

VNA Cold store solutions

Linde Material Handling



K mod 2008

Requirements and standards

- No interchanging operation (outside operation max. 10 min),
trucks must enter the cold store in dry condition only
- Permanent cold store operation down to -30°C ,
maintenance and repair works are permitted outside of the
cold store area
 - Batteries must be charged outside of the cold store area

Effects of cold store operation

- Auxiliary movements, lifting and lowering are generally slower during cold store operation
- Cold store trucks of cat. 2 and more only allow limited “normal” operation. Above 45 degrees the lubrication of the hydraulic oil is reduced. This may cause high follow-up costs.
During normal operation, the hydraulic oil reaches a temperature of approx. 60 degrees!
- The battery performance during cold store is reduced
- The conditions of the operation can easily extend repair times
- Cold store operation requires special planning.
Advising, project planning and offer must consider the special requirements for cold store operation

Examples of cold store operation and effects



Project planning needs for cold store operation

Cold stores operate at average temperatures of -27°C to -25°C . (dti recommendation)

Actual temperatures drop to -45°C . Such temperatures are specially found close to the cooling units.

Batteries do not render their full nominal capacity at low temperatures.

Charging takes considerably longer. This may mean that the battery is never charged completely.

The trucks or the components must be protected from excessive cold.

Humidity in cold store is very low.

Humidity only condenses from the air outside of the cold store on the cold surfaces of the truck.

Project planning needs for cold store operation

Trucks in cold store design

- Heated control panel, controls and sensors
- Partly heated hydraulic components
- Components, oils and grease suitable for cold store operation
- Lubricable roller bearings
- In the cold store the trucks must always be connected to a power source (battery or constant charger).
- Flattening of the wheels cannot be prevented.
The only efficient solution is to relieve the wheel load during longer brakes (the truck must be lifted up).
- Maintenance intervals every 250 operating hours or every 6 weeks for single shift operation

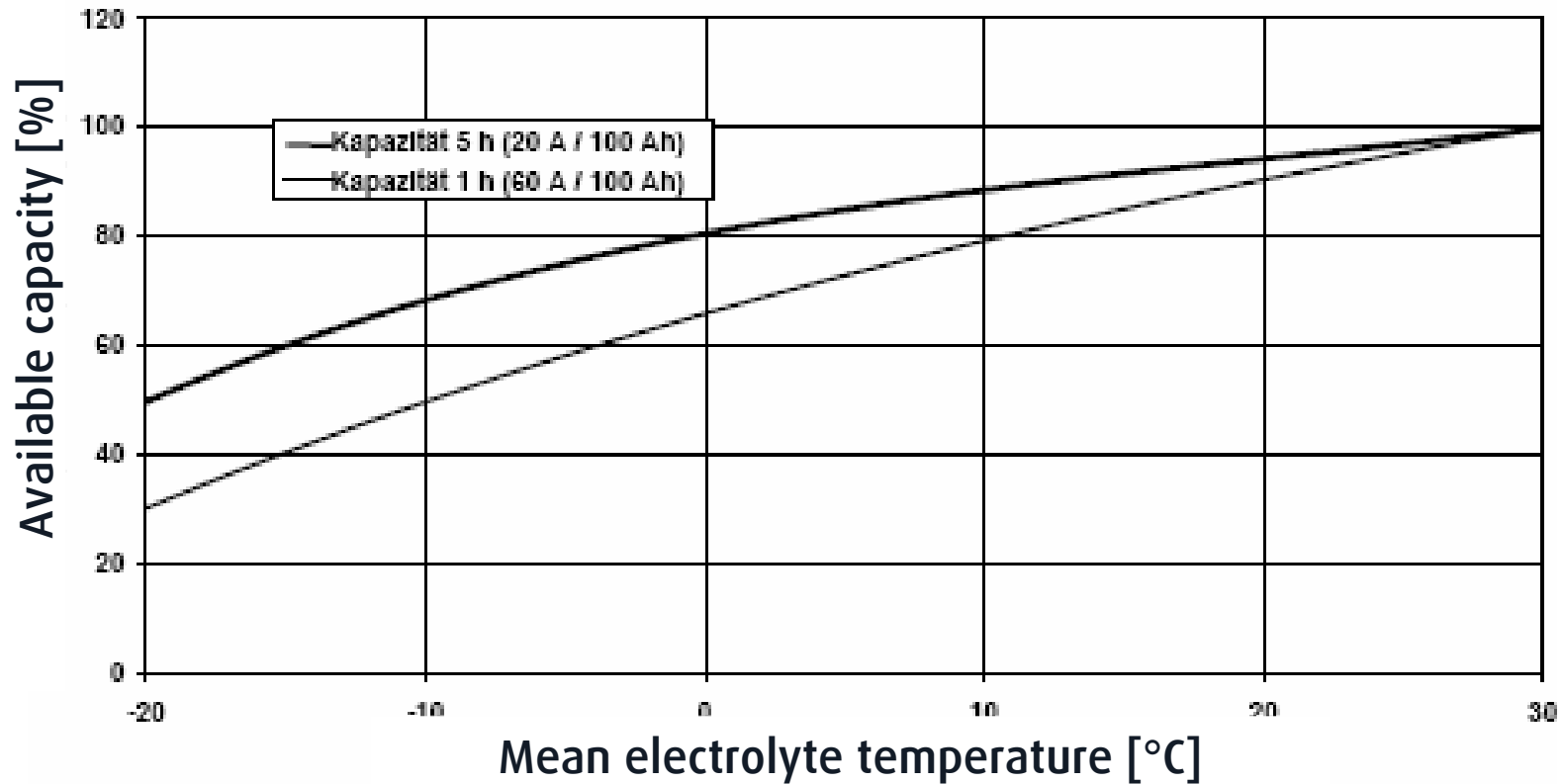
Project planning needs for cold store operation

