

Technical documentation and instruction manual

Lahmeyer-Compactstation®

Type NDV1200/1600/1800/2500/2600



SGB Neumark
Ohmstr. 1
08496 Neumark

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Enclosure: Danger evaluation

1. Use and technical determinations

The transformer substations are used as network or transmission substations.

The substation NDV 1600 was verified according to DIN EN 62271-202 with 16 kA 1 s, Qualification IAC B, equipped with a HV HRC fuse field 24 kV (min. distance 250 mm). The substation NDV 1600 is analogue to the substation type NDV 400. The substation NDV 400 is qualified by IAC-AB 20 kA 1s. By means of constructive analogy according to IEC EN VDE 62271-202 paragraph 6.8 the test results are deduced towards NDV 1200/ 1600/ 1800/ 2500/ 2600. The substation meets the following rules:

DIN VDE 1000	General guiding principles responsible to security of technical products
DIN VDE 0101	Heavy current gears with rated voltages over 1 kV
DIN VDE 0105-100	Operation of heavy current plants
EN 60071-1 (VDE 0111 part 1)	Insulation co-ordination - Part 1: Definitions, principles and rules
EN 60071-2 (VDE 0111 part 2)	Insulation co-ordination - Part 2: Application guide
EN 60445 (VDE 0197)	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and conductor terminations
CENELEC HD 603 S1/A3	Heavy current cables; part 603: Distribution cables of rated voltage U0/U 0,6/1 kV
CENELEC HD 620 S1/A3	Heavy current cables; part 620: Distribution cables with extruded insulation for rated voltages from 3,6/6 (7,2) kV to 20,8/36 (42) kV
DIN VDE 0278-628	Heavy current cables garnitures with rated voltages U up to 30 kV (Um up to 36 kV); part 628: testing proccess for high current cables garnitures with nominal voltages from 3,6/6 (7,2) kV to 20,8/36 (42) kV
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 60076-10	Power-transformers; part 10: determination of sound levels
DIN VDE 0660 part 514	low voltage-switch device combinations; Protection against electric shock; protection against direct accidental touch of dangerous active parts
EN 62271 part 202	High-voltage switchgear and controlgear - Part 202: High voltage/low voltage prefabricated substation
EN 61230 (VDE 0683 part 100)	Live working - Portable equipment for earthing or earthing and short-circuiting
EN ISO 6988	Metalic and other anorganic covers – testing with sulphur dioxid under general liquid condensation
DIN 4102	Fire behaviour of building materials and building parts
DIN 16913	Plastic moulding powder, reinforced reaction resin moulding powder
BGV A3 (previous VBG 4)	Accident prevention regulation: electric installations and means of production
BGV A8 (previous VBG 125)	Accident prevention regulation: security and healthprotection indication on the work place

The regulations of the water regime law (WHG = „Wasserhaushaltsgesetz“) of the Federal Republic of Germany and the regulation concerning electromagnetic fields; 26. BimSchG (federal immission law) have to be respected.

Installation, initial operation and operation of the substation take place by socialized staff, educated in coping with MV switchgears, transformers, BV distribution, the particular VDE-stipulations and the accident prevention regulations (BGV A3).

Specific values of the station :

- surrounding temperature	from - 30 °C to + 50 °C
- altitude of installation	up to 1000 m (higher altitudes or installation after special clarification of technical equipment)
- rated voltage	12 kV, 24 kV and 26 kV
- rated power	up to and including 2500 kVA as oil-isolated transformer
- frequencies	up to and including 800 kVA as cast resin isolated transformer
- rated isolation level	28/75 kV, 50/125 kV, 70/195 kV
- rated short time current	16 kA 1 second
- rated surge current	50 kA
- neutral point treatment	rigid and low ohmic
- kind of components	air isolated and SF6-isolated switchgears (12 kV, 24 kV, 356 kV) liquid filled transformers up to 2500 kVA and up to 36 kV encapsulated winding dry-type transformer up to 800 kVA and up to 24 kV
- housing classification	20 K to 1000 kVA, 25 K to 1600 kVA
- protection grading MV LV room	IP 54
- protection grading trafo room	IP 43 touch prevented
- installation	as a general rule embedded from 500 mm to 550 mm
- handling	The substation is not walkable and only controllable from the outside
- roof stressing	2500 N/m (montage weight or snow stress)
- wind pressure	according to IEC 694 (700 N/m)
- exterior choc stressing	on housing, doors, swinging arm levers and ventilation openings according to VDE 670 part 611, enclosure C
- sound level	when installing the tranformer within the station the sound pressure level decreases by 3 dB
- EMC-test	at all measurement points 200 mm from the substation values < 70 µT are reached
- fire resistance classification	complies F90
- internal light arc stability	The construction of transformer substations of the product line NDV 1600 is analogue to the LCS-E.7 due to the modular basic unit. The substation NDV 1600 was verified according to DIN EN 62271-202 with 16 kA 1s. Qualification IAC-B, equipped with HV HRC fuse field 24 kV (medium distance 250 mm). The substation NDV 1600 is analogue to the station type NDV 400. The substation NDV 400 is qualified with IAC-AB 20 kA 1s. By means of constructive analogy according to IEC EN VDE 62271-202 paragraph 6.8 test results are derived to the NDV 1600.

2. Station housing

The substation **type NDV 1200/ 1600/ 1800/ 2500/ 2600** is, like all Lahmeyer-Compactstations®, a plant ready and unit verified gear. It contains a medium voltage, a transformer and a low voltage room. After terminal of the MV and LV cable the substation is ready for service.

2.1 The housings are constructed as -curved construction and consist of:

- the foundation with oil sump, constructed as modular base unit.
The oil sump 4 mm, oilproof welded, hot dip galvanized (zinc) and powdered from the outside, is fixed between two sidewalls. Below the oil sump there are wide mechanically hard formed bars. They take the porting, lifting and mounting function of the whole station.
- housing including doors and covering sheet metal for the MV and LV room. The unit is liftable from the steel foundation sump.
- the walers to contain the MV and LV equipments are connected with the foundation sump.
- simple removable roof (unscrew four fixing screws in the area of the transformer)
- plug diaphragms as access to the transformer room at the sidewalls of the housing.

