

**Prüfprotokoll für Stromwandler** **Test report for current transformers**

| | | | | |
|--------------------|---------------------------|------------------------------------|--------------|------------------------|
| Besteller/ Client: | Areva Energietechnik GmbH | 3 Stück/ Units | Komm. No.: | 2005.1381.02 |
| Best./ Ord. No.: | | | | |
| Anlage/ Station: | US Steel Kosice | <u>7</u> Seiten/ Pages | Seite/ Page: | 1 |
| Typ/ Type: | JOF 123 | Frequenz/ Frequency: | | 50 Hz |
| Norm/ Standard: | IEC 60044-1 | I therm für/ for I _n >= | | 200.0 A: 31.5 kA 1.0 s |
| Spannung/ Voltage: | 123 / 230 / 550 kV | I dyn. (Peak): | | 80.0 kA |

Routineprüfungen/ Routine tests

Wechselspannungs-Prüfungen/ Power frequency tests

Prim - (Sec, Masse/ Ground):

230 kV 50 Hz 60 s ☒

Prim - Prim:

- kV - Hz - s ☐

Sec - (Sec, Masse/ Ground):

3 kV 50 Hz 60 s ☒

Windungsschluss-Prüfung/ Inter-turn overvoltage test

☒

Teilentladungs-Messung/ Partial discharge measurement

☒

Fehlerbestimmung / Determination of errors

☒

Polarität/ Polarity

☒

Klemmenbezeichnung/ Terminal markings

☒

Typenschild/ Rating plate

☒

Visuelle Prüfung/ Visual check

☒

| Kern Core | I prim [A] | I sec [A] | Klasse Class | Klemme Terminal |
|--------------|---------------|--------------|----------------------------|--------------------|
| 1 | 200 | 1.0 | 30 VA cl. 0.5 FS5 ext.200% | 1S1-1S2 |
| 2 | 200 | 1.0 | 60 VA cl. 5P20 | 2S1-2S2 |
| 3 | 200 | 1.0 | 60 VA cl. 5P10 | 3S1-3S2 |

Datum:
Date:

01.07.2005

Geprüft:

Checked by:

Alle Anforderungen erfüllt:
All requirements fulfilled:PFIFFNER
TEST LABORATORY
CH-5042 Hirschthal

**Fehlerbestimmung****Determination of errors**

Typ/ Type: JOF 123

Komm. No.: 2005.1381.02

Seite/ Page: 2

| Serie Serial No. | Kern Core No. | Übersetzung / Ratio | | S [VA] | cos β | Isec [%] | Grenzen/ Limits | | Fehler/ Error | |
|------------------------|---------------------|---------------------|---------------|-----------|-------------|-------------|-----------------|----------|---------------|-------|
| | | I prim. [A] | I sec. [A] | | | | [%] | [min] | [%] | [min] |
| 1 | 1 | 200 | 1.0 | 7.50 | 0.80 | 200 | ± 0.50 | ± 30 | +0.09 | 0 |
| | | | | | | 100 | ± 0.50 | ± 30 | +0.07 | +1 |
| | | | | | | 20 | ± 0.75 | ± 45 | +0.05 | +2 |
| | | | | | | 5 | ± 1.50 | ± 90 | +0.05 | +4 |
| | | | | 30.00 | 0.80 | 200 | ± 0.50 | ± 30 | -0.02 | +2 |
| | | | | | | 100 | ± 0.50 | ± 30 | +0.01 | -1 |
| | | | | | | 20 | ± 0.75 | ± 45 | -0.06 | +2 |
| | | | | | | 5 | ± 1.50 | ± 90 | -0.09 | +5 |
| | 2 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | +0.07 | 0 |
| | 3 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | -0.09 | 0 |
| | | | | | | | | | | |
| 2 | 1 | 200 | 1.0 | 7.50 | 0.80 | 200 | ± 0.50 | ± 30 | +0.10 | 0 |
| | | | | 30.00 | 0.80 | 200 | ± 0.50 | ± 30 | +0.05 | 0 |
| | | | | | | 20 | ± 0.75 | ± 45 | +0.01 | +2 |
| | 2 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | +0.04 | 0 |
| | 3 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | -0.08 | 0 |
| | | | | | | | | | | |
| 3 | 1 | 200 | 1.0 | 7.50 | 0.80 | 200 | ± 0.50 | ± 30 | +0.10 | 0 |
| | | | | 30.00 | 0.80 | 200 | ± 0.50 | ± 30 | +0.04 | +1 |
| | | | | | | 20 | ± 0.75 | ± 45 | +0.03 | +2 |
| | 2 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | +0.07 | 0 |
| | 3 | 200 | 1.0 | 60.00 | 0.80 | 100 | ± 1.00 | ± 60 | -0.09 | -1 |



