

Test Document

Report-No.: HBA 08906P

Content : 11 Sheets

Apparatus tested : Metal oxide surge arresters with porcelain housings

Series Type: 3EP1 ...

Series Type: 3EP2 ...

Series Type: 3EP3 ...

Series Type: 3EP4 ...

Date of Test : October 1999

Testing Station : Siemens AG, Arrester Test Field

Applied Test Specifications :

A) IEC 37/231/CDV, 1999 – 11, cl. 13 + IEC 37/231A/CDV, 2000 – 1, (IEC 37/247/CDV, 2000 – 1)

B) Australien Standard AS 1307.2 – 1996

Test performed :

A) Seal leak rate test, cl. 13.7.4

B) Seal leakage test, cl. 7.7

Test Result :

The test objects have passed the tests stated above without any objection.

The results obtained and the performance proved of the test objects comply with the requirements of the specifications mentioned above.

Siemens Aktiengesellschaft
EV HBA

gez. Dr. Fien

gez. Dr. Hinrichsen

Berlin, January 24, 2000

Index

	Sheet-no.
Test Document	1
Index	2
Technical data of the arresters	3
Dimensional drawings	4, 5, 6, 7
Seal leak rate test (Seal leakage test)	8
Test result	9
Scope of validity	9
Photograph of the mounting of the test setup	10
Photograph of the measurement at the test setup	11

Test Engineer / HBA 2: Gottschalk

Technical data of the arresters

Series Type 3EP1 ...

Maximum rated voltage	84 kV
Nominal discharge current	10 kA
Max. pressure relief current	40 kA
Max. number of units	1
Max. height	940 mm
Max. diameter of sheds	192 mm

Series Type 3EP2 ...

Maximum rated voltage	468 kV
Nominal discharge current	20 kA
Max. pressure relief current	65 kA
Max. number of units	4
Max. height	5860 mm
Max. diameter of sheds	290 mm

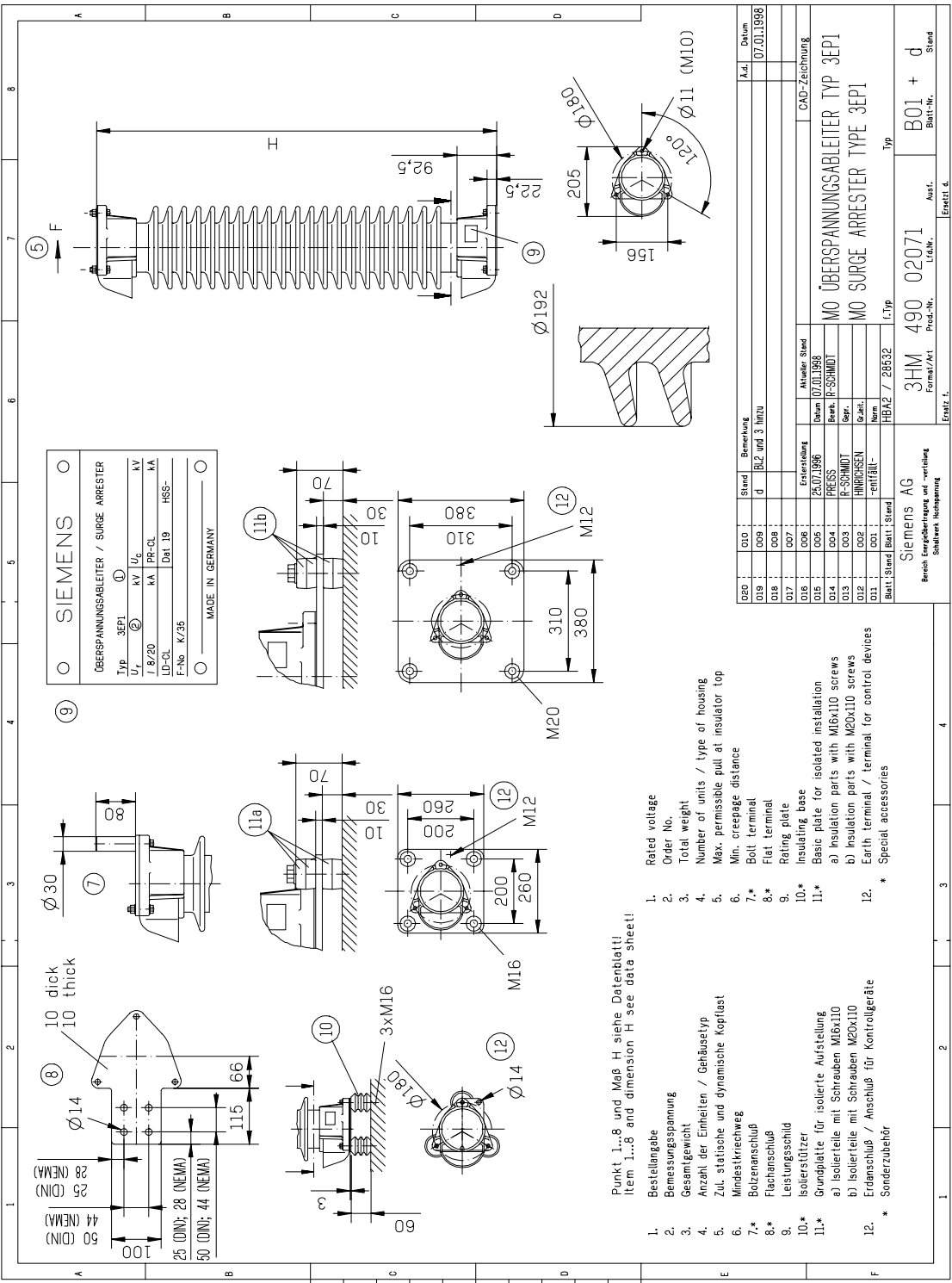
Series Type 3EP3 ...

