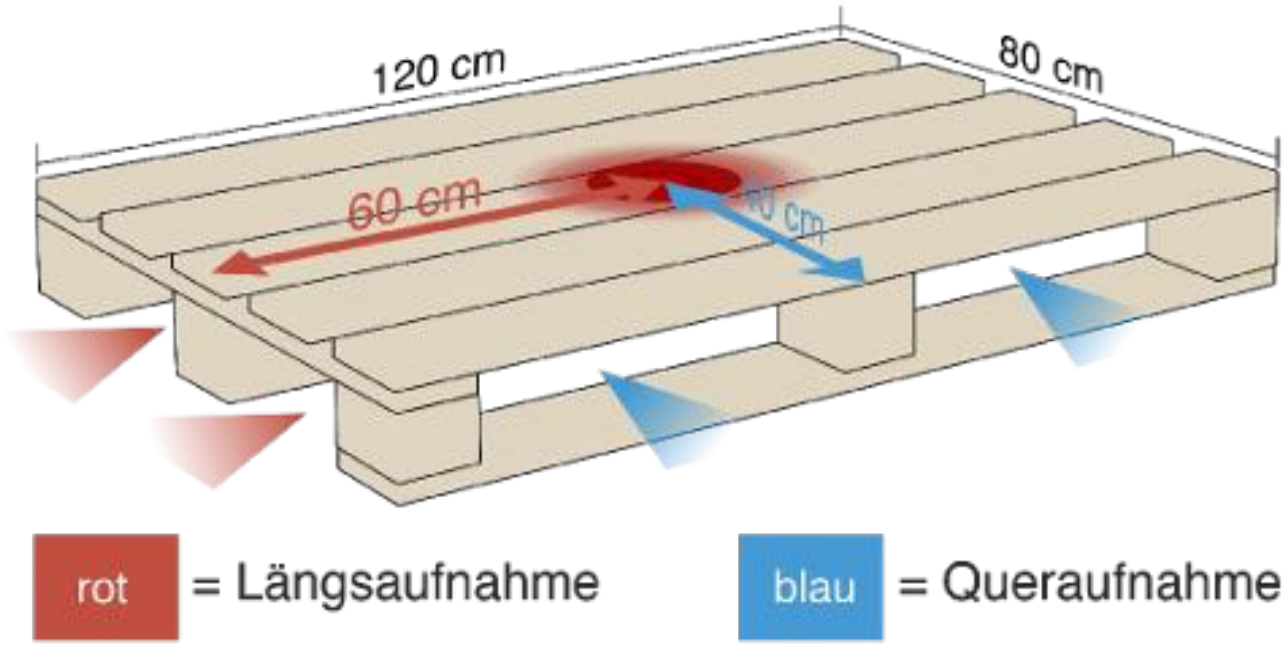
Euro pallet, Type 1, 80 x 120 cm, loaded crosswise

Special pallet, 100 x 100 cm (lengthways and crossways)

Euro pallet, Type 1, 80 x 120 cm, photographed lengthways

Special pallet, 160 x 160 cm

Distance from the centre of gravity



Calculation of the distance from the centre of gravity

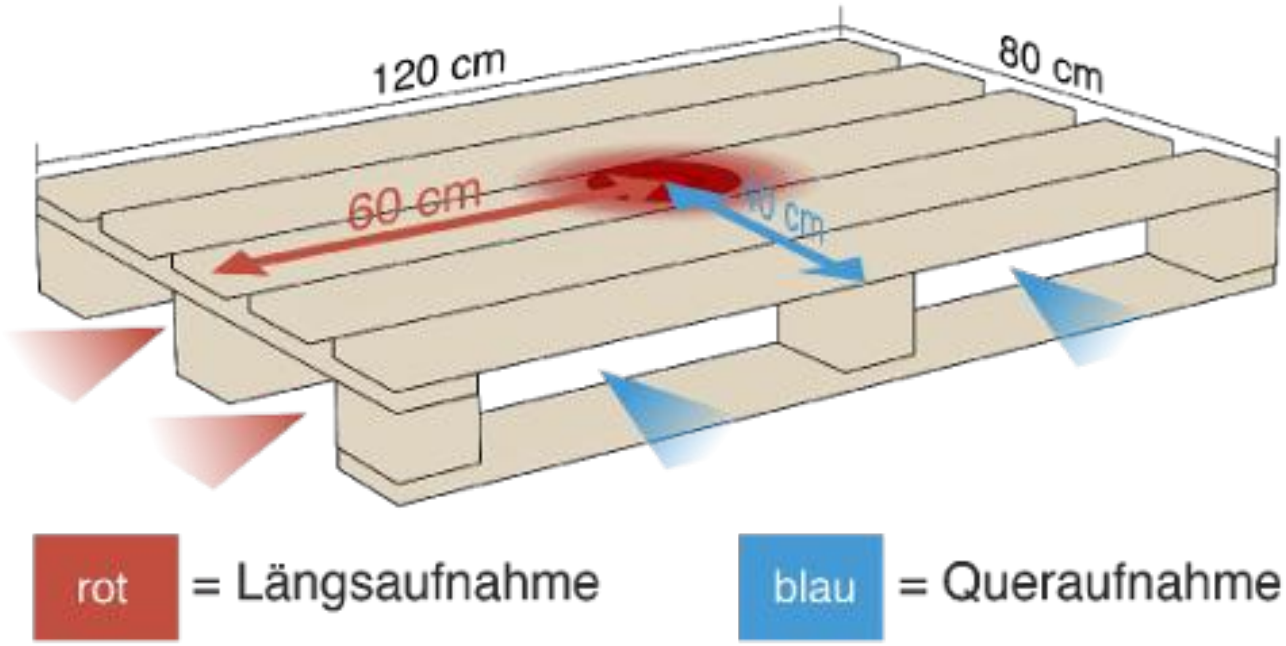
40 cm Euro pallet, Type 1, 80 x 120 cm, loaded crosswise

Special pallet, 100 x 100 cm (lengthways and crossways)