2.2 Material and surface treatment

Material (underground):

Oil sump: sheet iron 4 mm, hot dip galvanized (zinc) (>750g/m²) and double layer powder coating (zinc powder 70µm, top layer 70µm), to pick up the transformer

Apron made of sheet iron, 3 mm, hot dip galvanized (zinc) (>225 g/m²)
 Double powder coating 100 % without pores
 (zinc powder, top layer)

Material (overground):

Sheet iron, 2 mm, strip galvanized (> 225 g/m²) and to 100 % without pores
 With IT-based powder coating installation and 5-zones-pretreatment layer thicknesses equal > 70 µm. The used powder varnishes are without heavy metals and non toxic.
 Zinc and powder varnishes = highest corrosion protection.

Standard color: pebble grey (RAL 7032- structure)

Remark

The lodged powder coating can be recoated with liquid varnish into another color by the user if he wants to. The former corrosion protection remains existing!:

- 2.3** The doors to the MV and LV rooms are fixed with three hinges each. They have swing arm closures made of metal, planed for the installation of profile cylinders with an angle of closing of 45° or 90°. The profile cylinders are protected by rain protection flaps. Similar swing arm closures are used for the plug diaphragms.

– The cylinders them selves do not belong to the delivery volume. –

The door to the MV room has a fourfold locking.

All doors can be constructed optional on the left or on the right side.

This can be adjusted on-site. Opening angle 90° and 130°.

2.4 Protection grading

MV and LV room	IP 54
Transformer room	IP 43

- 2.5** The transformer substation can – completely equipped – be lifted with lifting devices. Therefore, the lifting devices are at the foundation sump (look lifting plan) with four lifting bolts. When transporting via cargo keep the loading guidelines in mind.
- 2.6** All installed parts are electrically conductive interconnected. They will be grounded on a central grounding point at the LV room. All parts under voltage are covered touch-proof, when doors are closed.
- 2.7** At the MV and LV room a lamp (40 W) be installed which switches by door contact can. For a LV HRC fuse reserve, there is a possible suspension within the LV room. A closable plug diaphragm enables the access to the transformer room. The cable terminal rooms are accessible on the outside to insert a cable, after removal of the covering and the door frame below,

3. MV switchgear

The substation can be equipped customer specific with 3 or 4 field SF6-isolated on-load disconnecter gear or with solid-air isolated switch fields. The switch fields are integrated into the housing, so that hot gases, caused by interior errors, are not able to reach the control side, instead they are guided above the transformer to the outside. Solid-air isolated switchgears or MV transducer rooms are generally equipped with a hygrostatic controlled heating. The heating has 300 Watt. The hygrostat keeps every room a relative humidity of < 70 %. This prevents every drawing of single parts according to experiences.

4. LV distribution

The LV room will be customer specific, plant ready and piece verified. To the standard equipment counts:

4.1.1 Main switch

Automatic circuit breaker	1250 A					
Fuse on-load disconnecter	1250 A					
LV HRC fuse-input-on-load switch bar according to DIN 43 623		size3				
<ul style="list-style-type: none">- reinforced Cu bars and contacts as well as high temperature resistant isolation material at the switch bar- generous dimensioned collection rails- use of Al-oxide-ceramic for the fuse body, linked with a new melt technic for :<table><tr><td>voltages</td><td>400 V</td></tr><tr><td>current</td><td>910 A</td></tr></table>			voltages	400 V	current	910 A
voltages	400 V					
current	910 A					
The bar can be equipped with maximal:						
3 pieces	LV HRC fuse inserts according to DIN 43 620 and VDE 0636 part 22					
	working class	gTr				
	nominal current	910 A				
	or with Cu-disconnecting knife-switch	1000 A				

4.1.2 Output bars

LV HRC fuse bars	400/630 A	max. 16 pieces
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4.1.3	current transducer reconnectable	1000/600/300/5 A	3 pieces
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4.1.4	Amperemeter in bimetal construction with slider (15 min)		3 pieces
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4.1.5	Synchronous plug sockets for synchronisation, fuses		3 pieces
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4.1.6	Construction current at the right sidewall of the LV room		2 pieces
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Optionally :

- 3 amperemeters with transducers
- 1 voltmeter with selector switch and fuses
- 1 Schuko-socket, fuse
- 1 lighting, fuse

4.1.7	The indication instruments, socket, fuses and clamp bar are installed in one instrument table.	
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4.1.8	The N- and PE-rail for the total grounding of the substation can be found in the lower area of the LV room.	
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4.1.9	The output cables can be fixed on a fixation iron below the floor sheet iron in the area of the cable terminal room.	
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5. Transformer room

The transformer room is equipped with changeable drive rails. Therewith, the SGB-transformers with especially small volume as well as usual DIN-transformers up to 1600 kVA can be installed. When the transformer is mounted at the plant into the substation, the complete electric connection to the MV and LV gear takes place at the same time. Of course all components get tested mechanically and electrically during the finishing control of the station. A prefabricated and electrically tested cable bridge connects the transformer with the MV switchgear. The substation NDV 1800 and NDV 2600 can be assembled with two transformers at maximum 1000 kVA.

6. Installation or exchange of the transformer on site

When installing or exchanging the transformer, you have to put an eye on the particular outputs of the MV switchgear and the LV distribution, so that they are **without tension and grounded** (VDE 0105). The transformer gets lifted above the station when exchanging.

Follow the sequence of operation:

- remove roof: open plug diaphragm on both sides and unscrew the four red signed fixation screws on the upper door frame of the transformer room
Remove the roof upwards by the crane.
- point U-rails at the tub according to the chassis of the transformer
- enter the transformer and connect
- put the roof on and screw

7. Grounding gear

The grounding rail is located at the LV switch closet. There the constructionally chosen grounding strip or the ground rod is connected (VDE 0101 paragraph 9). Therefore all housing parts and the foundation are connected to the main earth.

8. Transport, buildig-up and montage

- 8.1. If a substation is orderd with transformer, it gets built-up on site ready for connection and according to the measurement drawing and the excavation plan.
- 8.2. When determining the depth of excavation keep the subsequent terrain hight and the to expecting surface water in mind.
- 8.3. The construction pit needs to have a floor able to take load. Rough protuberances are compensated by a horizontal wood float finish sandbed. Among difficult floor conditions a base made of lean concrete or sills is recommandable.
- 8.4. The placement of the completely equiped transformer station into the building pit happens by suitable lifting devices. The lifting devices will be fasten on four retractable lifting bolts of the foundation tub (look lifting plan).
- 8.5. Connection of cables

Remove MV sideways:

- front panel on the foundation sump
- lower covering of the switchgear
- lower door arbor (screws sideways)

Remove LV sideways:

- front panel on the foundation sump
- anterior floor panel
- lower door arbor

Afterwards the whole terminal area is free for insert and connection of cable at the front.

