I. INFORMATION FOR USING THE LOAD CAPACITY TABLES

DANGER: **The specifications contained in the operating instructions are of vital importance for crane operation. Failure to observe these instructions may lead to ACCIDENTS!**

1. Explanations
2. Crane operating mode "Crane supported"
3. Danger of tipping or danger of overloading occurs when:
4. Telescopic boom
5. Rope winches
6. Hoisting rope reeving
7. Changing between material handling and installation operation
8. LICCON Overload safety device and Limit switch
9. Hook blocks and load hooks
10. Load capacity reduction
    - 10.1Load capacity reduction with folding jib mounted (40 ft - 118 ft)
11. Maximum turning speed of the crane's superstructure with a nominal load
12. Explanation of symbols
    - Hoisting rope reeving
    - Load capacity in pounds (lbs)
    - Operating mode
    - Operating types that can only be operated with accessoriesn!
    - Working radius of the telescopic boom
    - Working radius of the additional jib
    - Telescopic boom length /units of measurement
    - Short code
    - Hoisting rope reeving
    - Extension conditions of the telescopic boom sections
    - Counterweight
    - Crane operations "Crane supported"
    - Slewing range
    - Permissible wind speed
13. Observation of wind conditions
    - 13.1 Wind influence on the LICCON-overload safety device
    - 13.2 Permissible wind speed and surface susceptibility to wind

1. Explanations

1.1 The load capacity values in the tables are stated in kips. (1 kip = 1000 lbs).

1.2 The working radius is the horizontal gravity center distance of the load from the rotational axis of the crane superstructure measured at the ground. The radius stated is valid under load conditions, i.e. including boom flexure.

1.3 Jib positions not indicated in the load capacity charts are not allowed.

1.4 Even without a load, the boom may only be moved inside those areas for which load capacity values are stated, otherwise there is a danger of tilting. In normal operation, this hazard is prevented by the overload safety device. After switching to "Assembly" mode (with the "assembly" key-operated switch), the boom must not be lowered or topped outside the range of the working radius.

1.5 The stated load capacities contain the weights of the load bearing, lifting and slinging tackle. The possible weight for the load to be lifted is therefore reduced according to the weights of the afore-mentioned tackle.

1.6 If the boomnose is mounted on the jib head during crane operation, then the possible load is reduced further corresponding the weight of the boomnose (297 lbs).

2. Crane operating mode "Crane supported"

2.1 Before the crane is raised on its supports, the axle suspension must be blocked.

2.2 The sliding arms of the hydraulic support jack must be extended (to a uniform length on both sides) to the extent stated in the applirope load capacity table.

2.3 The sliding arms must be secured by pins.

2.4 It is necessary to place stable underlay material under the support pads of the support jacks over a large surface area according to ground conditions.

2.5 All wheels must be raised clear of the ground.

2.6 The crane must be aligned horizontally with the aid of the level gauges. The horizontal crane position must be checked occasionally, and if necessary corrected, during crane operation.

3. Danger of tipping or danger of overloading occurs when:

3.1 the slewing platform of an upright crane is turned away from the forward driving direction of the vehicle. Before turning the superstructure, the crane must be supported.

3.2 the four hydraulic supports of the crane are not properly supported and in vertical position,

3.3 the sliding rods are not slid out to the exact measurement specified in the load capacity charts (on both sides),

3.4 the sliding rods are not secured with pins,

3.5 the support pads are not supported with the appropriate base material (surface area too small) for the soil conditions,

3.6 the loads and/or the working radii in the load capacity charts corresponding to the jib length are exceeded or not met,

3.7 cranes are operated too close to landfills, basements and slopes,

3.8 the hook load begins swinging due to improper handling,

3.9 pulling at an angle is executed. Pulling at an angle is most dangerous when it goes against the jib length direction. Pulling at an angle is not allowed!

4. Telescopic boom

4.1 The lifting capacity of the telescopic boom with its 5 extendable telescopic sections is limited. The loads stated in the load capacity tables must not be exceeded.