Maximum rated voltage	612 kV
Nominal discharge current	20 kA
Max. pressure relief current	100 kA
Max. number of units	4
Max. height	7480 mm
Max. diameter of sheds	427 mm

Series Type 3EP4 ...

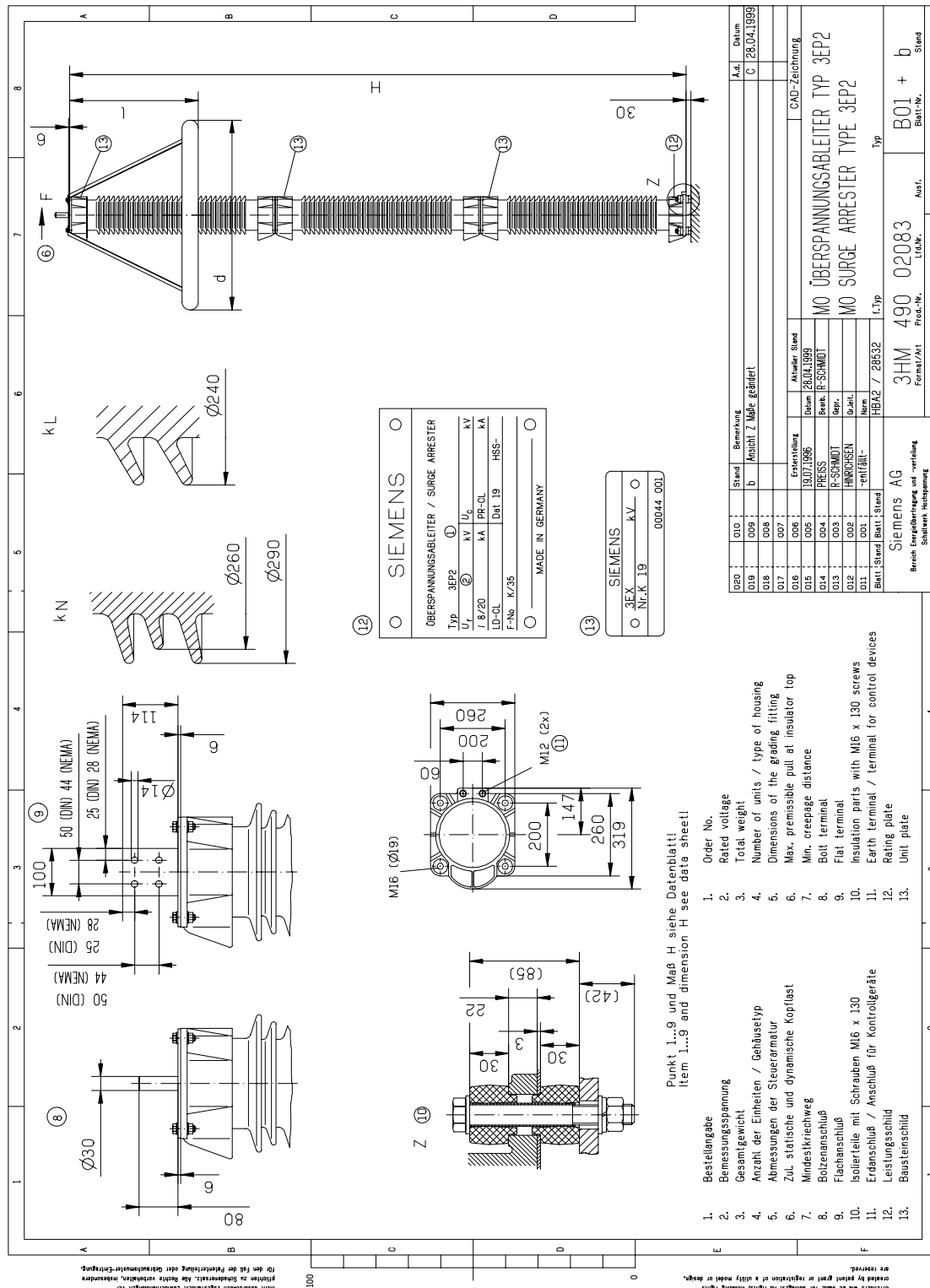
Maximum rated voltage	156 kV
Nominal discharge current	10 kA
Max. pressure relief current	65 kA
Max. number of units	1
Max. height	1480 mm
Max. diameter of sheds	214 mm