Batteries for cold store operation

- PzS and PzV batteries can be used for cold store operation. Battery temperature must not drop below 0°C
- Water filling systems make no sense.
The water can freeze in the pipes
- The battery should be as large as possible. Loss of up to 30% of the nominal capacity (for older batteries)
- Always charge batteries outside of the cold store at normal temperature above 0°C only
- Batteries are designed for an operating temperature of +30°C. Lower temperatures have a negative effect on nominal capacity, charging times and service life

Project planning needs for cold store operation

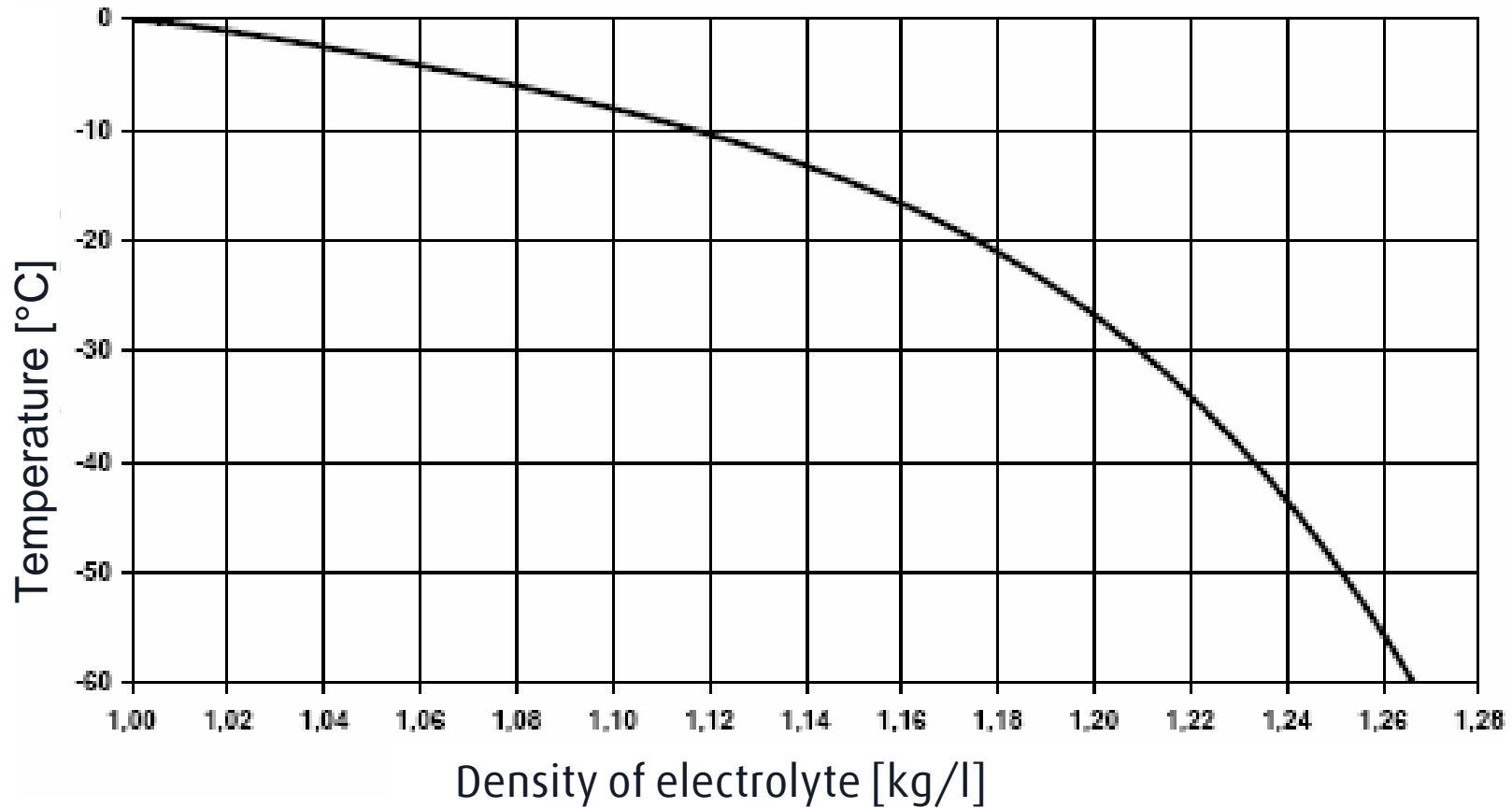
Ratio of mean electrolyte temperature
to capacity (reference values)