Euro pallet, Type 1, 80 x 120 cm, photographed lengthways

Special pallet, 160 x 160 cm

Distance from the centre of gravity



Calculation of the distance from the centre of gravity

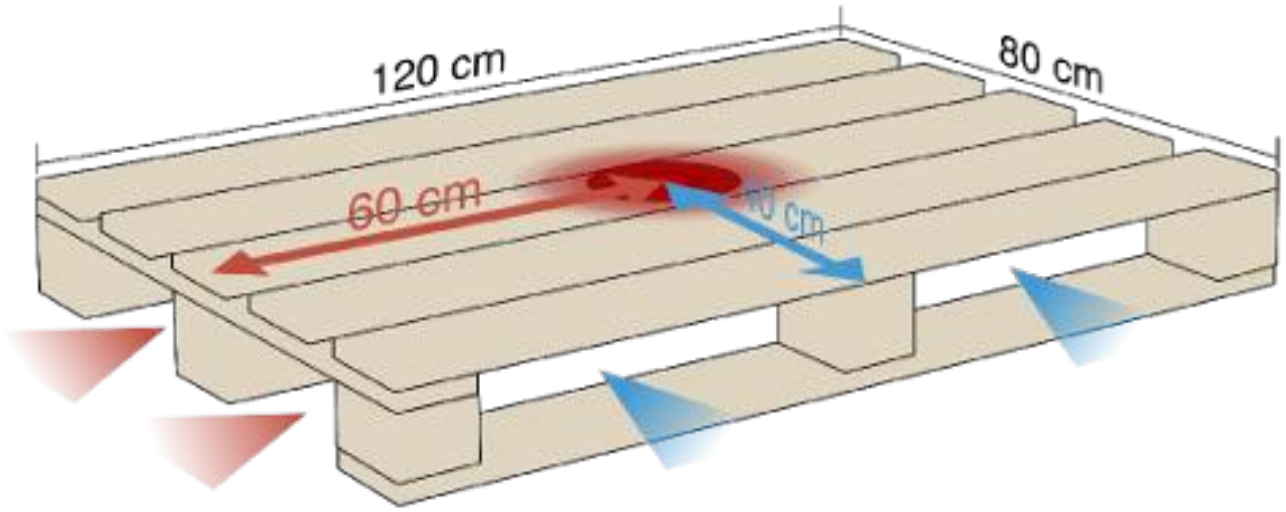
40 cm Euro pallet, Type 1, 80 x 120 cm, loaded crosswise

50 cm special pallet, 100 x 100 cm (lengthways and crossways)

Euro pallet, Type 1, 80 x 120 cm, photographed lengthways

Special pallet, 160 x 160 cm

Distance from the centre of gravity



rot = Längsaufnahme

blau = Queraufnahme

Calculation of the distance from the centre of gravity

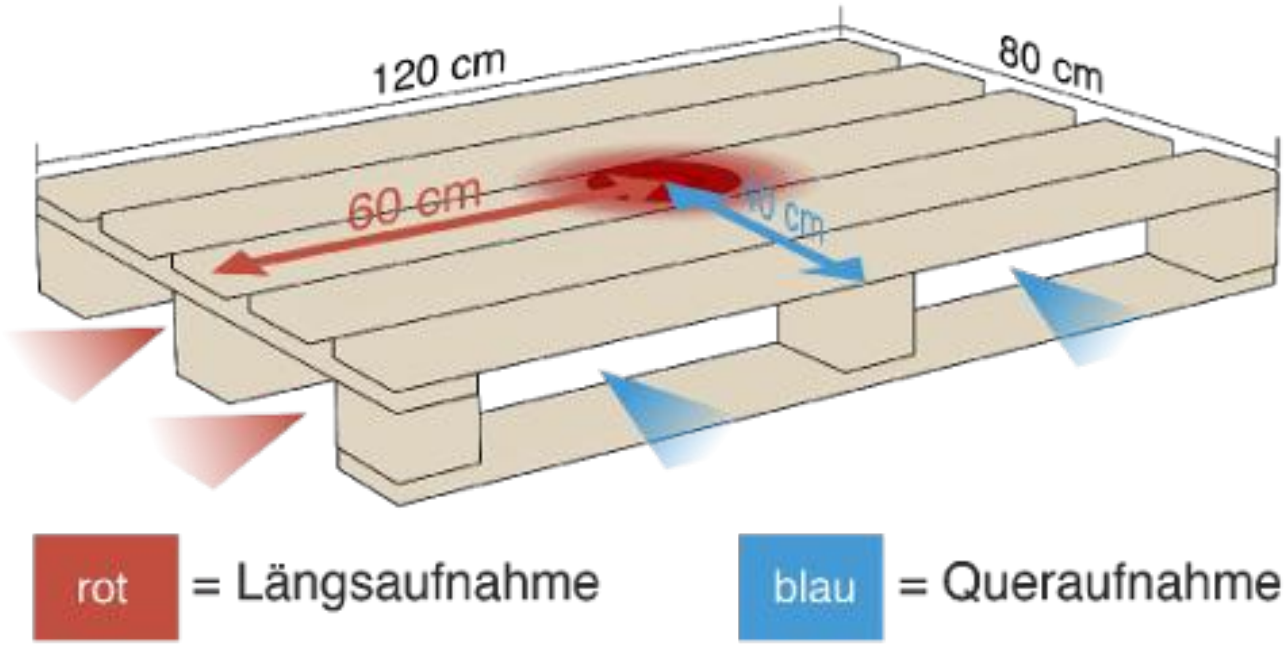
40 cm Euro pallet, Type 1, 80 x 120 cm, loaded crosswise

50 cm special pallet, 100 x 100 cm (lengthways and crossways)