Komm. Nr. 2005.1381.02

[illegible]

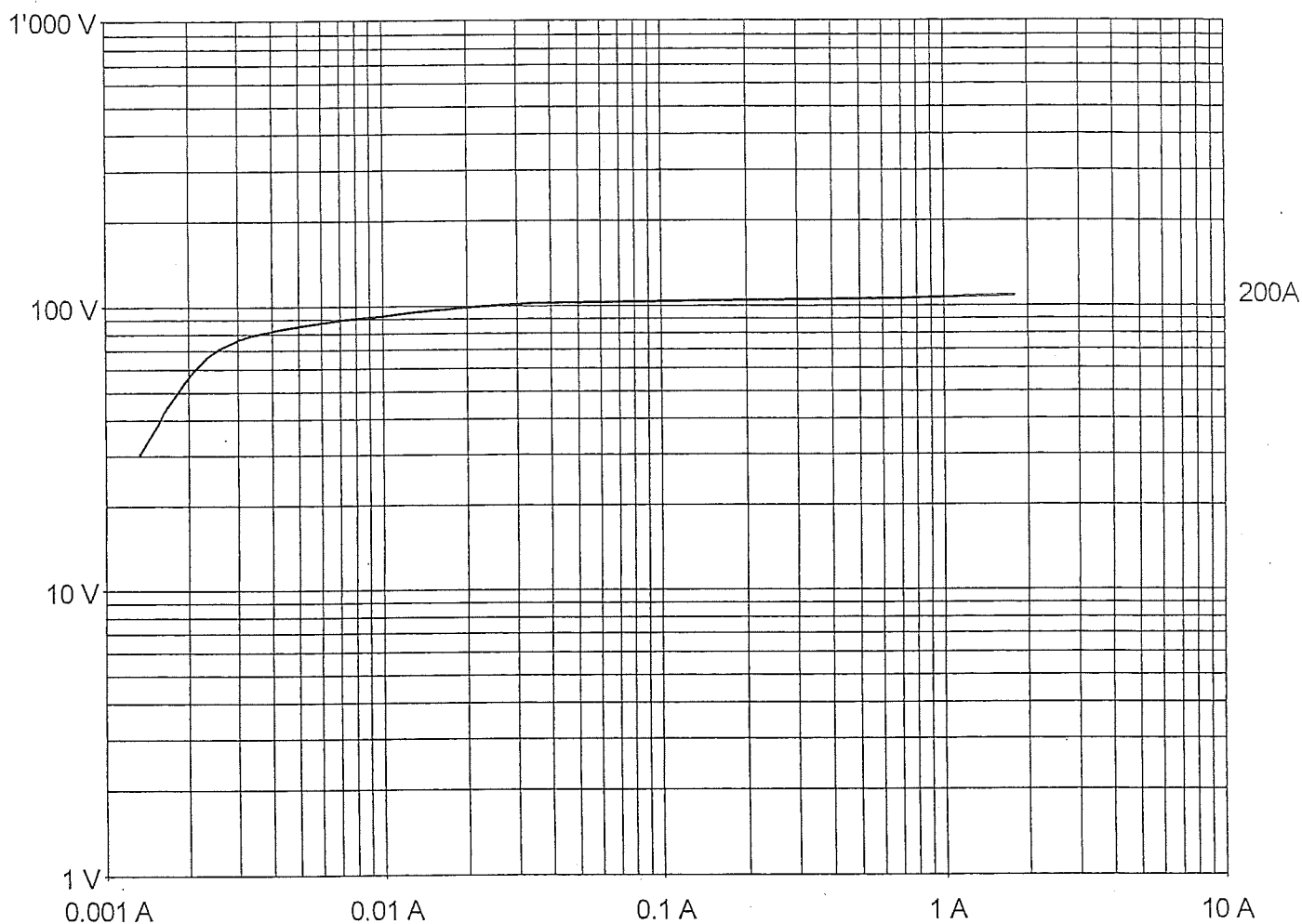
Magnetisierungskurve

Magnetization curve

Typ/ Type: JOF 123

Komm. No.: 2005.1381.02

Seite/ Page: 4



Frequenz / Frequency: 50 Hz

Kern-Nr. / Core-N°: 1

| I _{prim} /I _{sec} [A]/[A] | Klasse Class | R _{ct} [Ohm] 75°C | U [V] | I [A] verlangt required | I [A] gemessen measured | Knie/ Knee gemessen measured |
|--|----------------------------|----------------------------------|----------|-------------------------------|-------------------------------|------------------------------------|
| 200 /1 | 30 VA cl. 0.5 FS5 ext.200% | 2.31 | 159 | > 0.500 | > 1.78 | ok |

