



Maximum Strain



Deep Drawing Cup Test

**Universal
Sheet Metal
Testing Machine
Model
145-60 Basic**



Square Deep Drawing Cup Test



**Software for
Documentation and Filling
of Measuring Data**

testing equipment for quality management



Technical Description

**NAKAJIMA-Test
MARCINIAK-Test
Bulge-Test**

**Extensive
Tools / Accessories**

**With
electro-hydraulic Drive
and PLC**

Product

Universal Sheet Metal Testing Machine, Model 145-60 Basic, with electro-hydraulic drive, manual test head opening, fully automatic test sequence and switch-off at specimen failure.

The Testing Machine is equipped with a drawing force and a pre-setting blank holder pressure of **600 kN**, including an increased blanking force and blank holder force for blank diameters up to 220 mm.

Application

This Sheet Metal Testing Machine is not only ideal for the effortless, quick and accurately all important and known-deep drawing tests for ferrous and non-ferrous metals, it is also designed for a large number of additional technological investigations:

ERICHSEN Cupping Test in accordance with

DIN EN ISO 20482	JIS Z-2247
NF A 03-602	
NF A 03-652	
ASTM E 643-09	GOST 10510
GB 4156-07	

on sheet and strip 0.1 to 6.0 mm thick

ERICHSEN Deep Drawing Cup Test in accordance with

DIN EN 1669
ISO 11 531
JIS Z 2249
GB/T 15825

Square Cup Test (40 x 40 mm or 70 x 70 mm)

Bore Expanding Test (ISO 16630)

Determination of the Forming Limit Curves (FLC)

LDH Test

Deep Drawing Tests with Blankholder Quick Release (for Earing Test)

Deep Drawing Tests with Preselected Punch Stroke

Deep Drawing Test at High Temperatures up to 550 °C

Bulge Test in accordance with ISO 16808

ERICHSEN Cupping Test for Lacquer and Paint in accordance with DIN ISO 1520

Stamping Lacquer Test and Deep Drawing Cup Test on Coil Coatings

Special Requirements on request.

Description

The Testing Machine is driven electro-hydraulically. The test sequence is controlled automatically or manually as appropriate. The drawing force and blankholder force as well as the drawing punch stroke are digitally displayed. The triple-acting hydraulic system in conjunction with the general design results in the following cost saving simplifications:

- ◆ Blanking press in the head (blanking force maximum 800 kN)
The blanks are punched and deep-drawn in one step
- ◆ Hydraulic cup ejector
Easy removal of the cups.
- ◆ Fully-automatic test sequence
A programme logic controller is used for the functions of the machine, i.a. automatic stop at specimen failure.

Further technical advantages:

- ◆ Security / Safety
An integrated access protection of the clamping cylinder protects the operator from injury. The electronic interrogation of the head position prevents tarnishing of the machine with open lid.
- ◆ User-friendly
Clear arrangement of the control elements on the slanted control panel (ergonomic works)
- ◆ Cylinder head with bayonet lock
permitting direct access to drawing dies, blanking rings, blank holders etc. and quick and convenient changing of the drawing and blanking tools
- ◆ Infinitely variable drawing speed
once set it remains constant throughout the drawing movement, independent of any change of load
- ◆ Cardanic drawing die retention
ensures the consistent, parallel clamping of the specimen, independent of variations in thickness
- ◆ Sheet holder quick release (BSA function) optionally preselected
prevents squashing of the ear-ends in the final phase of the deep-drawing process - when reaching the on the digital display preselected drawing punch path, the sheet holder force is released
- ◆ Drawing punch stop (ZS function) optionally preselected
When the preselected drawing punch on the counter is reached, the machine currently stopped in the ZS function and the sheet holder force in the BSA function will be relieved. The "drawing punch stop" is limited to the drawing speed up to 20 mm/min.

Accessories (Option)/Additional features

Hydraulically lifted test head

Hydraulic test head lifting function (*Fig. 1*) ensures a high rate of working safety and facilitates convenient testing due to the fact that the test head is hydraulically opened and closed.