4.2 The specifications for the telescopic sections to be extended according to load and required boom length must be observed under all circumstances.

4.3 As a general rule, the boom should first be extended to the required length, and then loaded. However, it is possible to extend and retract the boom under partial load. The weight of this partial load is dependent on bearing pad lubrication and the available useable lengths of the telescopic sections.

4.4 Even without a load, the telescopic boom may only be moved within the working radius ranges for which values are listed in the load capacity table.

DANGER: Failure to observe this regulation may lead to accidents!

5. Rope winches

5.1 Winch 1 (main hoisting gear)

Winch 1 is designed for a maximum rope tension of 105 kN. This rope tension must not be exceeded under any circumstances. Accordingly, the minimum number of hoisting rope lines (rope reeving) should be selected according to the weight of the load to be lifted (see Table "Hoisting rope reeving" in Chapter II).

5.2 Winch 2 (Auxiliary hoisting gear)

Winch 2 is designed for a maximum rope tension of 105 kN. This rope tension must not be exceeded under any circumstances. Accordingly, the minimum number of hoisting rope lines (rope reeving) should be selected according to the weight of the load to be lifted (see Table "Hoisting rope reeving" in Chapter II).

5.3 Prevention of rope slack formation:

5.3.1 When retracting the telescopic boom, the winch must be operated in the direction of lifting simultaneously, in order to prevent the hook block from descending to the ground and creating rope slack. The speed of the hoisting rope movement should matched to that used for retraction!

5.3.2 The rope guides on the winches must be supervised by a member of the workforce when additional equipment is being mounted!

6. Hoisting rope reeving

6.1 The hoisting rope must be reeved in between boom head and hook block in accordance with the maximum rope tension of the winch and the weight of the load to be lifted.

6.2 When the hoisting rope is reeved multiple times, the efficiency of the hook block is reduced because of pully friction and rope flexion.
In consequence, with a rope tension of e.g. 105 kN, only 986 kN (218700 lbs) can be pulled with a 10-fold line reeving, instead of 1050 kN (234000 lbs).

6.3 Consult the table "Hoisting rope reeving" in Chapter II of this manual for the maximum loads in dependence on the number of hoisting rope lines.

6.4 The number of hoisting rope lines reeved must be set on the control and display unit of the LICCON overload safety device according to the current hoisting rope reeving total.

6.5 If the block hook is operated with a higher reeve number than necessary for the respective boom lenght loads, then the block hook weight will not be sufficient and can slacken the cable when lowering, whitch can lead to damage to the cable.

7. Changing between material handling and installation operation

7.1 Load carrying capacity of the crane

The load carrying members of the crane have been designed according to the load criteria for installation /set up operations (load collective classification = "light" = Q1 or L1). Stress collective S1 according to DIN 15018 Part 3 and stress margin range N1 according to DIN 15018 Part 1 or ISO 4301, group A1.
If an installaton / set up crane is used material handling, the stress margin rangs increases. Therefore the loads must be reduced since a higher stress group now be applicable. This is especially true if the calculated loads are limited by strength values.

CAUTION: **For crane value calculation, it has been assumed that the crane will be utilized as an installation crane** (load collective classification = "light" = Q1 or L1)**. If the crane is also used in material handling application, premature wear of all drive sections must be expected, and cracksmay occur in load carrying steel members. We therefo-restronglyrecommend, that if the crane is utilized in material handling application, the load values are reduced by 50 %, as compared to the data given in the corresponding load carrying capacity chart.**

For details, have material handling data ready and then contact your Liebherr Service Dept.

The size of the cables as well as drive sections of hoist gears are configured according to the load collectives applicable for installation operation (load collective classification = "light" = Q1 or L1):

ISO 4301/2 or 4308/2
Group A1
Hoist gears M3
Intake gears M2

If an installaton / set up crane is used material handling (load collective classification = "light" = Q1 or L1), the stress margin range increases, the rope runs must therefore be reduced. If this in not assured, then the hoist rope wear out rate will be reached much earlier, and / or the hoist gear must be rebuilt / serviced much earlier.