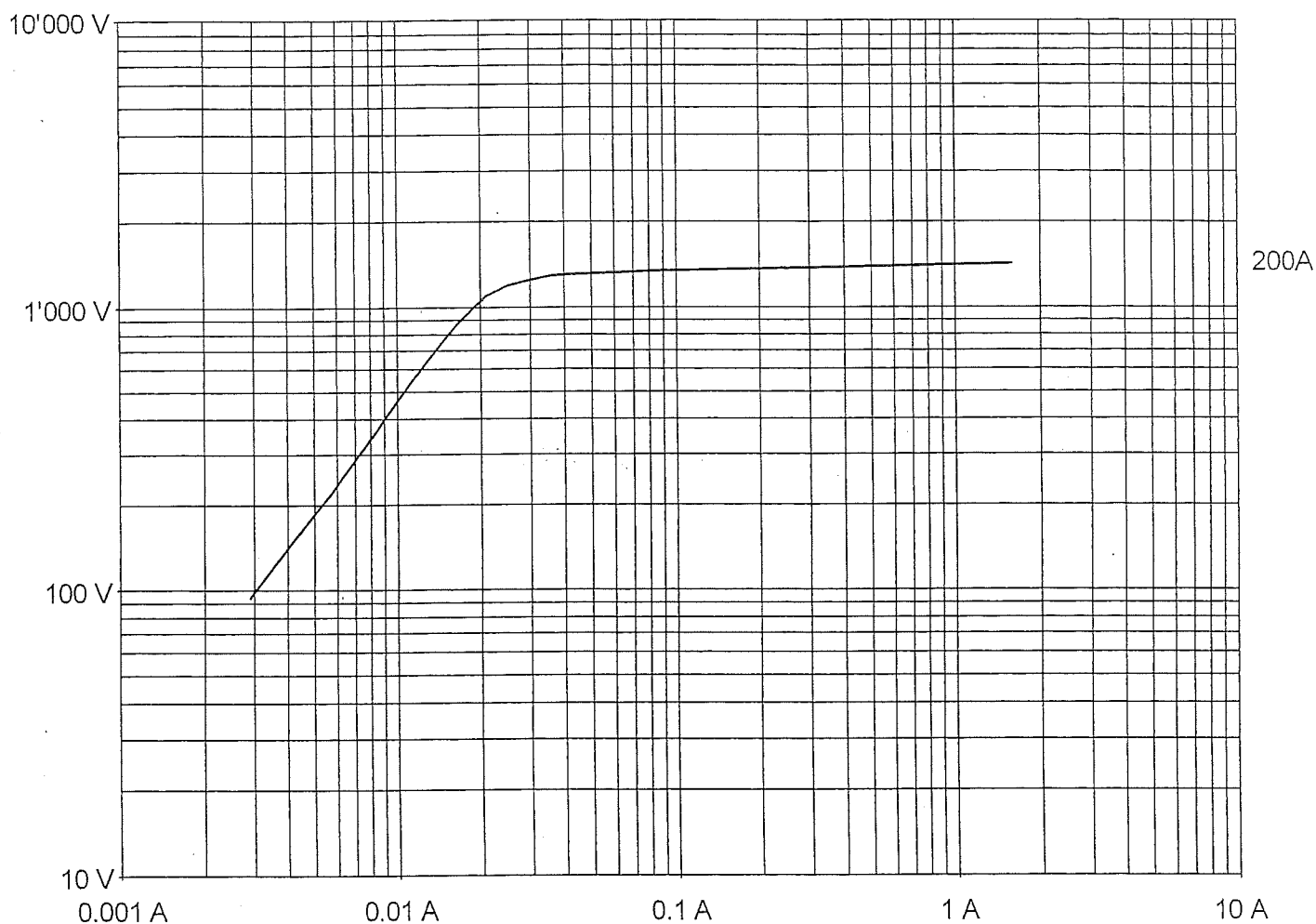
Magnetisierungskurve

Magnetization curve

Typ/ Type: JOF 123

Komm. No.: 2005.1381.02

Seite/ Page: 5



Frequenz / Frequency: 50 Hz

Kern-Nr. / Core-N°: 2

| I _{prim} /I _{sec} [A]/[A] | Klasse Class | R _{ct} [Ohm] 75°C | U [V] | I [A] verlangt required | I [A] gemessen measured | Knie/ Knee gemessen measured |
|--|-----------------|----------------------------------|----------|-------------------------------|-------------------------------|------------------------------------|
| 200 /1 | 60 VA cl. 5P20 | 3.89 | 1263 | < 1.00 | 0.034 | ok |