After connection of cables the previous removed parts get refit in reverse order.

9. Technical documents

	NDV1200	NDV1600	NDV1800	NDV2500	NDV2600
Measurement drawing	0152L17	4000212	0152B54	0152Z42	0152A54
Excavation			<< 0152L19 >>		
Lifting plan			<< 0152Q96 >>		
Lading plan			<< 0152Q98 >>		

Confirmation

according to §5 par.4 of the accident prevention regulation „Elektrische Anlagen und Betriebsmittel“ (BGV A3) (electrical installations and means of production)

FROM :

Sächsisch – Bayerische Starkstrom-Gerätebau GmbH

Ohmstraße 1

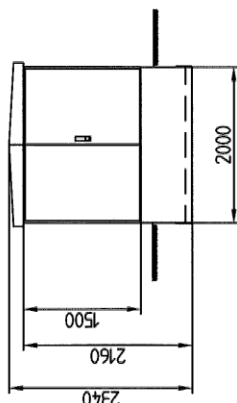
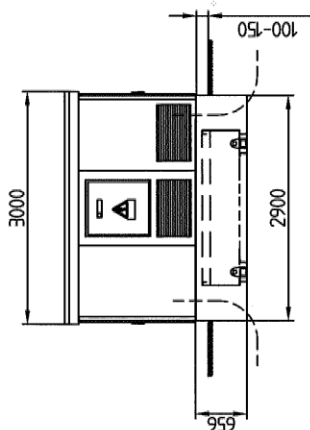
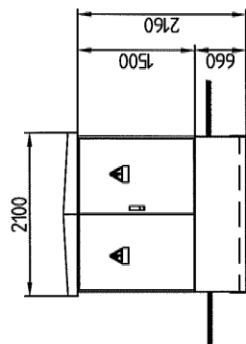
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It is confirmed that the electrical installation / the electrical mean of production

Compact station type NDV400/401

the determination of the accident prevention regulation „Elektrische Anlagen und Betriebsmittel“ BGV A3 (electrical installations and means of production) needs to be supplied.

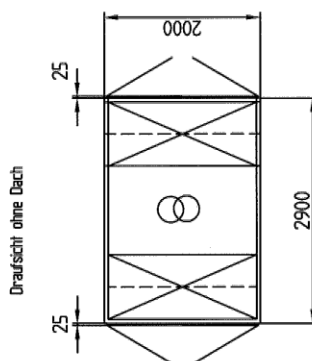
This confirmation serves only for the purpose that the entrepreneur is without engagement of verifying or letting verify the installation before the first entry into service (look §5 par.1 and 4 of the BGV A3). Civil warranty and liability claims are not settled by this confirmation



Platzbedarf :			
Stellfläche	m ²	6,30	
Fläche bei geöffneten Türen	m ²	10,30	
Gewichte :			
Gegeßklasse	komplett	1400	kg
Gesamtgewicht ^{*)}		5000	kg





*) Richtwert mit Transformator 250kVA und Ausrüstung

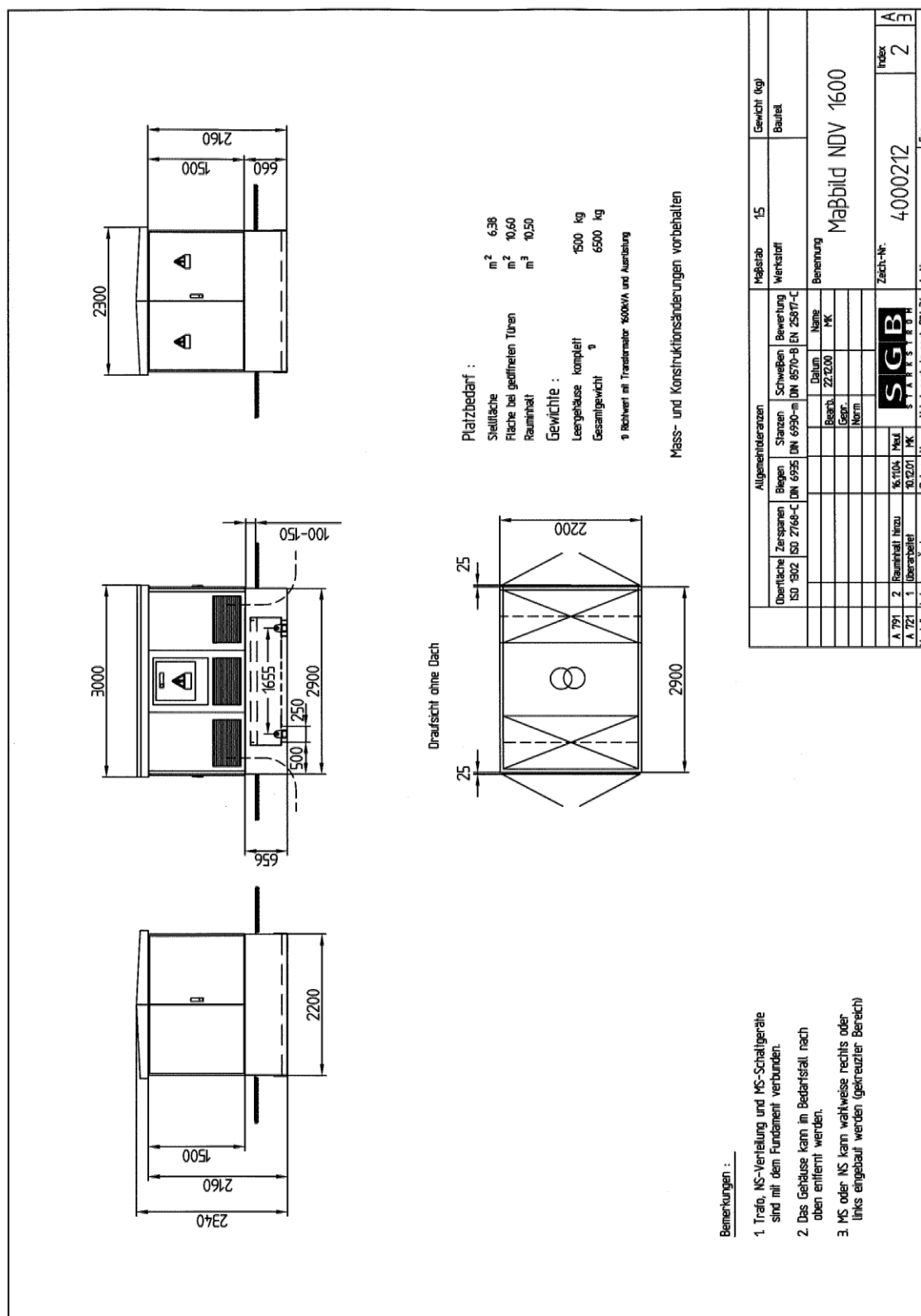
Mass- und Konstruktionsänderungen vorbehalten