Project planning needs for cold store operation



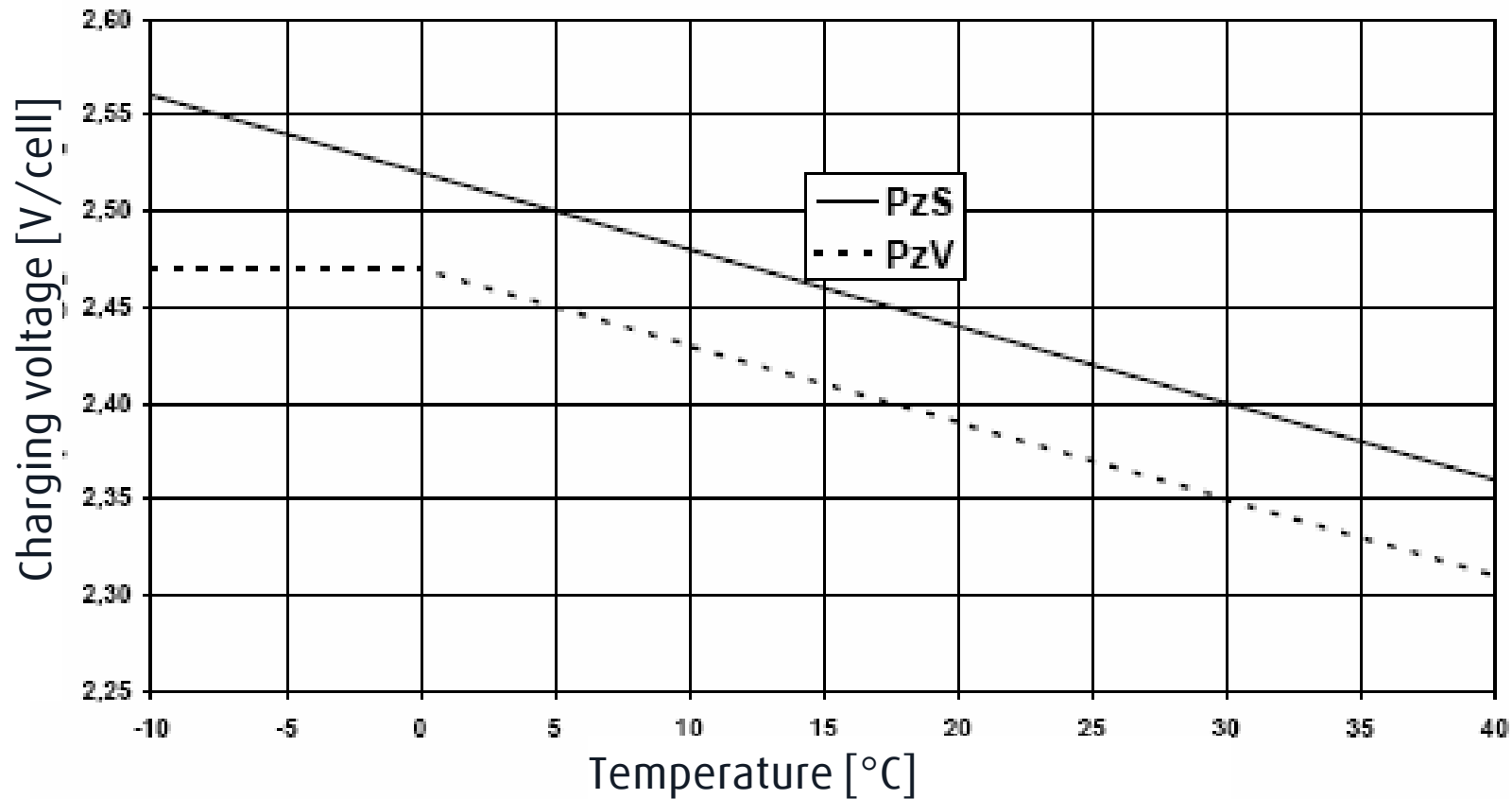
Freeze point curve of electrolyte



Project planning needs for cold store operation



Temperature dependency of the charge voltage during IU-charging



Project planning needs for cold store operation

Summary

- Plan trucks prepared for cold store operation
- Avoid temperatures below -30°C in the cold store
- Flattening of the wheels may disturb at the beginning of a shift
- Define batteries sufficiently large and always charge outside cold store area
- Always use fully charged batteries.
Perform equalizing charge weekly
- No water filling systems
Check operation temperature of other battery systems.
Always refill water after charging
- Plan a constant charger for each cold store truck.
Always connect to power supply

- VNA trucks can be used in cold store down to -30°C with or without cab. Continuous operation only, no interchanging operation!
- Cold store solutions are available as standard option
- Conditions of operation and planning requirements must be considered in the offer phase and especially for the orders
- Failures, faults and damages caused by humidity or ice are damages caused by the customers
- Warranty for 12 months only for single shift operation and if the prescribed conditions and maintenance intervals are met
- Consider higher costs for maintenance and repair for cold store operation

Cold store solution K modular



The cold store cab is a new development :

- Specially for cold store operation down to -30°C and the corresponding requirements
- Design to match the K mod
- Standardised interface with the truck
- Extensive options available
- Equipments and fittings meet the high requirements of a modern mobile work space
- Modern, powerful ventilation and temperature controlled heating ensure comfortable working conditions
- Good view to the front and sides due to large panorama windows. Rear wall with window for good rear view

Cold store cab K modular



Cold store cab K modular