60 cm Euro pallet, Type 1, 80 x 120 cm, photographed lengthways

Special pallet, 160 x 160 cm

Distance from the centre of gravity



Calculation of the distance from the centre of gravity

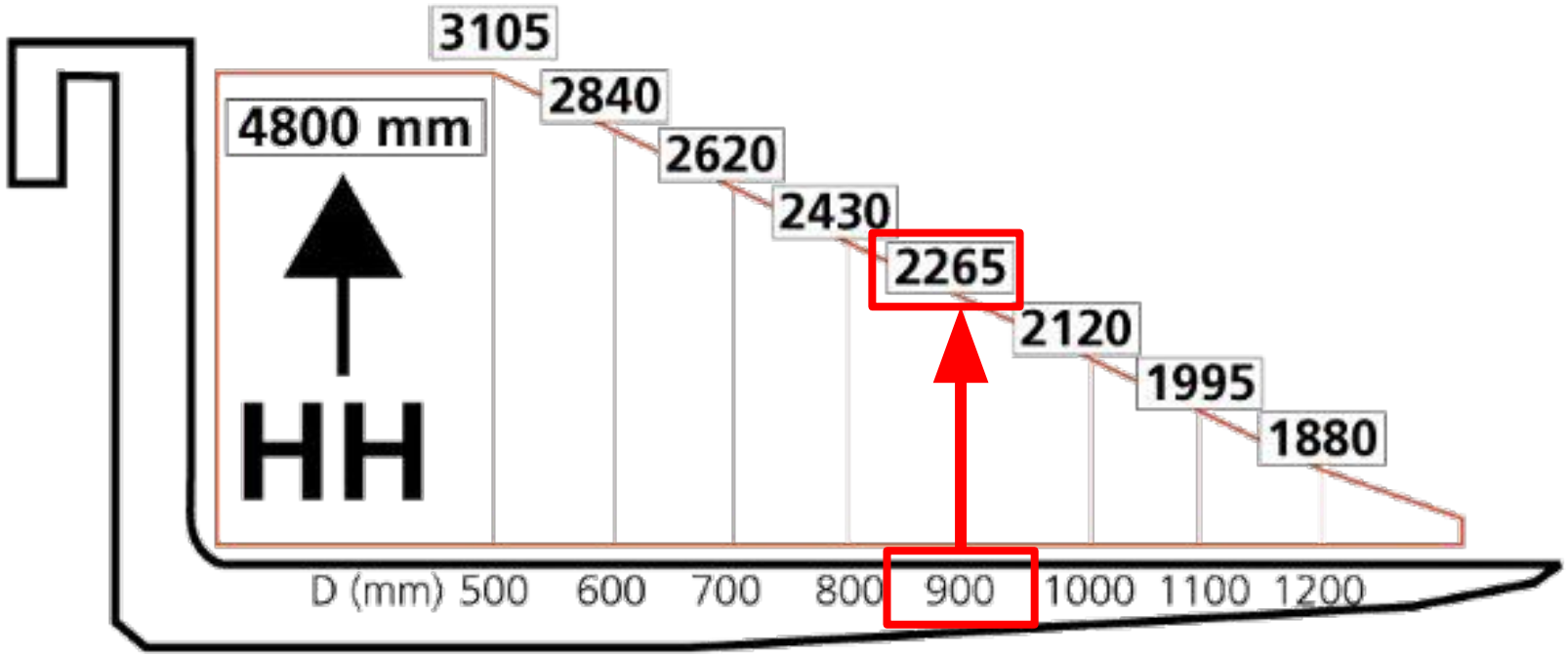
40 cm Euro pallet, Type 1, 80 x 120 cm, loaded crosswise

50 cm special pallet, 100 x 100 cm (lengthways and crossways)

60 cm Euro pallet, Type 1, 80 x 120 cm, photographed lengthways

80 cm special pallet, 160 x 160 cm

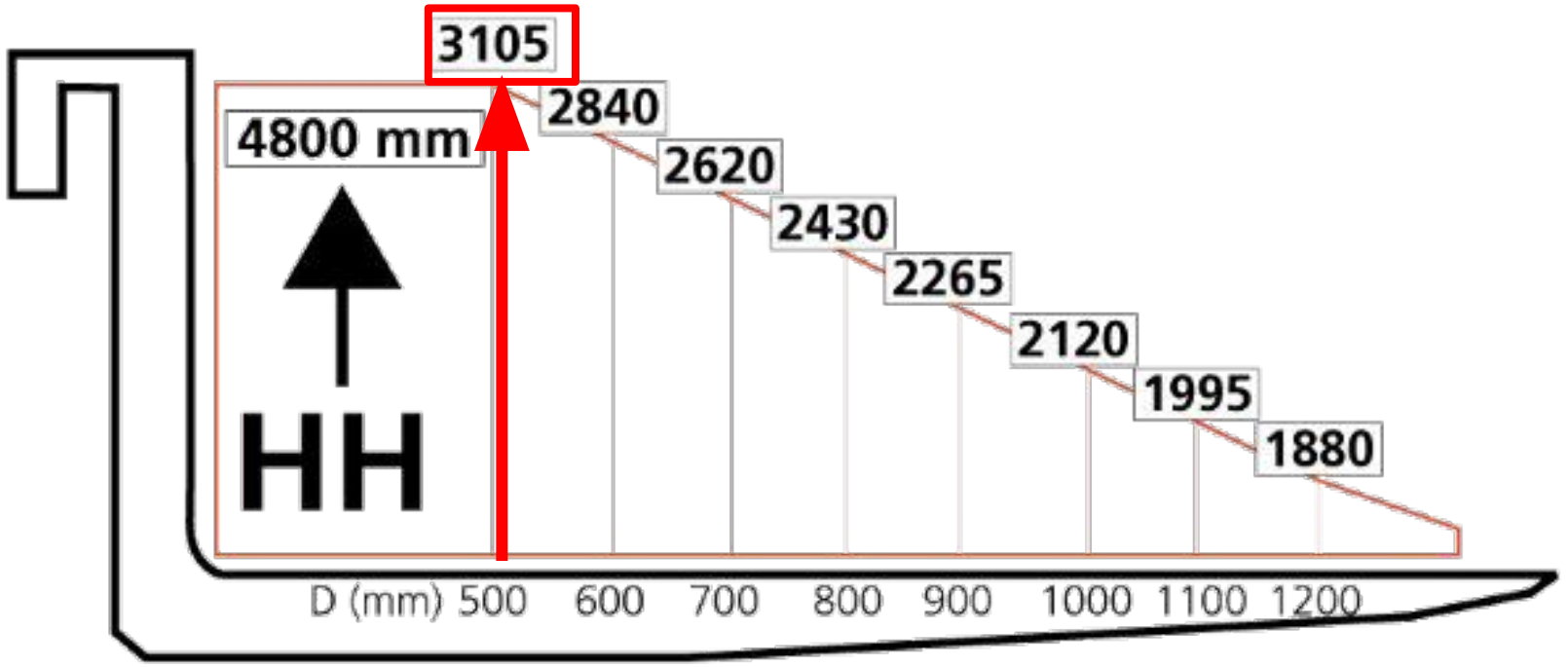
Load capacity chart without lift height specification