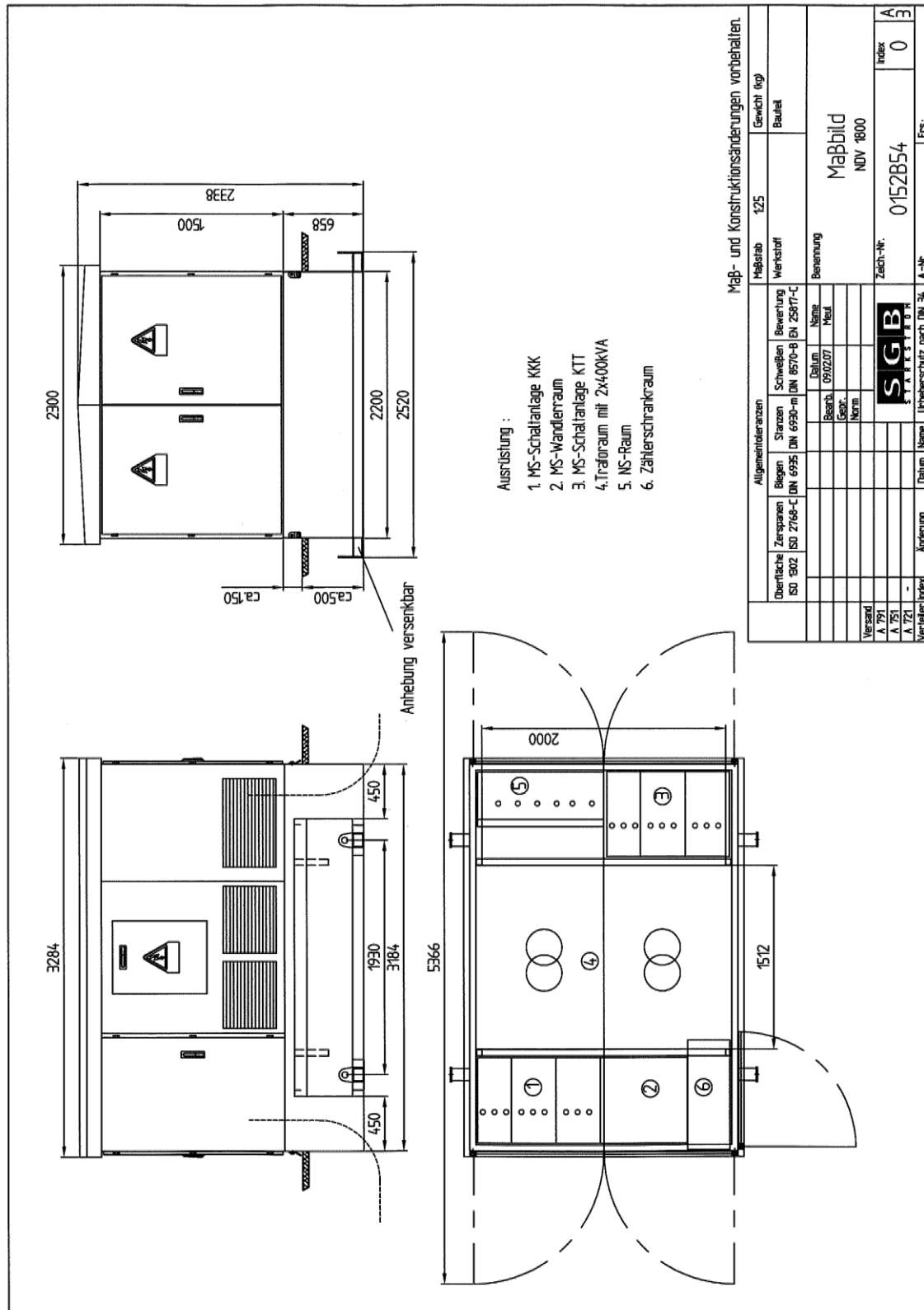


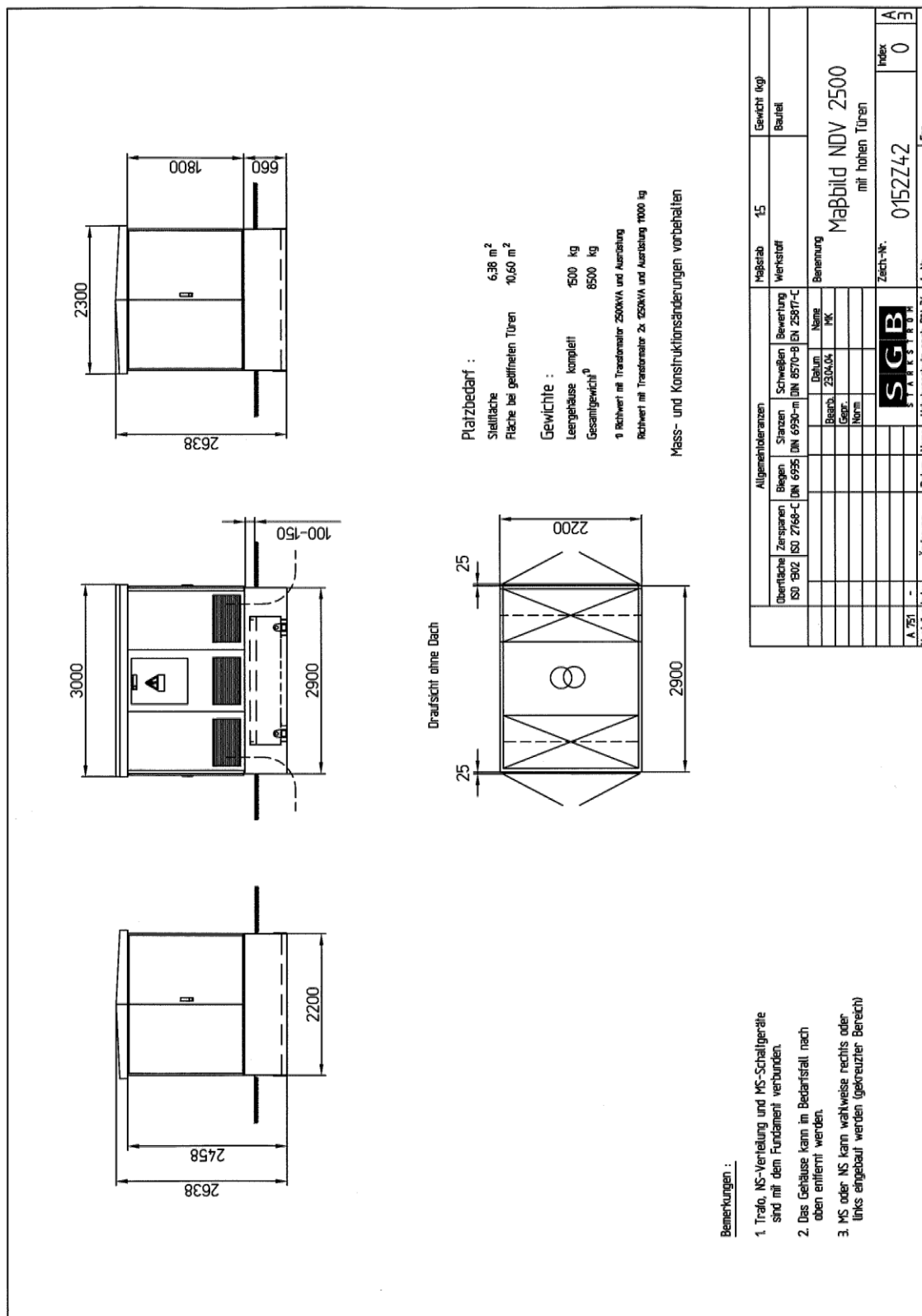
Bemerkungen :

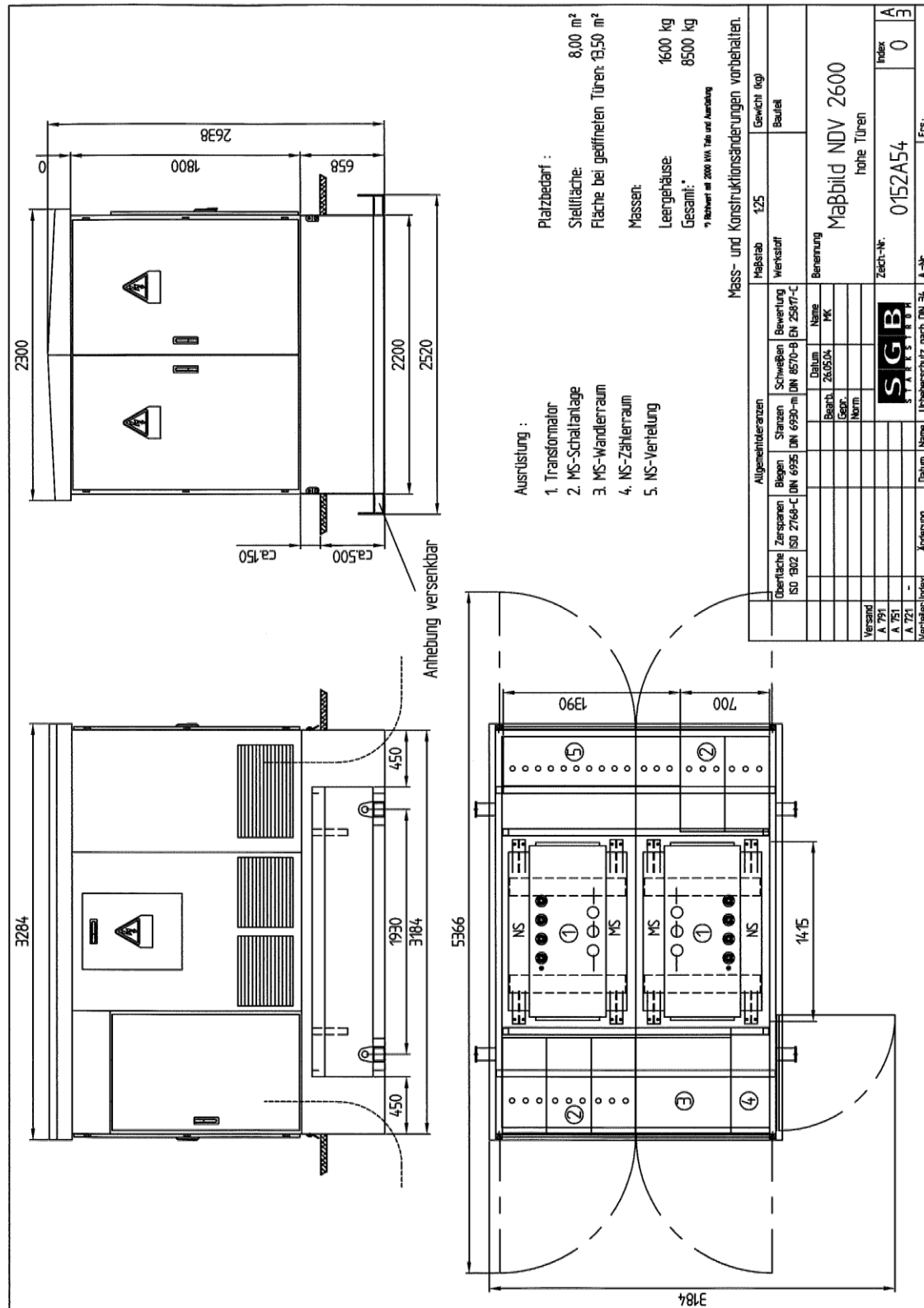
1. Trato, NS-Verteilung und MS-Schallgeräusche sind mit dem Fundament verbunden.
2. Das Gehäuse kann im Bedarfsfall nach oben entfernt werden.
3. a. MS oder NS kann wahlweise rechts oder links eingebaut werden (gekreuzter Bereich)