Please refer to the information regarding wear out criteria for ropes according to DIN 15020, part 2 or ISO 4309 in chapter 8.01 "Repeat crane inspections" in the crane's Operating Instructions.

NOTE: **In order to keep wear out rate of hoist ropes as low as possible during material handling operation (load collective classification = "medium" or higher) , we recommend the use of a special length rope, so thatduring material handling operation the rope is rolled onto drum of the hoist winch in only one rope layer**
If several layers are on the rope drum, the wear rate increases. In addition, the winch drive will run cooler, if the crane is operated with only one rope layer.

8. LICCON Overload safety device and Limit switch

If the permissible load moment is exceeded, the electronic LICCON overload safety device shuts down the hoisting, boom topping and boom extension movements. It is possible to decrease the load by means of movements in the opposite direction. The LICCON overload safety device must be checked for correct operation on each occasion before operating the crane.

8.1 The LICCON overload safety device must be set to the current equipment mode of the crane by means of function keys or by entering the corresponding 4-digit code.

8.2 The LICCON overload limit switch is a safety device and must not be used as a shut-down device for operating purposes. The crane operator must assure himself of the weight of a load before attempting to lift it. The fact that the crane is equipped with the LICCON overload safety device does not free the operator from responsibility with regard to operating safety.

8.3 The control and display unit of the LICCON overload safety device indicates among other things the working radius, boom length, pulley height, load and degree of crane load utilization. This provides the operator with a constant overview of the working range and crane utilization.

8.4 Hoisting limit switches at the head of the telescopic boom and folding fly jib prevent the hook block from running up against the boom head. The hoisting limit switches must be checked for correct operation on each occasion before the crane is operated.

8.5 Gear cam limit switches on the rope winches ensure that 3 safety turns remain on the rope drums. When the final rope layer is reached, a visual check is also necessary to ensure that the 3 safety turns are available. If the hoisting gears have been overturned in the lifting direction, or if the hoisting rope has been changed, then the corresponding limit switch must be reset before resuming operation.

8.6 The crane operator must check correct operation of the LICCON overload safety device on each occasion before operating the crane. The crane manufacturer will accept no liability for damage to the crane and consequential damage resulting from non-function or disactivation of the LICCON overload safety device.

9. Hook blocks and load hooks

Load [kps]	Number of rope pulleys	strings	weight [t]	weight [kps]
386.757	9	19	2,400	5.292
314.433	7	15	1,700	3.748
238.802	5	11	1,450	3.197
156.555	3	7	1,040	2.293
69.020	1	3	0,870	1.918
23.373	-	1	0,500	1.102

10. Load capacity reduction

10.1 Load capacity reduction with folding jib mounted (40 ft - 118 ft)

10.1.1 The load capacity values stated for the telescopic boom in the load capacity tables apply to the boom without installation of a folding fly jib for transport or operating purposes.

10.1.2 When operating the crane, the folding jib is mounted at an angle from **0°** to the telescopic jib, the possible load capacities of the telescopic jib are reduced according to the chart below. The weight of the hook block for TK operation of 1102 lbs and 1918 lbs respectively, must be considered.

Position of the folding jib	[ft]	T-43	T-59	T-72	T-85	T-98	T-115
Entire folding jib sideways on the jib pivoting section	[kps]	2.778	2.095	1.676	1.411	1.213	1.058
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	9.041	14.333	10.364	10.364	14.333	10.364
K-22,0 m on the jib head	[kps]	13.671	24.255	16.538	16.538	24.255	16.538
K-29,0 m on the jib head	[kps]	18.302	34.398	22.491	22.491	34.398	22.491
K-36,0 m on the jib head	[kps]	23.814	46.526	29.768	29.768	46.526	29.768

Position of the folding jib	[ft]	T-128	T-141	T-157	T-171	T-184	T-197
Entire folding jib sideways on the jib pivoting section	[kps]	0.948	0.860	0.771	0.705	0.662	0.617
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	10.364	8.820	8.159	8.159	8.159	7.938
K-22,0 m on the jib head	[kps]	16.538	13.451	11.907	11.907	11.907	11.687
K-29,0 m on the jib head	[kps]	22.491	18.081	15.876	15.876	15.876	15.215
K-36,0 m on the jib head	[kps]	29.768	23.373	20.065	20.065	20.065	19.404

10.1.3 When operating the crane, the folding jib is mounted at an angle from **20˚** to the telescopic jib, the possible load capacities of the telescopic jib are reduced according to the chart below. The weight of the hook block for TK operation of 1102 lbs and 1918 lbs respectively, must be considered.