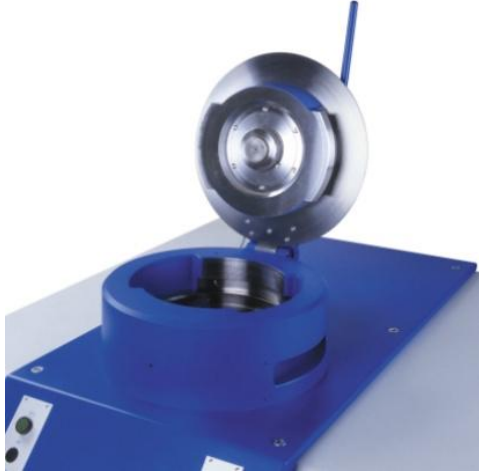


Fig. 1

Hot Drawing Equipment up to 550 °C

A further valuable addition to the possibilities offered by Model 145 is provided by the additional hot drawing equipment (*Fig.2*). In this, the blank holder and drawing die are heated in an insulated container and special provision is made to enable these then to be set up without difficulty on the machine. An electronic temperature measuring device is incorporated, and on this the preset intended temperature and the current measure temperature are displayed. The preset temperature can be set up to 550 °C, and in the test, the temperature remains constant within ± 1 °C.

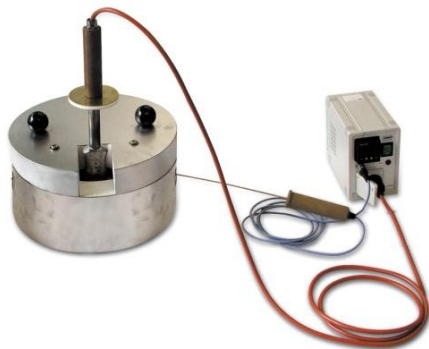


Fig. 2

HEXRASCAN I / II

Camera with traversing bar and lighting, for rupture detection according to ISO 16630 'hole expansion test' (HEXRASCAN I) or for strain measurement on flat sheet metal specimen (e.g. PV 1054) (HEXRASCAN II).

An appropriate recording and analysis software is included.

Fig. 3

Special Applications

The Sheet Metal Testing Machine, Model 145-60 Basic, can be customized and extended to accommodate special requirements (*Fig. 4*), e.g. determination of forming limit curves (FLC) using a 3D.

Generally the sheet metal testing machine will be equipped with proportional technology and difference pressure measuring.

As option it is possible to select a PC controls/regulation with software.



Fig. 4

ErMES – Data logger for recording the measurements

The software enables the continuous acquisition of measured values with simultaneous display of the force/displacement diagram throughout the forming process. The data recording will be stopped after the maximum force is achieved in a cupping test or the deep draw test is finished.

This data is presented immediately on the VDU on completion of the test alongside the graph of the force against displacement. (fig.5)

Either a printout can then be obtained and the data saved or the data can be easily transferred to other evaluation programmes (e.g. Microsoft Excel).

The scope of supply includes PC, VDU and printer.

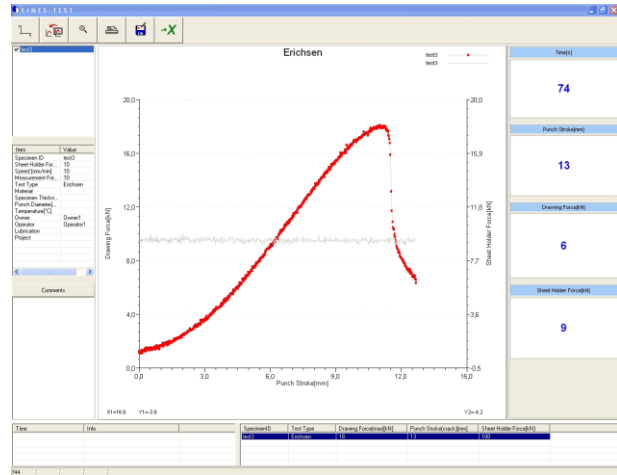


Fig. 5

The Universal Sheet Metal Testing Machines, Model 145-60 Basic, together with the wide range of accessories can be comprehensively adapted to individual requirements. Since due to the tremendous number of different applications our price lists cannot take all conceivable tools and accessories into account, please contact us if you have any special requirements. This will enable us to draw up a quotation according to your specific needs.