Distance from load centre: **900 mm**

Maximum load ? 2265 kg

Load capacity chart without lift height specification



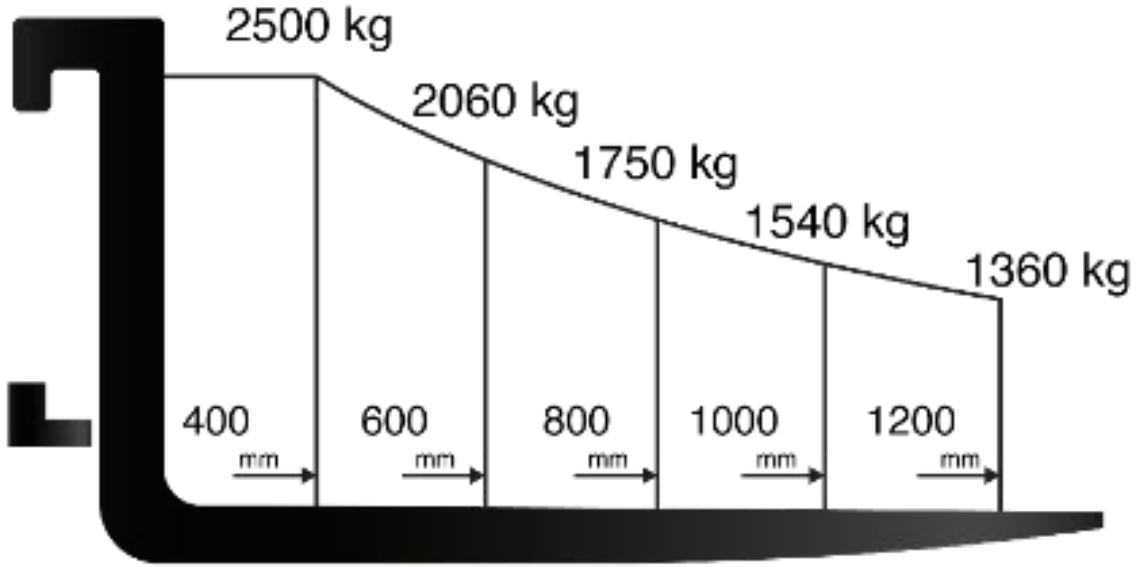
Distance from load centre: **500 mm**

Maximum load ?

3105 kg

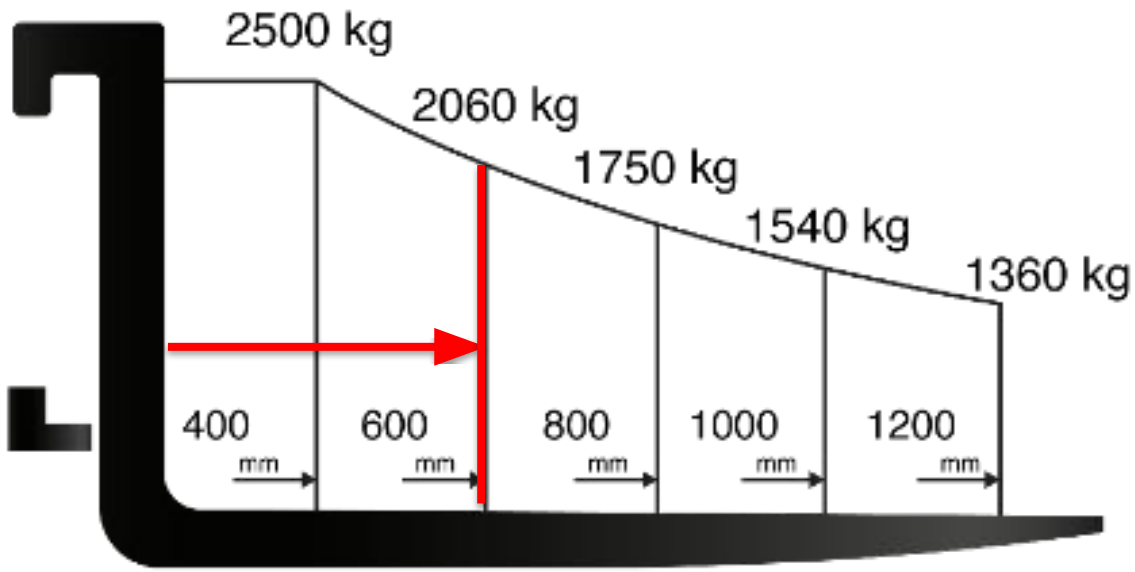
Load capacity diagram without lifting height specified

- Maximum permissible load decreases
- If the distance from the centre of gravity to the load falls between two values, take the safer value
  (e.g. 500 mm > 400 mm)



Load capacity chart without lift height specification

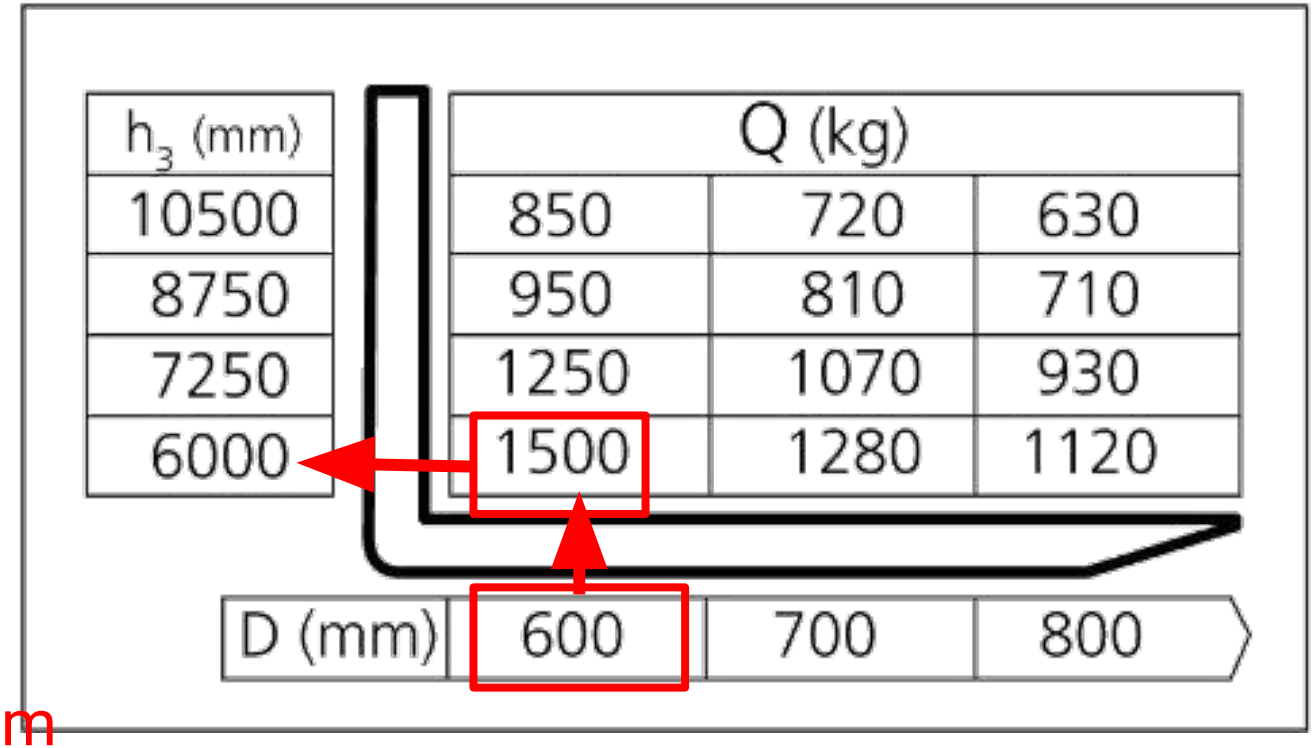
- What is the maximum weight that can be lifted with a load centre distance of 600 mm?
- **2060 kg.**