Position of the folding jib	[ft]	T-43	T-59	T-72	T-85	T-98	T-115
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	9.923	14.553	11.466	11.466	14.333	11.687
K-22,0 m on the jib head	[kps]	16.317	26.901	20.066	21.168	27.783	21.168
K-29,0 m on the jib head	[kps]	22.712	40.131	28.886	31.311	41.675	31.311
K-36,0 m on the jib head	[kps]	30.429	56.007	39.470	43.218	58.433	43.218

Position of the folding jib	[ft]	T-128	T-141	T-157	T-171	T-184	T-197
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	11.687	10.143	9.482	9.482	9.482	9.261
K-22,0 m on the jib head	[kps]	21.168	17.640	15.656	15.656	15.656	15.215
K-29,0 m on the jib head	[kps]	31.311	25.578	22.271	22.271	22.271	21.389
K-36,0 m on the jib head	[kps]	43.218	34.839	29.988	29.988	29.988	28.665

10.1.4 When operating the crane, the folding jib is mounted at an angle from **40˚** to the telescopic jib, the possible load capacities of the telescopic jib are reduced according to the chart below. The weight of the hook block for TK operation of 1102 lbs and 1918 lbs respectively, must be considered.

Position of the folding jib	[ft]	T-43	T-59	T-72	T-85	T-98	T-115
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	11.466	18.963	14.333	14.333	20.506	15.876
K-22,0 m on the jib head	[kps]	19.845	36.823	26.460	30.429	41.013	30.429
K-29,0 m on the jib head	[kps]	28.224	55.566	38.808	45.423	62.401	45.423
K-36,0 m on the jib head	[kps]	38.367	78.057	53.802	63.284	88.200	63.283

Position of the folding jib	[ft]	T-128	T-141	T-157	T-171	T-184	T-197
K-12,2 m on the jib head, the rest on the jib pivoting sectionk	[kps]	15.876	13.450	11.907	11.907	11.907	11.466
K-22,0 m on the jib head	[kps]	30.429	24.475	21.168	21.168	21.168	20.286
K-29,0 m on the jib head	[kps]	45.423	36.162	30.870	30.870	30.870	29.547
K-36,0 m on the jib head	[kps]	63.283	49.833	42.336	42.336	42.336	40.131

11. Maximum turning speed of the crane's superstructure with a nominal load

Boom [ft]	permissible slewing speed in $\left[\frac{1}{\text{min}}\right]$	
	75%-ISO-DIN load charts	**85%** load charts
T-43	0.38	0.23
T-59	0.38	0.23
T-72	0.38	0.23
T-85	0.38	0.23
T-98	0.23	0.23
T-115	0.23	0.23
T-128	0.23	0.23
T-141	0.23	0.23
T-157	0.23	0.23
T-171	0.23	0.23
T-184	0.23	0.23
T-197	0.23	0.23
TK-operation	0.23	0.23

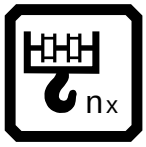
*****85%-capacity load charts are marked in the upper left-hand area of thecorresponding pages of the tables with the symbol **"85%"**.

With 85% capacity load charts, nominal loads may only be moved with the slowest lifting or luffing speeds.

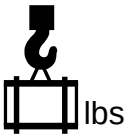
DANGER: **Should this not be noted, there is a great DANGER OF ACCIDENT!**

12. Explanation of symbols

Hoisting rope reeving



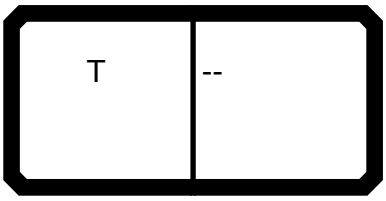
This symbol appears on the hoisting rope reeving table (1st table of chapter II) and indicates the required number of hoisting rope reevings to achieve a certain load capacity.