Technische Daten

Drawing force, max.	600 kN
Blanking force, max.	800 kN
Sheet holder force, max.	600 kN
Drawing punch stroke	approx. 150 mm
Sheet holder punch	approx. 38 mm
Ejector stroke	approx. 150 mm
Drawing punch dia.	up to 100 mm
Blank dia.	up to 220 mm (bigger diameter upon request)
NAKAJIMA-/MARCINIAK Test (punch dia.)	up to 100 mm
BULGE Test (Bulge dia.)	up to 100 mm
Drawing speed	approx. up to 500 mm/min
Digital indicators	resolution
Drawing punch stroke	0.1 mm (on request 0.01 mm)
Drawing force	0.1 kN
Sheet holder force	0.1 kN
Mains supply	400 V / 3 ~, 50/60 Hz (other voltages on request)
Power required	10,3 kW
Dimensions (W x D x H)	approx. 2250 x 1320 x 1460 mm
Net weight	approx. 2600 kg

**Selection table for drawing dies B1/C2
(#01370132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)
Norm: ERICHSEN

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,076	28	0,85
2	0,100	29	0,90
3	0,127	30	0,95
4	0,13	31	1,00
5	0,14	32	1,10
6	0,15	33	1,15
7	0,18	34	1,20
8	0,20	35	1,25
9	0,21	36	1,30
10	0,23	37	1,40
11	0,24	38	1,50
12	0,25	39	1,60
13	0,26	40	1,70
14	0,27	41	1,80
15	0,28	42	1,90
16	0,30	43	2,00
17	0,32	44	2,10
18	0,35	45	2,20
19	0,40	46	2,30
20	0,45	47	2,40
21	0,50	48	2,50
22	0,55	49	2,60
23	0,60	50	2,65
24	0,65	51	2,70
25	0,70	52	2,8
26	0,75	53	2,9
27	0,80	54	3,0

**Selection table for drawing dies B1/C2
(#01370132)**

valid for **aluminium and aluminium alloy**
Norm: DIN EN 1669

valid for Clearance ratio 1,15 bis 1,52		valid for Clearance ratio 1,34 bis 1,76	
1	0,095 < s ≤ 0,120	1	0,080 < s ≤ 0,100
2	0,121 < s ≤ 0,150	2	0,101 < s ≤ 0,125
3	0,151 < s ≤ 0,185	3	0,126 < s ≤ 0,157
4	0,186 < s ≤ 0,235	4	0,158 < s ≤ 0,195
5	0,236 < s ≤ 0,280	5	0,196 < s ≤ 0,240
6	0,281 < s ≤ 0,345	6	0,241 < s ≤ 0,290
7	0,346 < s ≤ 0,435	7	0,291 < s ≤ 0,360
8	0,436 < s ≤ 0,535	8	0,361 < s ≤ 0,450
9	0,536 < s ≤ 0,665	9	0,451 < s ≤ 0,555
10	0,666 < s ≤ 0,800	10	0,556 < s ≤ 0,670
11	0,801 < s ≤ 0,940	11	0,671 < s ≤ 0,800
12	0,941 < s ≤ 1,130	12	0,801 < s ≤ 0,965
13	1,131 < s ≤ 1,450	13	0,966 < s ≤ 1,250
14	1,451 < s ≤ 1,900	14	1,251 < s ≤ 1,600
15	1,901 < s ≤ 2,350	15	1,601 < s ≤ 2,000
16	2,351 < s ≤ 2,900	16	2,001 < s ≤ 2,400
17	2,901 < s ≤ 3,500	17	2,401 < s ≤ 3,000

**Selection table for drawing dies B1/C2
(#01370132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)
Norm: ISO 11531

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,1 < s ≤ 0,2	4	0,8 < s ≤ 1,6
2	0,2 < s ≤ 0,4	5	1,6 < s ≤ 3,0
3	0,4 < s ≤ 0,8		