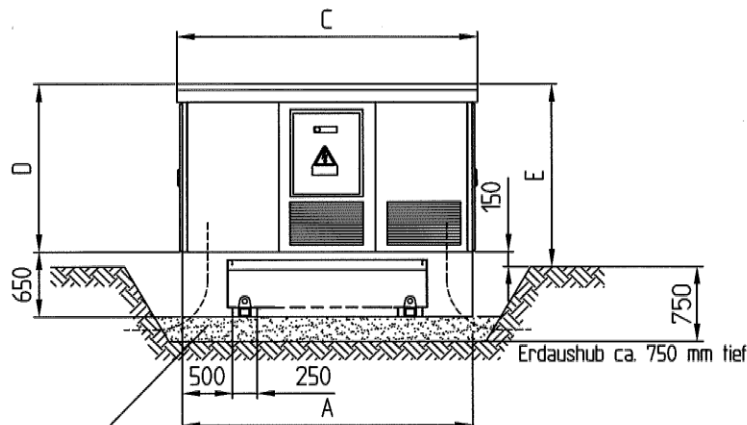
Allgemeindaten				Maßstab 1:5		Gewicht (kg)	
Oberrichtliche ISO 1502	Zerspannen ISO 2768-C	Biegen DIN 6950-m	Stärken DIN 6950-m	Schweißen DIN 6570-B	Bewertung EN 25817-C	Werkstoff Bauteil	
				Datum 27.02.03		Benennung Maßbild NDV 1200	
				Bohrh. 12			
				Geogr. Norm			
				Geogr. Norm			
Versand	A 791						
A 751							
A 773							
1	1	1	1	1	1	Zeich.-Nr. 0152L17	
				Unbeschichte nach DIN 24		Index 1	
				Drehen		A-Maß 3	
				Kleiden		Frei	







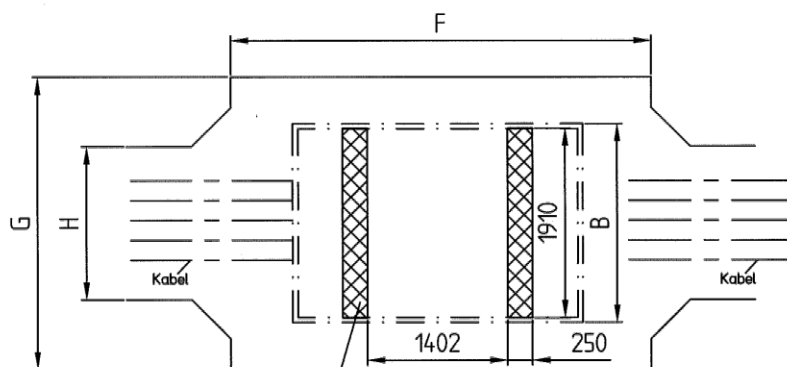




1) Dicke der Bodenplatte ca. 200 mm
Bodenpressung $\approx 65 \text{ kN/m}^2$

Abmessungen in mm

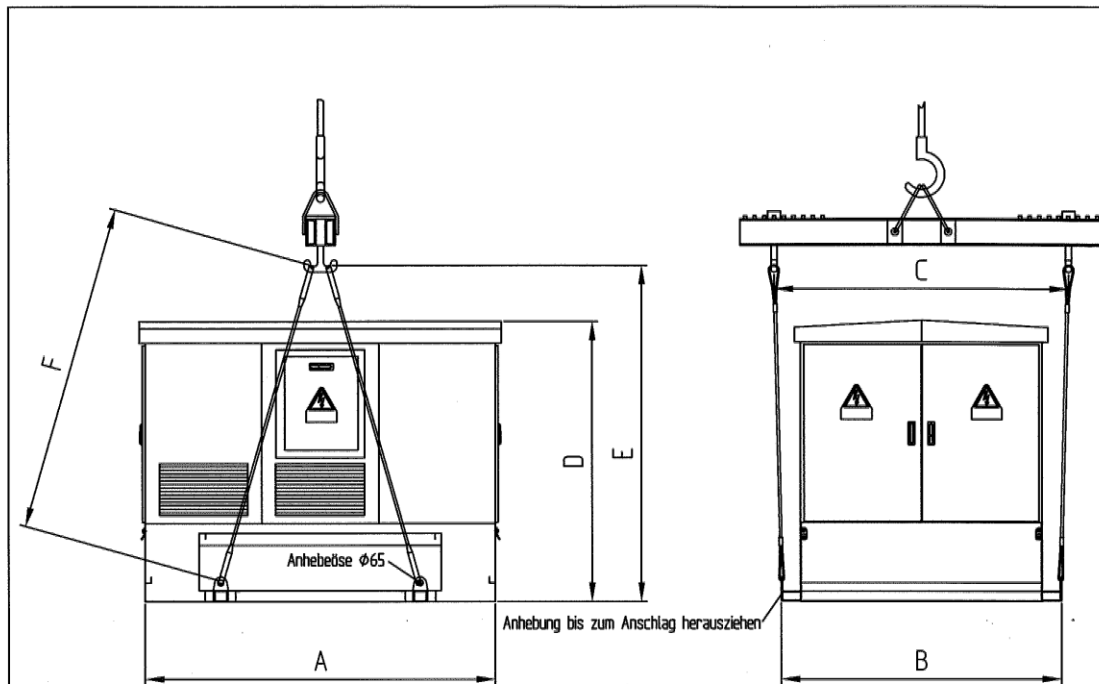
	A	B	C	D	E	F	G	H
NDV1200	2900	2000	3000	1680	1830	4200	2945	1545
NDV1600	2900	2200	3000	1680	1830	4200	3145	1745
NDV1800	3184	2200	3284	1680	1830	4484	3145	1745
NDV2500	2900	2200	3000	1980	2130	4200	3145	1745
NDV2600	3184	2200	3284	1980	2130	4484	3145	1745



Aufstandsfläche 2x 0,48 m²

Maß- und Konstruktionsänderungen vorbehalten

Allgemeintoleranzen							Maßstab	1:50	Gewicht (kg)
Oberfläche	Zerspanen	Biegen	Stanzen	Schweißen	Bewertung		Werkstoff		Bauteil
ISO 1302	ISO 2768-C	DIN 6935	DIN 6930-m	DIN 8570-B	EN 25817-C				
				Datum	Name		Benennung Bodenaushub NDV1200/1600/1800/2500/2600		
				Bearb.	27.02.03	Meuleman			
				Gepr.					
				Norm					
Versand							Zeich.-Nr. 0152L19		
A 791	3	Erw. auf alle NDV1/2	15.05.08	Meul					
A 751	2	WE geä.	10.11.04	MK					
A 721	1	Sandbett entf.	01.11.04	MK					
Verteiler	Index	Änderung	Datum	Name	Urheberschutz nach DIN 34		A.-Nr.	Ers.	