Load-carrying capacity diagrams

Complete the exercises

Load capacity charts showing lift height

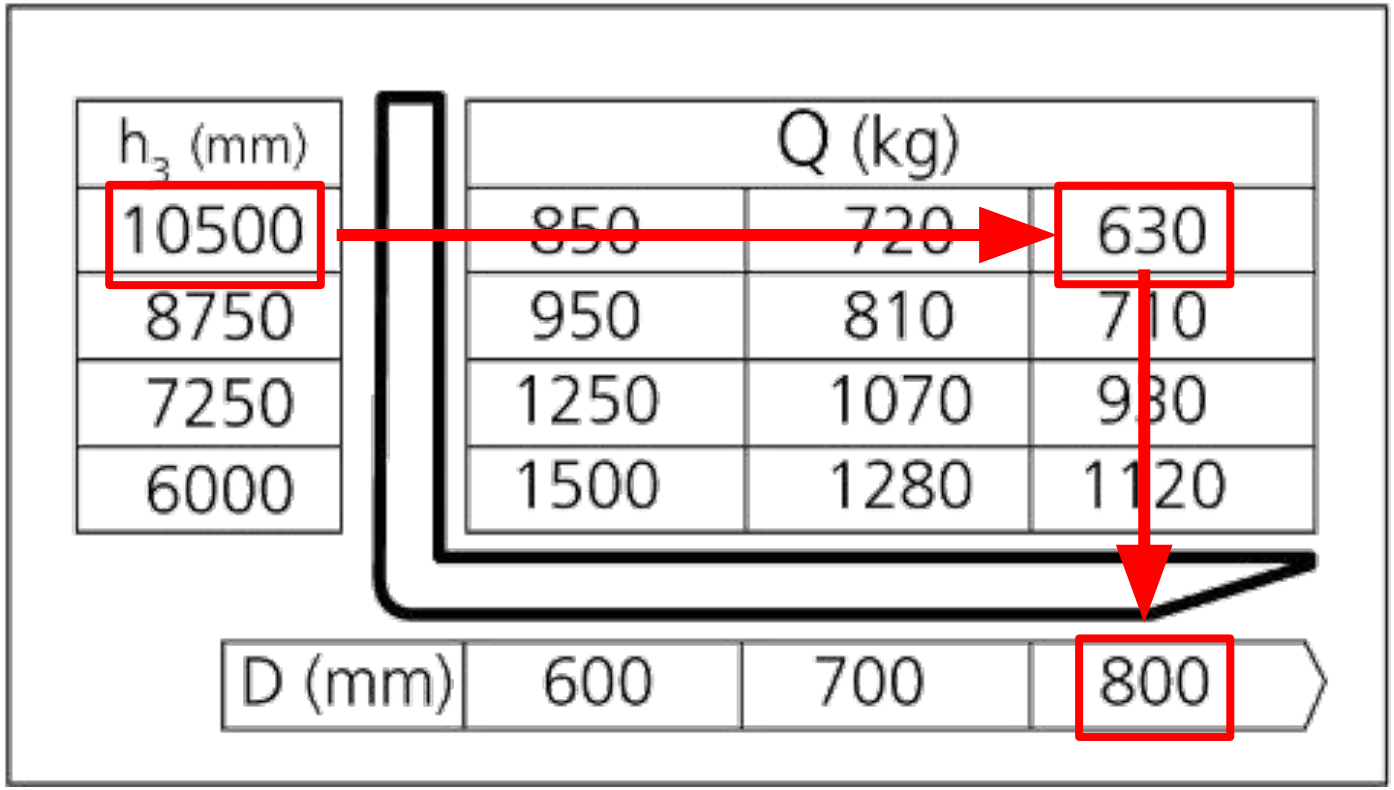


Distance from load centre: 600 mm

Desired load: 1500 kg

Max. lift height? **6000 mm**

Load capacity charts showing lift height



h_3 (mm)	Q (kg)		
10500	850	720	630
8750	950	810	710
7250	1250	1070	930
6000	1500	1280	1120
D (mm)	600	700	800