Dimensional drawing of surge arrester series 3EP1

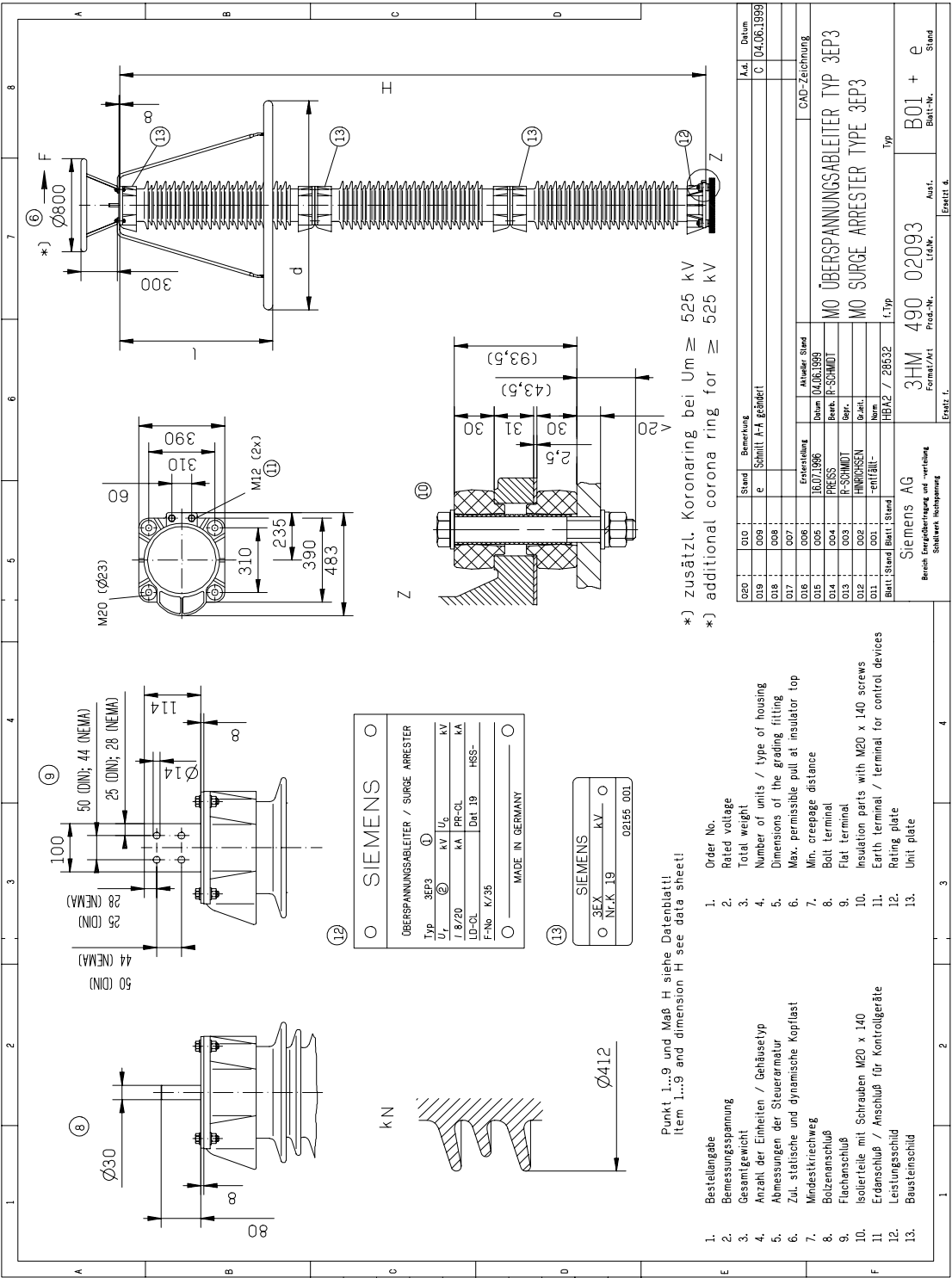


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Dimensional drawing of surge arrester series 3EP2



Dimensional drawing of surge arrester series 3EP3



Dat.	Stund	Bemerkung	Akt.	Datum
016	006			
016	007	b Maß 180 in 195 geändert!!	C	08.04.1998
016	008	Entstehung		
016	009	01.08.1997		
013	003	Alt- und Stand		
013	004	PPPERT		08.04.1998
013	005	PPPERT		
011	001	PPPERT		
011	002	Ger.		
009	003	HINRICHSSEN		
009	004	to 24		
009	005	entfällt		
Batt-Std	Batt-Std	l.typ	Typ	
		HD-2 / 29533		
Siemens AG		3HM 490 02901	B01 + b	
Bereich Energieübertragung und -verteilung		Prod.-Nr.	Blatt-Nr.	Stand
Sollplatz: Hochspannung		Format/Art		

Seal leak rate test (Seal leakage test)