Load capacity in pounds (lbs)

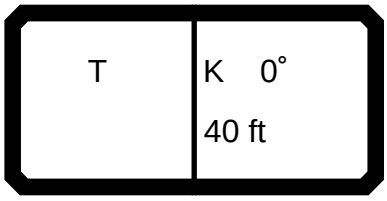
This symbol appears on the hoisting rope reeving table (1st table of chapter II) and indicates the max. permissible load capacity depending on hoisting rope reeving

Operating mode



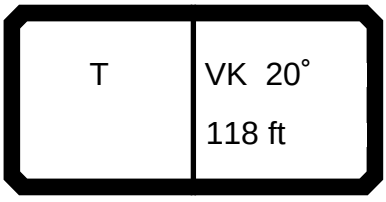
2part symbol
left side = Main boom mode
example:

- Main boom type — ex.: T=Telescopic boom



right side = Additional jib mode
example:

- Additional jib type — ex.: K=folding fly jib
- Angle of the additional jib — ex.: 0° = 0 deg. offset from main boom.
- Additional jib length — ex.: 40 ft

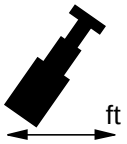


right side = Additional jib mode
example:

- Additional jib type — ex.: V = lattice jib extension
  ex.: K = folding fly jib
- Angle of the additional jib — ex.: 20° = folding fly jib, mounted at an angle of 20° to the telescopic boom with lattice jib extension.
- Additional jib length — ex.: 118 ft m = length of folding fly jib

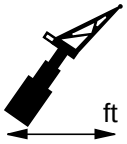
Operating types that can only be operated with accessoriesn!

- Max. load capacity — ex.: 469 kips



Working radius of the telescopic boom

The working radius is the horizontal distance of the center of gravity of the load to the slewing axis of the crane superstructure as measured from the ground beneath the load.



Working radius of the additional jib

The working radius is the horizontal distance of the center of gravity of the load to the slewing axis of the crane superstructure as measured from the ground beneath the load.

Telescopic boom length /units of measurement

In the row beneath this symbol the different boom length of the crane are indicated in columns. The letters next to the symbol indicate the units of measurement in the actual load chart, par example “ m> <t“ means that all lengths are given in meters [m] and all weights are given in metric tons [t]. Other possible units of measurement are feet [ft] and pounds [lbs] (lifting capacities in [kips] = 1000 lbs).

CODE 〉0001〈

Short code

4-digit short code; can be directly entered into the LICCON overload safety device in order to call up the corresponding load chart.

* n *

Hoisting rope reeving

Appears in the load charts as a line below the load capacity values. Indicates the number of hoisting rope reevings required to hoist the maximum load in the corresponding load chart column. If a load capacity value in the column exceeds the load which can be lifted with the maximum reeving, then an exclamation mark (!) is next to the reeving number to signify that special equipment is required to lift this load

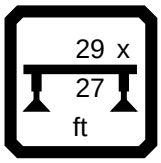
- Loads over 297.675 kips with additional pulley block

Extension conditions of the telescopic boom sections

Indications i percent for the individual telescopic sections (Tele 1 / Tele 2 / Tele 3 / Tele 4 / Tele 5). Indication 0 = completely retracted, 100 = completely extended. Extension conditions other than those specified in the load charts are prohibited.
A + symbol after a percentage entry means that the corresponding telescope parts are pinned down.
The status indicator "-" next to the extension condition in percentages means that the corresponding telescopic section can be telescoped out under load to the extension condition value shown in percentages (according to the load capacity chart).

Counterweight

In this symbol, the size of the counterweight is indicated in pounds [lbs] which must be on the crane superstructure in order to achieve the values of the given load chart.