Lifting height: 10,500 mm

Desired load: 630 kg

Max. distance from load centre? **800 mm**

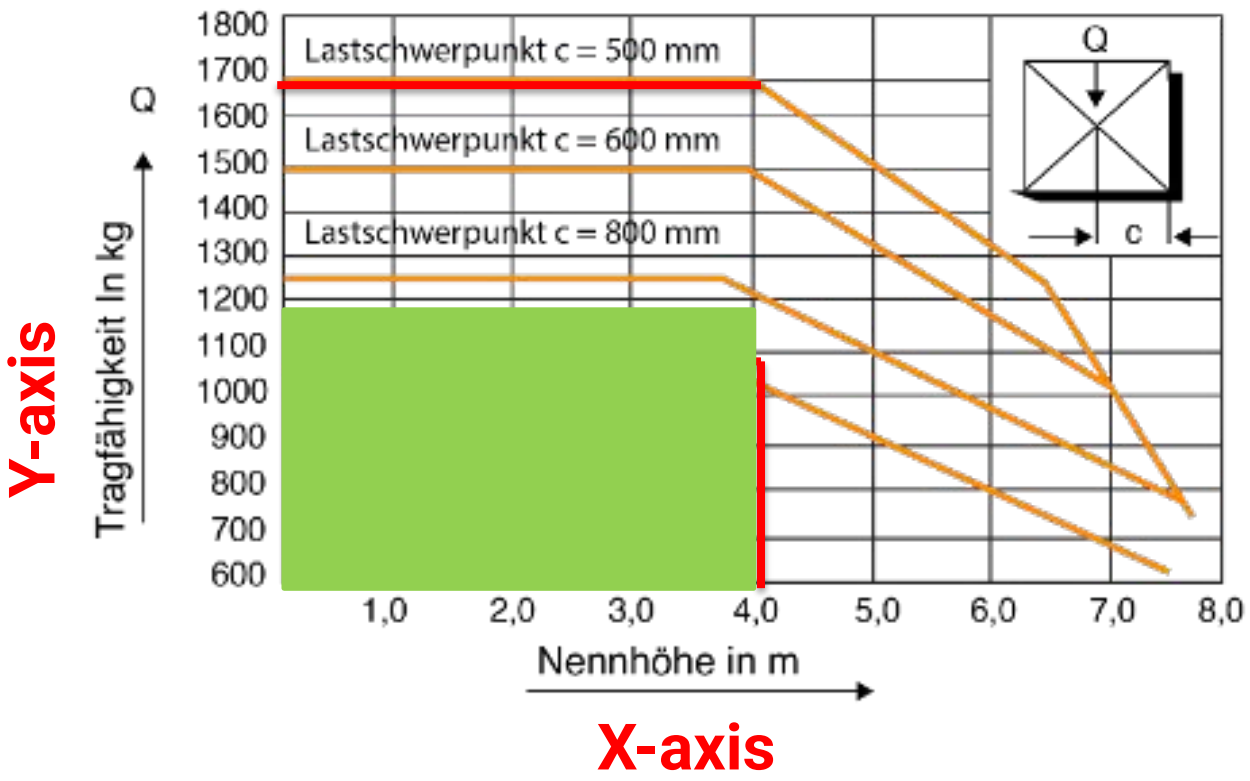
Load capacity charts

Can I lift 1100 kg to a height of 4 m with a load centre distance of 800 mm?

YES

How should I lift a 1700 kg pallet?

Transverse centre of gravity distance 400 mm, as less than 500 mm is optimal



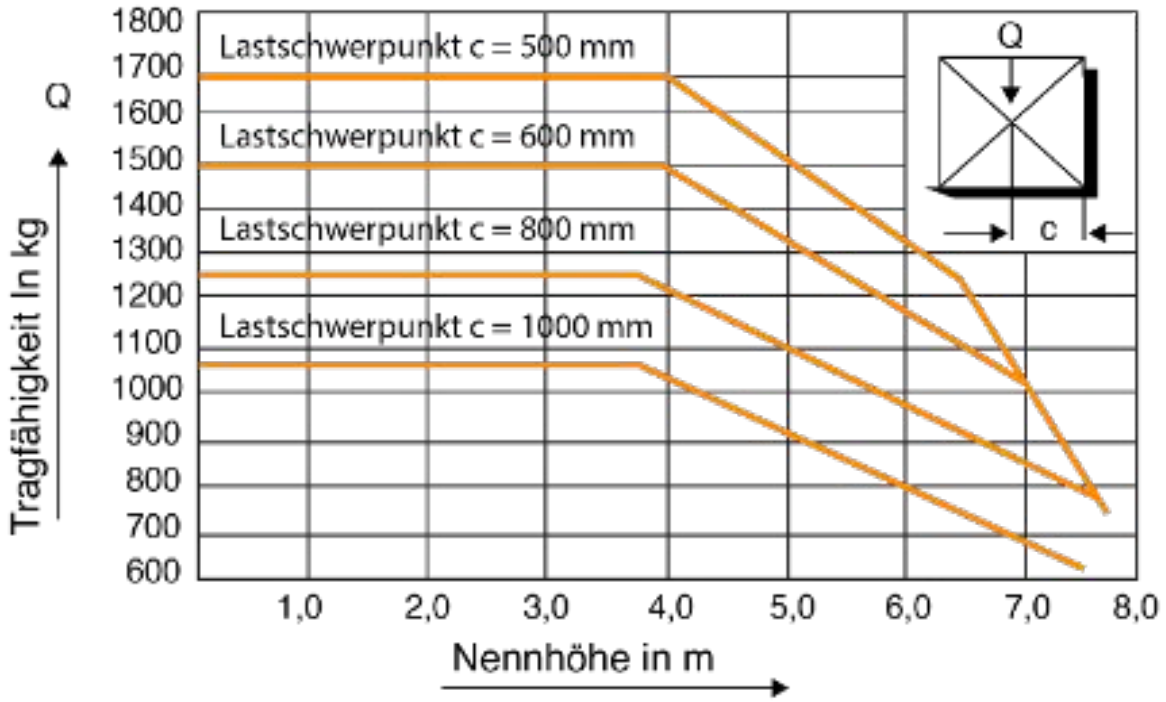
Load capacity charts

The lower the distance from the centre of gravity, the higher the load capacity!

The higher you lift, the less weight you can lift. (Law of the lever)

Can I lift 1100 kg to a height of 4 m with a load centre distance of 800 mm?