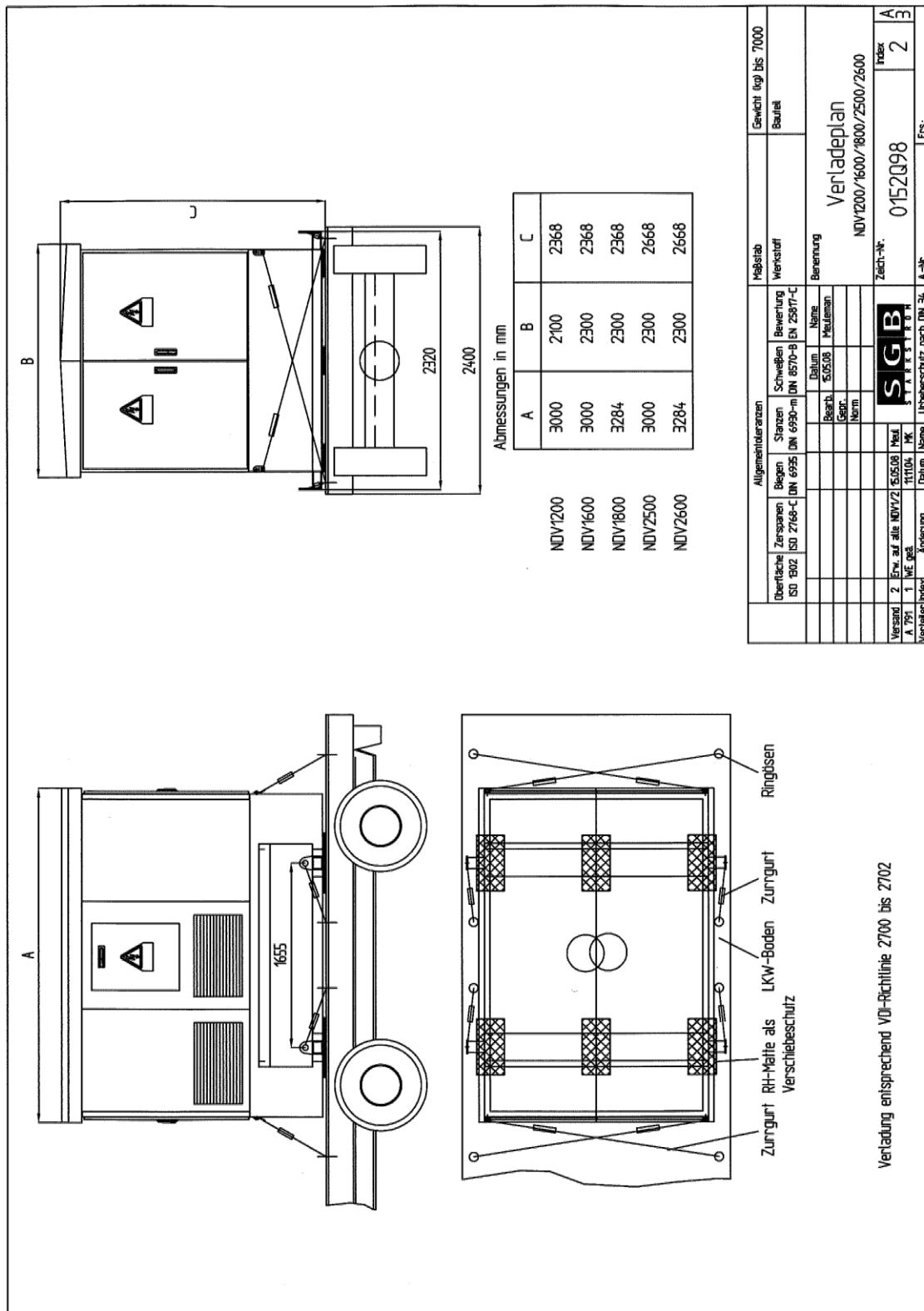


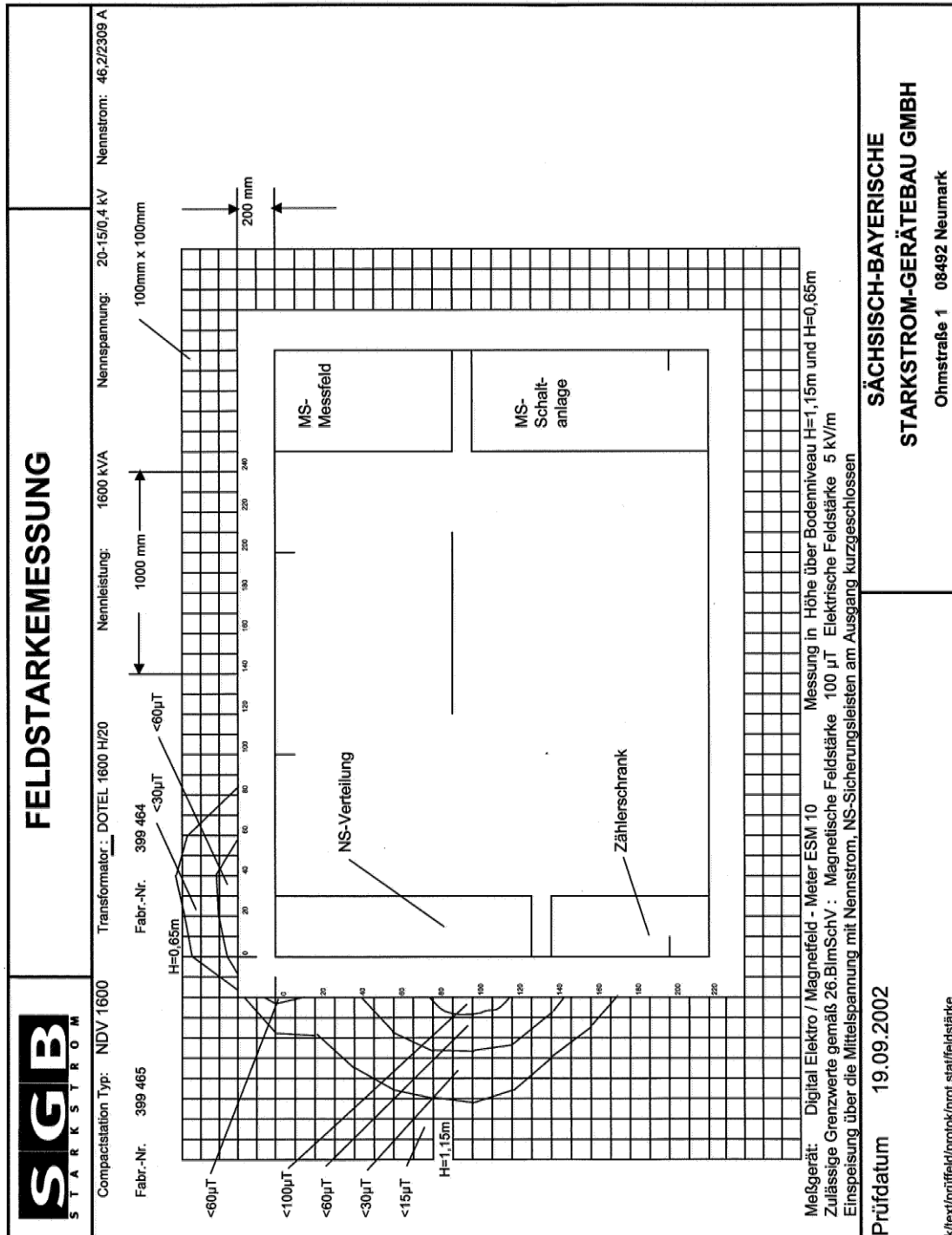
Abmessungen in mm


	A	B	C	D	E	F
NDV1200	2900	2320	2400	2330	2800	ca. 2800
NDV1600	2900	2520	2600	2330	2800	ca. 2800
NDV1800	3184	2520	2600	2330	2800	ca. 2800
NDV2500	2900	2520	2600	2630	3100	ca. 3100
NDV2600	3184	2520	2600	2630	3100	ca. 3100

Mass- und Konstruktionsänderungen vorbehalten

Allgemeintoleranzen						Maßstab	1:50	Gewicht (kg) bis 7000
Oberfläche	Zerspanen	Biegen	Stanzen	Schweißen	Bewertung	Werkstoff		Bauteil
ISO 1302	ISO 2768-C	DIN 6935	DIN 6930-m	DIN 8570-B	EN 25817-C			
						Benennung		
						Hebeplan		
						NDV1200/1600/1800/2500/2600		
A 721						Zeich.-Nr.		Index
Versand						0152Q96		2
A 791	2	Erw. alle NDV1/2	15.05.08	Meul				A
A 751	1	WE geä.	11.11.04	MK				4
Verteiler	Index	Änderung	Datum	Name	Urheberschutz nach DIN 34	A.-Nr.		Ers.





		Prüfbericht Erwärmungsmessung		WF-Nr: 412659 Seite: 1
Art der Prüfung : Typprüfung		Prüfvorschrift : IEC EN DIN 62271 - 202		
Hersteller : SBG		Auftraggeber :		
Stationsdaten :		Auftr.-Num.:	Fabr.-Nr.: 412659	Primärspannung [V]: 20000
Typ : NDV1600		Nennleistung [kVA]: 1600	Schaltgruppe: Dyn 5	Sekundärspannung [V]: 400
Frequenz [Hz]: 50	Isolationsklasse: A	Betriebsart: DB	Primärstrom [A]: 46,2	
u_{k75} [%]: 6,3	Trafo: 401423 WF--Nr.:391003	Masse [t]: 4,14	Sekundärstrom [A]: 2309	
Belastungsart:	Kurzschluss	Spannungssteller Stufe:	2	
Belastung:		24 h mit 1,0x In bis Beharrung Po + Pk eingespeist : 19224 Watt		