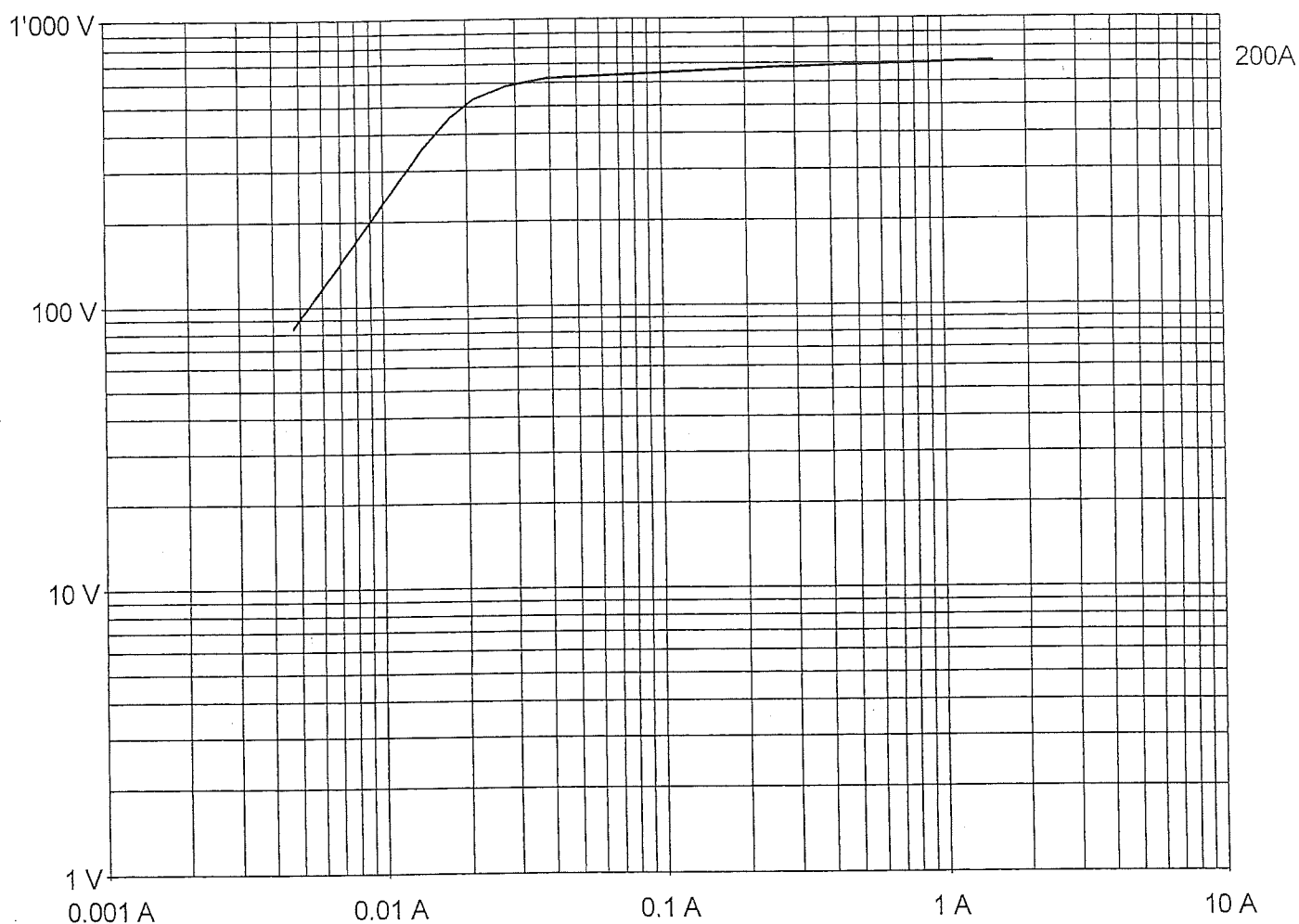
Magnetisierungskurve

Magnetization curve

Typ/ Type: JOF 123

Komm. No.: 2005.1381.02

Seite/ Page: 6



Frequenz / Frequency: 50 Hz

Kern-Nr. / Core-N°: 3

| I _{prim} /I _{sec} [A]/[A] | Klasse Class | R _{ct} [Ohm] 75°C | U [V] | I [A] verlangt required | I [A] gemessen measured | Knie/ Knee gemessen measured | |
|--|-----------------|----------------------------------|----------|-------------------------------|-------------------------------|------------------------------------|----|
| 200 /1 | 60 VA cl. 5P10 | 2.90 | 623 | < 0.500 | 0.044 | | ok |