**Selection table for drawing dies B2/C3
(#01430132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ERICHSEN

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,076	43	2,00
2	0,100	44	2,10
3	0,127	45	2,20
4	0,13	46	2,30
5	0,14	47	2,40
6	0,15	48	2,50
7	0,18	49	2,60
8	0,20	50	2,65
9	0,21	51	2,70
10	0,23	52	2,8
11	0,24	53	2,9
12	0,25	54	3,0
13	0,26	55	3,1
14	0,27	56	3,2
15	0,28	57	3,3
16	0,30	58	3,4
17	0,32	59	3,5
18	0,35	60	3,6
19	0,40	61	3,7
20	0,45	62	3,8
21	0,50	63	3,9
22	0,55	64	4,0
23	0,60	65	4,1
24	0,65	66	4,2
25	0,70	67	4,3
26	0,75	68	4,4
27	0,80	69	4,5
28	0,85	70	4,6
29	0,90	71	4,7
30	0,95	72	4,8
31	1,00	73	4,9
32	1,10	74	5,0
33	1,15	75	5,1
34	1,20	76	5,2
35	1,25	77	5,3
36	1,30	78	5,4
37	1,40	79	5,5
38	1,50	80	5,6
39	1,60	81	5,7
40	1,70	82	5,8
41	1,80	83	5,9
42	1,90	84	6,0

**Selection table for drawing dies B2/C3
(#01430132)**

valid for **aluminium and aluminium alloy**
Norm: DIN EN 1669

gültig für Clearance ratio 1,15 bis 1,52		gültig für Clearance ratio 1,34 bis 1,76	
1	3,501 < s ≤ 4,100	1	3,001 < s ≤ 3,500
2	4,101 < s ≤ 5,000	2	3,501 < s ≤ 4,400
3	5,001 < s ≤ 6,000	3	4,401 < s ≤ 5,300

**Selection table for drawing dies B2/C3
(#01430132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ISO 11531

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,1 < s ≤ 0,2	4	0,8 < s ≤ 1,6
2	0,2 < s ≤ 0,4	5	1,6 < s ≤ 3,0
3	0,4 < s ≤ 0,8		

**Selection table for drawing dies B3/C4
(#01480132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ERICHSEN

(only for model 142-40-Basic)

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,076	31	1,00
2	0,100	32	1,10
3	0,127	33	1,15
4	0,13	34	1,20
5	0,14	35	1,25
6	0,15	36	1,30
7	0,18	37	1,40
8	0,20	38	1,50
9	0,21	39	1,60
10	0,23	40	1,70
11	0,24	41	1,80
12	0,25	42	1,90
13	0,26	43	2,00
14	0,27	44	2,10
15	0,28	45	2,20
16	0,30	46	2,30
17	0,32	47	2,40
18	0,35	48	2,50
19	0,40	49	2,60
20	0,45	50	2,65
21	0,50	51	2,70
22	0,55	52	2,8
23	0,60	53	2,9
24	0,65	54	3,0
25	0,70	55	3,1
26	0,75	56	3,2
27	0,80	57	3,3
28	0,85	58	3,4
29	0,90	59	3,5
30	0,95		

**Selection table for drawing dies B4
(#03980132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ERICHSEN

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,20	16	1,70
2	0,30	17	1,80
3	0,40	18	1,90
4	0,50	19	2,00
5	0,60	20	2,10
6	0,70	21	2,20
7	0,80	22	2,30
8	0,90	23	2,40
9	1,00	24	2,50
10	1,10	25	2,60
11	1,20	26	2,70
12	1,30	27	2,80
13	1,40	28	2,90
14	1,50	29	3,00
15	1,60		