Operation manual for switch unit

1. Operation spotlight on/off
2. Intercom on/off (additional option)
3. Two level ventilation
4. Two level heater switch



Cold store cab K modular

Ventilation,
lighting,
emergency exit



Cold store cab K modular

Heating with thermostat (additional option)



Cold store cab K modular

Control panel,
storage wells,
seat,
door handle,



Cold store cab K modular



Cold store cab K modular

Standard equipment

width $b_{25} = 1400$ mm cab width

- Polycarbonate windows for good all-round view
- Insulated cab walls, floor with floor mat and soft underlay. Textile wall cladding comfortable and noise reducing
- Manual control of ventilation by fan and air openings
- 2 x 1000 W heating with 2 levels, controllable. Air output directly below the panorama window and blowing into the foot room. 2nd level thermostatically controlled
- Left hand sliding door. Easy to open and tightly closing. Guided at top and bottom. Large access and exit
- Inner lighting, operation panel and paper store
- Emergency exit via roof window

Additional options

- Lateral panorama rear mirrors outside and central panorama rear mirror inside
- Switch-on intercom inside cab. Consisting of microphone and loudspeaker inside and outside of the cab
- 2nd sliding door right, polycarbonate windows top and bottom
- Heated polycarbonate panorama front window
- Other cab widths $b_{25} > 1400$ mm possible on request
- Reversing camera with colour monitor in the cab on request. For Ast < 1600 mm no lateral rear mirrors possible!

Cab K mod



Cold store cab and closed cab K mod

The cold store cab maintains the claim of the K mod as the market leader with respect to **design, equipment and quality.**

The K mod offers a top class mobile work place for even better motivation and performance.

- Standard solutions and scope of options available immediately

Thank you for your attention

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Linde

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