Magnetisierungspunkte

Magnetization point

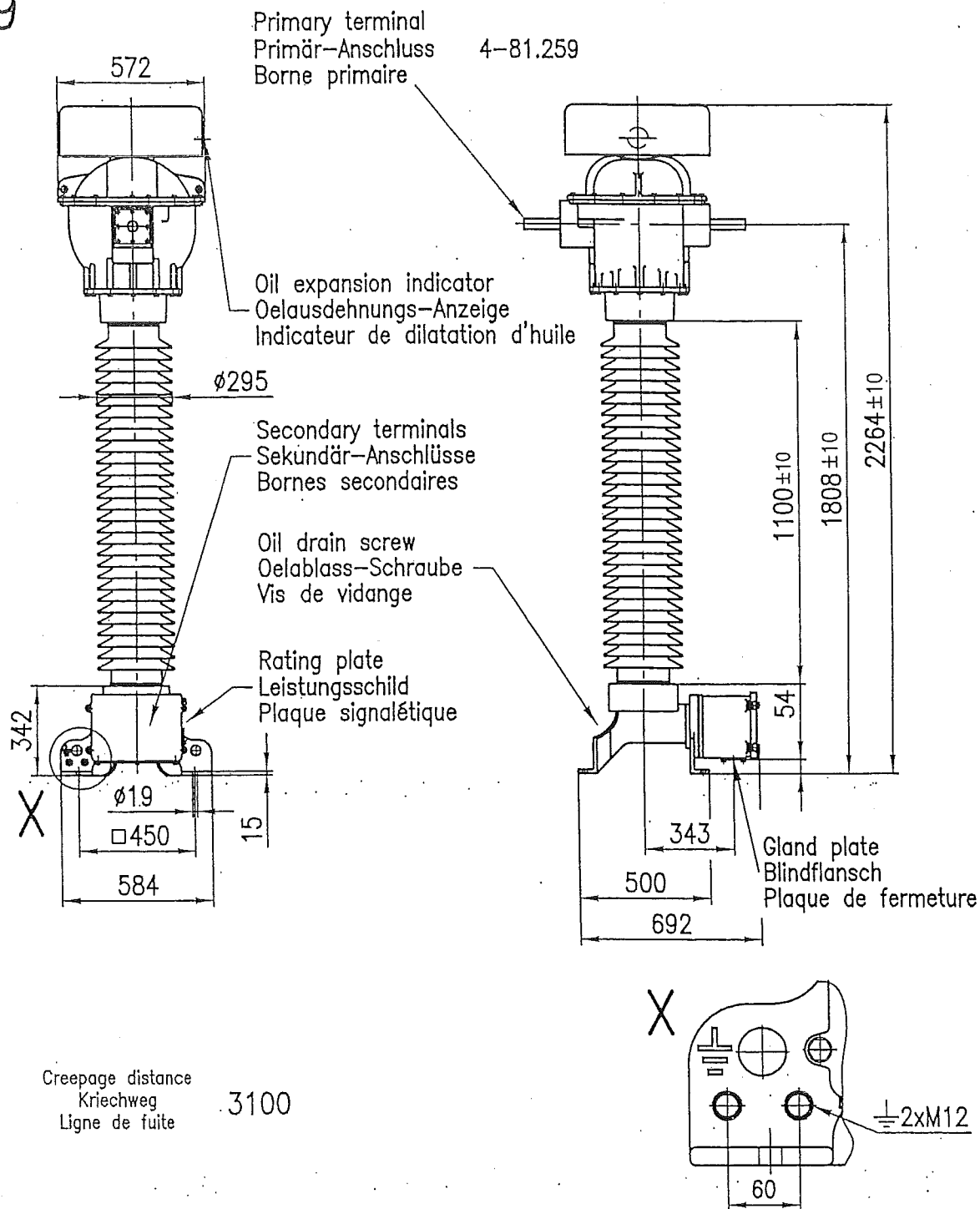
Typ/ Type: JOF 123

Komm. No.: 2005.1381.02

Seite/ Page: 7

| Kern Nr | Serie Nr | I _{prim} /I _{sec} [A]/[A] | Klasse Class | R _{ct} [Ohm] 75°C | U [V] | I [A] verlangt required | I [A] gemessen measured | Knie/ Knee gemessen measured |
|------------|-------------|--|-----------------|----------------------------------|----------|-------------------------------|-------------------------------|------------------------------------|
| 2 | 1 | 200 /1 | 60 VA cl. 5P20 | | 1263 | < 1.00 | 0.043 | |
| 2 | 2 | 200 /1 | 60 VA cl. 5P20 | | 1263 | < 1.00 | 0.056 | |
| 2 | 3 | 200 /1 | 60 VA cl. 5P20 | | 1263 | < 1.00 | 0.037 | |
| 3 | 1 | 200 /1 | 60 VA cl. 5P10 | | 623 | < 0.500 | 0.041 | |