**Selection table for drawing dies C1
(#01410132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ERICHSEN

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,076	43	2,00
2	0,100	44	2,10
3	0,127	45	2,20
4	0,13	46	2,30
5	0,14	47	2,40
6	0,15	48	2,50
7	0,18	49	2,60
8	0,20	50	2,65
9	0,21	51	2,70
10	0,23	52	2,8
11	0,24	53	2,9
12	0,25	54	3,0
13	0,26	55	3,1
14	0,27	56	3,2
15	0,28	57	3,3
16	0,30	58	3,4
17	0,32	59	3,5
18	0,35	60	3,6
19	0,40	61	3,7
20	0,45	62	3,8
21	0,50	63	3,9
22	0,55	64	4,0
23	0,60	65	4,1
24	0,65	66	4,2
25	0,70	67	4,3
26	0,75	68	4,4
27	0,80	69	4,5
28	0,85	70	4,6
29	0,90	71	4,7
30	0,95	72	4,8
31	1,00	73	4,9
32	1,10	74	5,0
33	1,15	75	5,1
34	1,20	76	5,2
35	1,25	77	5,3
36	1,30	78	5,4
37	1,40	79	5,5
38	1,50	80	5,6
39	1,60	81	5,7
40	1,70	82	5,8
41	1,80	83	5,9
42	1,90	84	6,0

**Selection table for blanking die ring
(#08690132)**

valid for **ferrous and non-ferrous** material
Norm: ISO 16630

Var.	Thickness s / mm	Var.	Thickness s / mm
1	$1,2 \leq s < 1,5$	7	$3,6 \leq s < 4,0$
2	$1,5 \leq s < 1,9$	8	$4,0 \leq s < 4,4$
3	$1,9 \leq s < 2,3$	9	$4,4 \leq s < 4,8$
4	$2,3 \leq s < 2,7$	10	$4,8 \leq s < 5,2$
5	$2,7 \leq s < 3,1$	11	$5,2 \leq s < 5,7$
6	$3,1 \leq s < 3,6$	12	$5,7 \leq s < 6,0$

**Selection table for drawing dies for square
cups 40x40 (#01530132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)

Norm: ERICHSEN

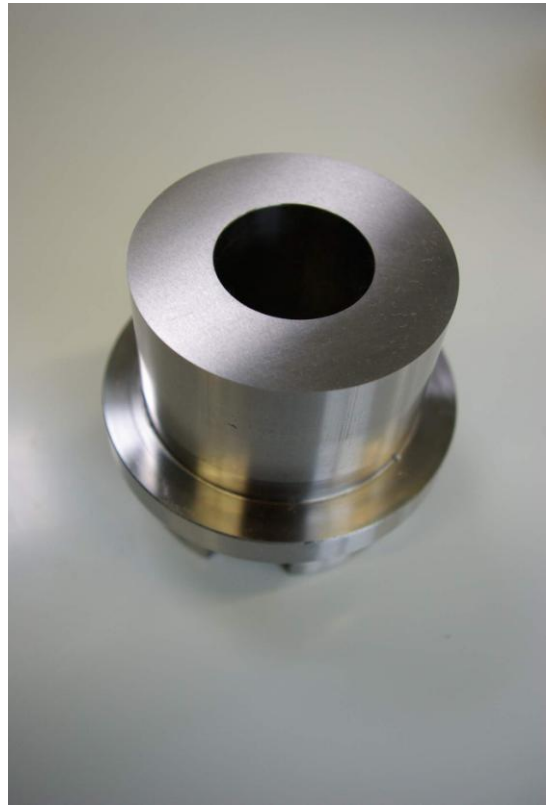
Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,10	20	0,85
2	0,15	21	0,90
3	0,20	22	0,95
4	0,22	23	1,00
5	0,23	24	1,10
6	0,24	25	1,20
7	0,25	26	1,25
8	0,26	27	1,30
9	0,30	28	1,40
10	0,35	29	1,50
11	0,40	30	1,60
12	0,45	31	1,70
13	0,50	32	1,80
14	0,55	33	1,90
15	0,60	34	2,00
16	0,65	35	2,30
17	0,70	36	2,50
18	0,75	37	2,60
19	0,80	38	3,00

**Selection table for square cups 70x70
(#03880132)**

valid for **ferrous and non-ferrous** material
(material type necessary for order)
Norm: ERICHSEN