YES



Y-axis

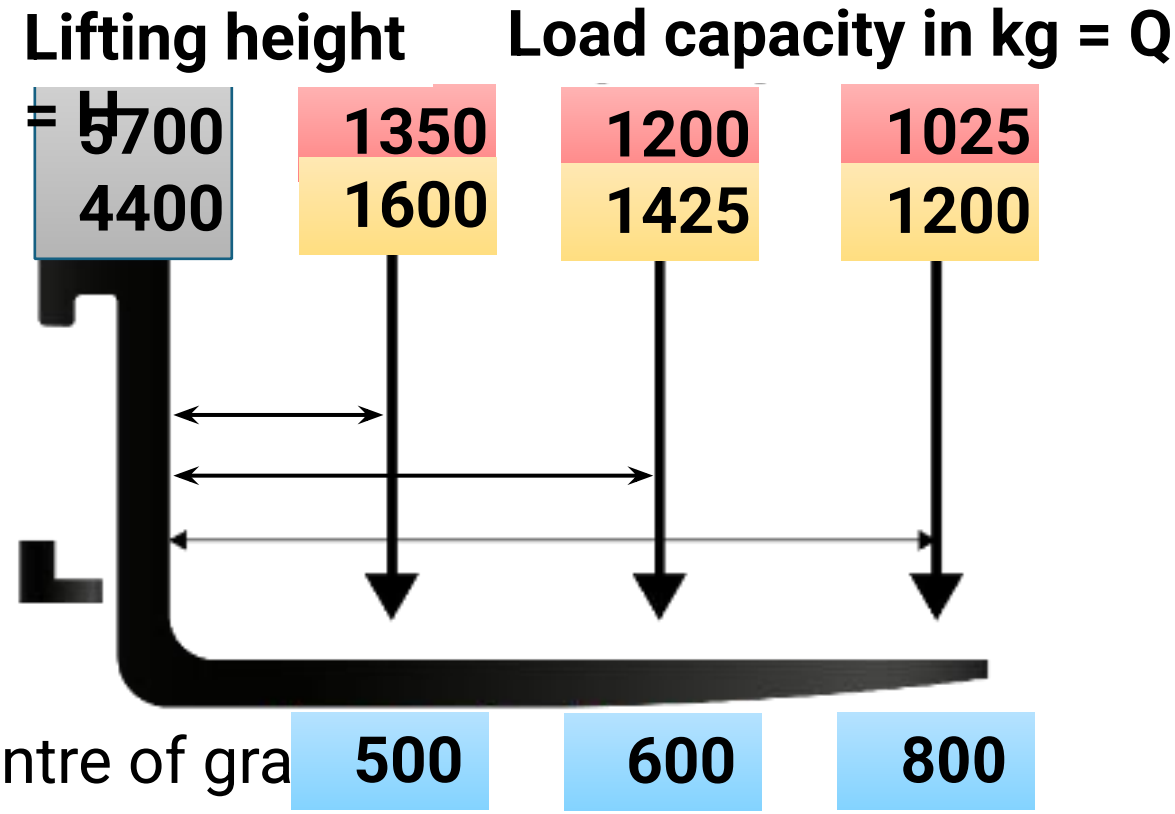
X-axis

Load-capacity diagrams

Solve the exercises

Load capacity charts

2 different lift heights



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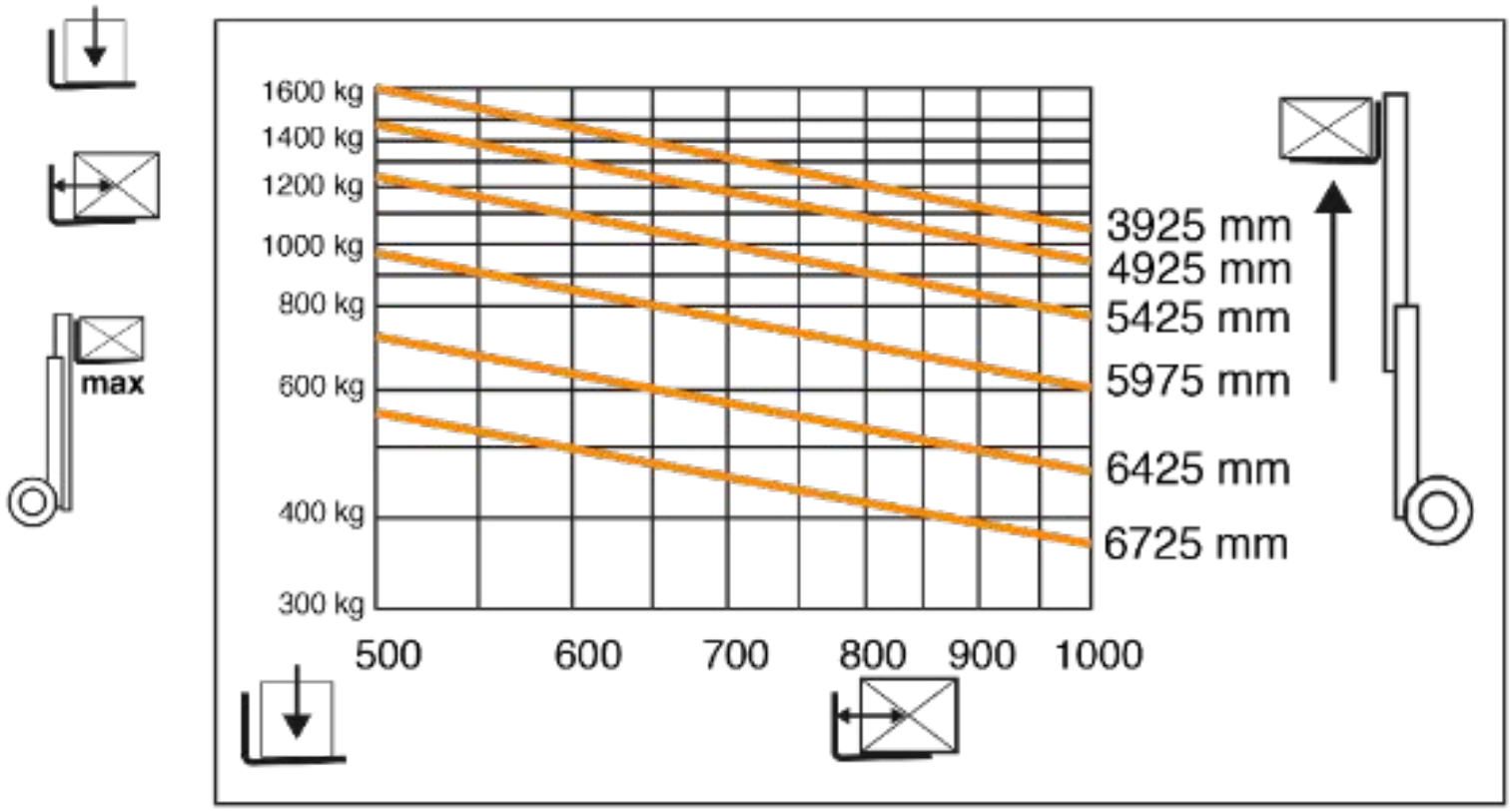
Load-capacity diagrams

Solve the exercises

Load capacity charts



Load-carrying capacity diagrams

Solve the exercises

Load capacity charts

- Fitting of auxiliary equipment (clamp)
- Changes to the load capacity chart
- Dead weight of the attachment
- Lift capacity diagram
  Load capacity chart

This forklift can also be fitted with a clamp (attachment)

Load-bearing capacity diagrams

Question:

- How many kg can I lift using the side shift and how many kg using the clamp at a lifting height of 4 m and a load centre distance of 60 cm?