Crane operations "Crane supported"

Indication of the support base (ex.: 29 ft x 27 ft = length x width). The hydraulic supports of the crane must be extended to the dimensions specified in this symbol and pinned when the corresponding load chart is being worked with

Slewing range

Slewing range data of the crane superstructure for the corresponding load capacity table:

- 360˚ = unlimited slewing permissible
- ! 0˚ = working range to the rear
- 0˚ = working range to the rear

The appearance of ! 0˚ indicates that a load chart also exists for the 360˚ working range for the same equipment mode. If the slewing platform locking is not engaged, the LICCON automatically switches to the weaker load chart for the 360˚ working range. The displayed abbreviated code is different for the ! 0˚ working range and the 360˚ working range. If 0˚ appears, this means that there is no corresponding 360˚ load capacity table. In this case, if the slewing platform lock is not engaged, crane operation is not possible.

Permissible wind speed

Indication of wind speed in [ft/s] up to which crane operation is permissible depending on boom length. If the wind speed exceeds the indicated value, crane operations must be terminated, and if necessary, equipment must be removed from the crane.

13. Observation of wind conditions

13.1 Wind influence on the LICCON-overload safety device

When working in operation modes involving long boom systems and steeper boom positions in particular, the wind can either increase or ease additional duress on the crane system. The load will then be incorrectly displayed, and the LMB can shut down too early or too late.

13.1.1 Wind from the rear

With wind from the rear the boom system will be under increased duress. The load being displayed is too high. LMB-shutdown occurs with loads smaller than the max. load.

13.1.2 Wind from the front

With wind from the front the boom system will be eased of duress. The load being displayed is too low. LMB-shutdown will only occur with loads greater than the max. load.

DANGER: **Wind from the front will not relieve duress from the hook, hoist cable, cable pulleys or the hoisting winch. These units can become overloaded through lifting to the point of LMB-shutdown with wind from the front!**

The entire crane can become overloaded when wind from the front eases, if it has previously been loaded to the point of LMB-shutdown!

The operator must therefore be aware of the load weight and may

not then exceed the max. load!

There is SERIOUS RISK OF ACCIDENT if these points are not observed!

13.2 Permissible wind speed and surface susceptibility to wind

13.2.1 Crane operation is permissible up to the wind velocity stated in the load capacity table corresponding to the current boom length.

DANGER : The crane operator must consult the local meterological office for information on the expected wind velocity prior to commencing operations. If unacceptable wind velocities are forecast, it is not permissible to lift a load. Failure to observe this precaution may result in accidents!

13.2.2 The wind surface A_W of the load must not exceed certain values. These values are stated in Diagram 1 (see next page).
If the wind surface of the load exceeds the diagram values, the wind velocity up to which crane operation is permissible is reduced correspondingly (note example below).

DANGER : Even if the wind surface of the load is smaller than the reference surface, it is prohibited to operate the crane if wind velocity exceeds the limits stated in the load capacity tables! Failure to observe this rule will lead to risk of accidents!

13.2.3 Example:

Weight of the load in accordance with load chart:

m = 50.0 t (110250 lbs)

Permissible wind speed according to load capacity table:

v = 9.0 m/s (29.5 ft/sec)

Permissible load wind surface area, diagram 1:

A_{Wz} = 55.0 m^2 (592.1 sqft)

Actual load wind surface area:

A_{Wr} = 100.0 m^2 (1076.5 sqft)

Diagram 2 yields for v = 9 m/s (29.5 ft/sec) an impact pressure of:

p = 50.0 N/m^2 (4.645 N/sqft)

Accordingly, a force F acts upon a load with the permissible wind surface area

A_{Wz} = 55 m^2 (592.1 sqft):

F = impact pressure p x wind surface area A_{Wz}

F = 4.645 N/sqft x 592.1 sqft = 2750 N

For the actual wind surface area A_{Wr} = 1076.5 sqft, a permissible impact pressure p is yielded for the same force F:

p = F / A_{Wr} = 2750 N / 1076.5 sqft = 2.555 N/sqft

A maximum permissible wind speed of v = 6.7 m/s (22.0 ft/sec) is yielded for p = 27.5 N/m^2 (2.555 N/sqft) from diagram 2