Var.	Thickness s / mm	Var.	Thickness s / mm
1	0,10	23	1,00
2	0,15	24	1,10
3	0,20	25	1,20
4	0,22	26	1,25
5	0,23	27	1,30
6	0,24	28	1,40
7	0,25	29	1,50
8	0,26	30	1,60
9	0,30	31	1,70
10	0,35	32	1,80
11	0,40	33	1,90
12	0,45	34	2,00
13	0,50	35	2,30
14	0,55	36	2,50
15	0,60	37	2,60
16	0,65	38	3,00
17	0,70	39	3,50
18	0,75	40	4,00
19	0,80	41	4,50
20	0,85	42	5,00
21	0,90	43	5,50
22	0,95	44	6,00

Selection table for blanking tools



Blanking tool for deep-drawing cups blank cut with punch dia 33 mm (B1):

- consists of blanking die ring (# 01380132) and blanking punch (01390132)

for ferrous material:

- 55 – 80 mm
- 64 mm recommended
- ISO 11531 approx. 60 mm

for non-ferrous material:

- DIN EN 1669 / 60 or 64 mm

Punching areas for sheet thicknesses of ferrous materials:

- 0,2 – 1,0 mm
- 1,1 – 2,5 mm

Punching areas for sheet thicknesses of non-ferrous materials:

- 0,1 – 0,59 mm
- 0,6 – 1,69 mm
- 1,7 – 3,0 mm

Blanking tool for deep-drawing cups blank cut with punch dia 50 mm (B2):

- consists of blanking die ring (# 01440132) and blanking punch (01450132)

for ferrous material:

- 81 - 120 mm
- 90 mm recommended
- Square cups 40 x 40 approx. 85 mm (blanking punch # 04190132)

Punching areas for sheet thicknesses of ferrous materials:

- 0,2 – 1,0 mm
- 1,1 – 2,0 mm
- 2,1 – 4,0 mm
- 4,1 – 6,0 mm

Punching areas for sheet thicknesses of non-ferrous materials:

- 0,1 – 0,59 mm
- 0,6 – 1,69 mm
- 1,7 – 3,0 mm

Blanking tool for deep-drawing cups blank cut with punch dia 75 mm (B3):

- consists of blanking die ring (# 01490132) and blanking punch (01500132)

for ferrous material:

- 121 - 170 mm
- 90 mm recommended
- Square cups 40 x 40 approx. 85 mm (blanking punch # 04190132)

Punching areas for sheet thicknesses of ferrous materials:

- 0,2 – 1,0 mm
- 1,1 – 2,0 mm
- 2,1 – 4,0 mm
- 4,1 – 6,0 mm

Punching areas for sheet thicknesses of non-ferrous materials:

- 0,1 – 0,59 mm
- 0,6 – 1,69 mm
- 1,7 – 3,0 mm

Blanking tool for deep-drawing cups blank cut with punch dia 100 mm (B4):

- consists of blanking die ring (# 01490132) and blanking punch (01500132)

for ferrous material:

- 175 - 220 mm
- 180 mm recommended
- Square cups 70 x 70 approx. 130 mm (blanking punch # 04200132)

Punching areas for sheet thicknesses of ferrous materials:

- 0,2 – 1,0 mm
- 1,1 – 2,0 mm
- 2,1 – 4,0 mm
- 4,1 – 6,0 mm

Punching areas for sheet thicknesses of non-ferrous materials:

- 0,1 – 0,59 mm
- 0,6 – 1,69 mm
- 1,7 – 3,0 mm

Further Universal Sheet Metal Testing Machines supplied by ERICHSEN:

**Electro-hydraulically driven Sheet Metal Testing Machine
with Automatic Controls – Model 134
(drawing force 120 kN)**



**Universal Sheet Metal Testing Machine with Automatic
Test Sequence - Model 142-Basic
(drawing force 200 kN or 400 kN) – *compact design***



**Universal Sheet Metal Testing Machine with Automatic
Test Sequence - Model 142
(drawing force 200 kN or 400 kN)**



**Universal Sheet Metal Testing Machine for Research
and Development - Model 145
(drawing force 600 kN or 1000 kN)**



**Universal Sheet Metal Testing Machine for Research,
Development and In-process Testing - Model 146
(drawing force 600 kN or 1000 kN)**