The side shift can lift **a maximum of 1,400 kg** and the **clamp a maximum of 1,100 kg**.

Load-carrying capacity diagrams

Complete the exercises

Stock-in and stock-out techniquesStock-in and stock-out techniques

Rule of thumb for racks with a depth of 110 cm:

The pallet must protrude approximately 5 cm beyond the spreader beam on each side. This ensures that the pallet blocks at the front and rear rest fully on the spreader beams and that the load is distributed evenly.

Stock-in and Stock-out Techniques

- Read pages 37–45 of R2

Stock-in and stock-out procedures

- Please sort the index cards correctly!
- In groups or individually, depending on group size

Find the donkey

Complete the exercises

Find the dorkey

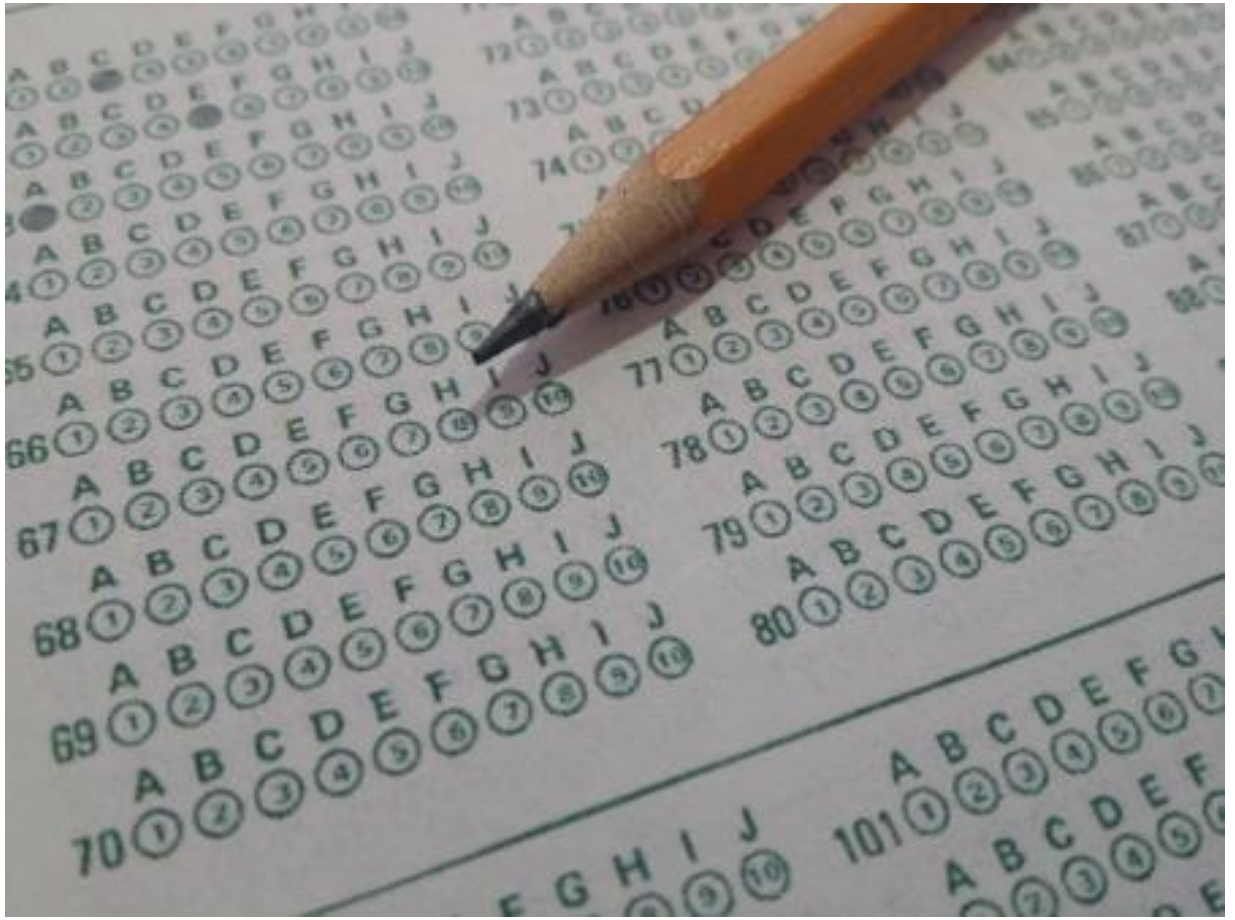
Suchesel Staplerkurs

D	R	E	H	G	A	B	E	L	L	A	S	T	S
K	M	M	Y	V	W	S	N	Q	H	I	V	B	C
H	H	E	B	E	L	G	E	S	E	T	Z	H	H
S	T	A	P	L	E	R	O	C	N	N	G	K	M
P	H	L	K	Y	X	H	T	O	C	D	I	G	A
T	R	A	N	S	P	O	R	T	W	I	F	B	L
I	K	W	U	F	B	Q	R	U	K	A	A	L	G
I	F	X	G	K	E	P	B	W	M	G	H	U	A
K	I	P	P	R	I	S	I	K	O	R	R	E	N
G	J	E	C	P	L	D	W	Z	Q	A	W	S	G
B	S	H	H	I	W	H	Y	A	E	M	E	P	E
H	O	C	H	R	E	G	A	L	N	M	G	O	P
O	O	R	E	W	W	I	G	O	T	M	Y	T	Y
Y	J	N	S	C	H	W	E	R	P	U	N	K	T

Die Wörter können horizontal oder vertikal versteckt sein.

Any questions?

Exam



Course evaluation

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altix
Arbeiten in der Höhe

THANK YOU VERY MUCH