Temperaturen Transformator eingebaut in Station NDV1600			Transformator ohne Station	
Trafo Deckel 92,1 °C			Trafo Deckel 76,1 °C	
Trafo Raum 73,0 °C				
Dach Außen 47,8 °C				
Umgebung 21,9 °C			Umgebung 22,2 °C	
$\Delta T_1 = T_{\text{Öl}} - T_{\text{Umgeb}}$ 70,2 K			$\Delta T_2 = T_{\text{Öl}} - T_{\text{Umgeb}}$ 53,9 K	
Die Temperaturdifferenz des Transformators beträgt 16,3 K. Die Station NDV1600 erfüllt die Bedingungen für die Klasse 20: $\Delta t \leq 20$ K gemäß IEC EN DIN 62271-202.				
<div style="border: 1px solid black; padding: 10px;"> Prüfergebnis: Klasse 20 : $\Delta t \leq 20$ K gemäß IEC EN DIN 62271- 202 </div>				
15.03.2004	Dipl.Ing.(FH): Gruner			
Datum	Prüfer	Abnehmer		
		SÄCHSISCH-BAYERISCHE STARKSTROM-GERÄTEBAU GMBH Ohmstraße 1 08496 Neumark		

Bestätigung

nach §5 Abs.4 der Unfallverhütungsvorschrift
„Elektrische Anlagen und Betriebsmittel“ (BGV A3)

VON :

Sächsisch – Bayerische Starkstrom-Gerätebau GmbH

Ohmstraße 1

08496 NEUMARK

Es wird bestätigt, dass die elektrische Anlage/ das elektrische Betriebsmittel

Kompakte Station Typ NDV1600

den Bestimmungen der Unfallverhütungsvorschrift „Elektrische Anlagen und Betriebsmittel“ BGV A3
entsprechend beschaffen ist.

Diese Bestätigung dient ausschließlich dem Zweck, den Unternehmer davon zu entbinden, die elektrische
Anlage vor der ersten Inbetriebnahme zu prüfen bzw. prüfen zu lassen (siehe §5 Abs.1 und 4 der BGV A3).
Zivilrechtliche Gewährleistungs- und Haftungsansprüche werden durch diese Bestätigung nicht geregelt.