Diagramm 1

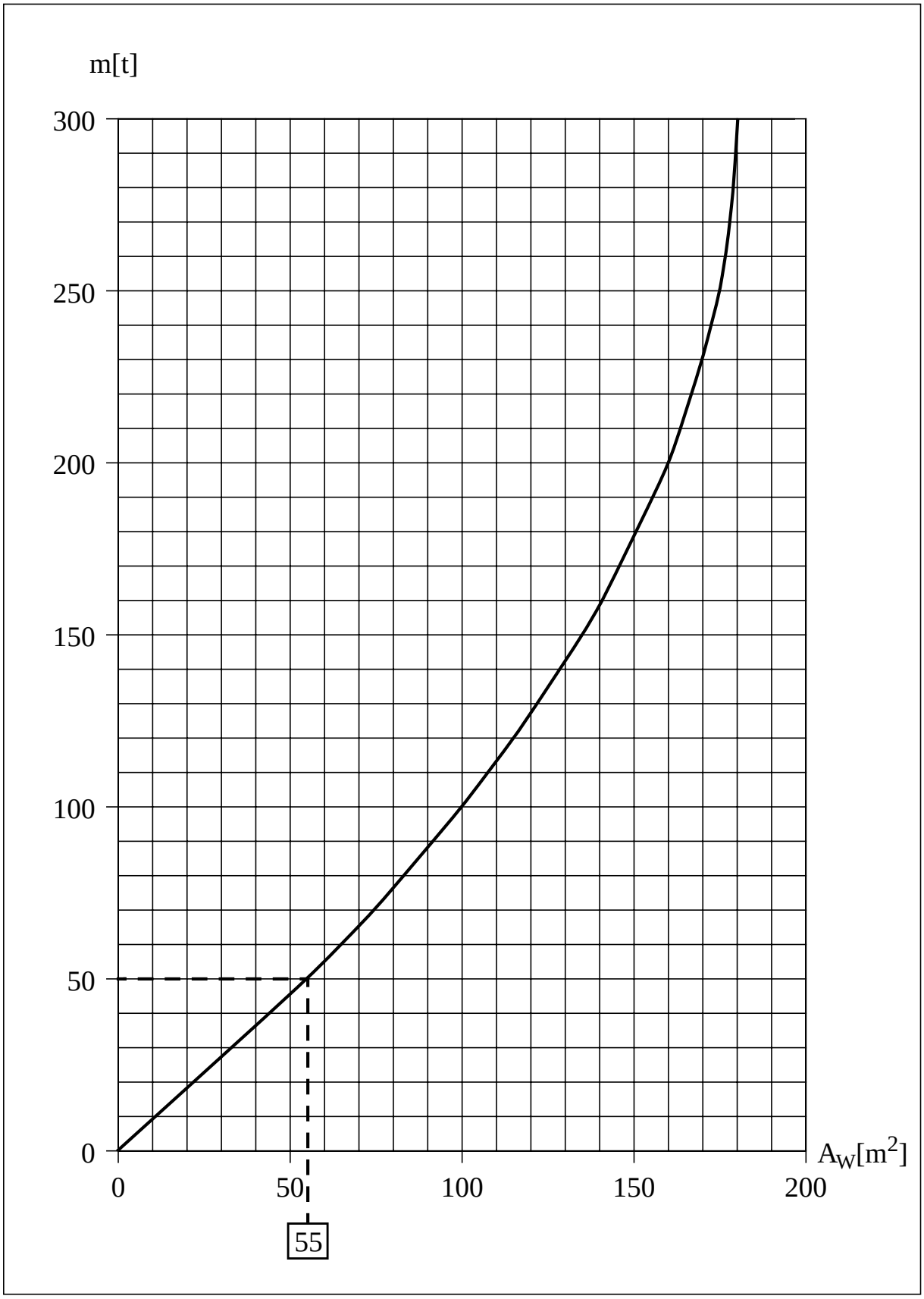


Diagramm 2