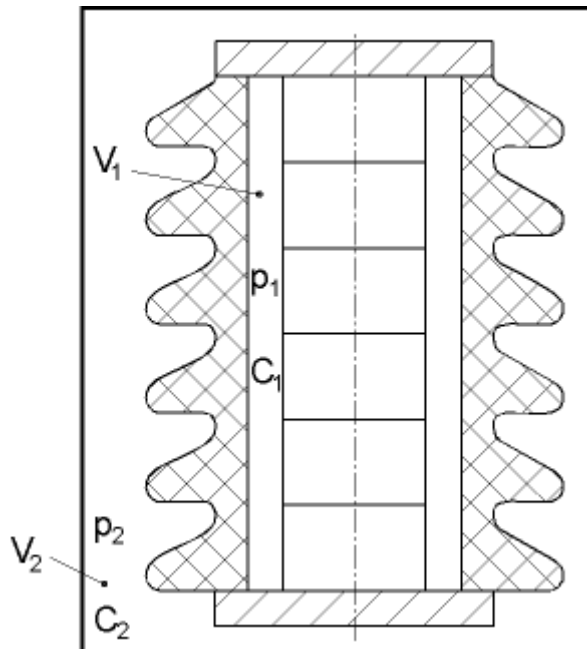
The metal oxide surge arrester 3EP2 096 – 2PZ2 was filled up with $p_1=1.717$ bar sulphur hexafluoride (SF_6). The complete surge arrester was enclosed in a covering. Then the sulphur hexafluoride concentration in the covering was measured at the beginning and at the end of the seal leak rate test after $t= 44$ hours.

Technical data of the tested arrester

Manufacturer	Siemens AG
Type	3EP2 096 – 2PZ2
Serial No.:	350 47329
Unit No.:	57671
Year of manufacturing	1999
Height of arrester	1465 mm
Diameter of sheds	290 mm
Volume (internal), $V_1=$	17.2 dm ³

Technical data of the leak detection equipment

Manufacturer	Siemens AG
Type	3AX 59.11
Serial No.:	016695
Calbration:	6/99
Equipment No.:	HS 6.444



V_1 is the internal gas volume of the arrester
 p_1 is the internal gas pressure of the arrester housing
 C_1 is the internal SF_6 concentration of the arrester housing (only for the seal leak rate test)

V_2 is the volume of the cover
 p_2 is the internal gas pressure of the covering (only for the seal leak rate test)
 C_2 is the internal SF_6 concentration in the covering (only for the seal leak rate test)

Calculation of the leakage rate

Measured SF₆ concentration at the beginning of the test in the covering $C_{2,1} = 1 \cdot 10^{-8}$

Measured SF₆ concentration after t=44 hours in the covering $C_{2,2} = 1 \cdot 10^{-6}$

Volume of the cover $V_2 = 100 \text{ dm}^3$

Measuring time (44 hours) $t = 158400 \text{ s}$

$$\begin{aligned}\text{Pressure drop in } V_1: \Delta p &= (C_{2,2} \cdot V_2 \cdot p_2) / V_1 \\ &= (1 \cdot 10^{-6} \cdot 100 \text{ dm}^3 \cdot 10^5 \text{ Pa}) / 17.2 \text{ dm}^3 \\ &= 0.58 \text{ Pa}\end{aligned}$$

$$\begin{aligned}\text{Seal leak rate} &= (\Delta p \cdot V_1) / t \\ &= (0.58 \text{ Pa} \cdot 17.2 \text{ dm}^3) / 158400 \text{ s} \\ &= 6.3 \cdot 10^{-5} \text{ Pa} \cdot \text{dm}^3 \cdot \text{s}^{-1} = 6.3 \cdot 10^{-8} \text{ Pa} \cdot \text{m}^3 \cdot \text{s}^{-1}\end{aligned}$$

Test result

The measured seal leak rate of the tested arrester is $6.3 \cdot 10^{-8} \text{ Pa} \cdot \text{m}^3 \cdot \text{s}^{-1}$ and therefore fulfills the test requirement ($\leq 1 \cdot 10^{-6} \text{ Pa} \cdot \text{m}^3 \cdot \text{s}^{-1}$).

Scope of Validity

With respect of the identical sealing systems this test is valid for all surge arresters of the 3EP - series.



Putting the surge arrester into the cover.



Measuring of the SF₆ concentration inside the cover after t= 44 hours.