| 3 | 2 | 200 /1 | 60 VA cl. 5P10 | | 623 | < 0.500 | 0.040 | |
| 3 | 3 | 200 /1 | 60 VA cl. 5P10 | | 623 | < 0.500 | 0.044 | |

99



CAD-Datei: 051018

Verbindlich für / Valid for : US Steel Kosica
 Kunde / Customer No. : Areva Energietechnik GmbH
 PFIFFNER Com. No. : 2005.1381.02
 Erstellt / Prepared : 21.12.05 MK

CURRENT TRANSFORMER
 Stromwandler JOF 123 ... 170
 TRANSFORMATEUR DE COURANT

PFIFFNER Messwandler AG
 CH-5042 Hirschthal

Gezeichnet: 07.07.98 RK
 Freigegeben: sig. 08.07.98 sl

Änderungen/Modification

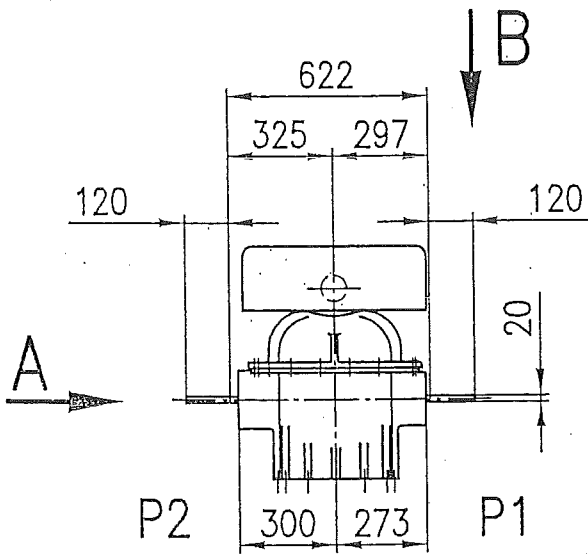
6 | 08.11.04 RA

7 |

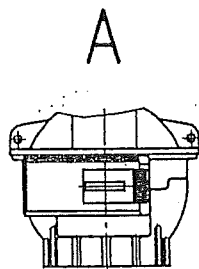
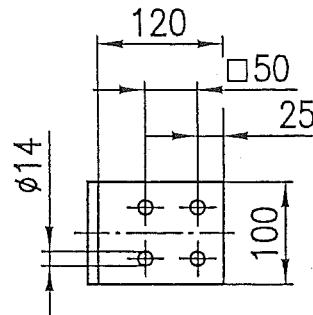
8 |

4-81.377

91



B Form F1 (DIN 46 206 Teil3)



I_N

Without primary change-over
Ohne Primärumschaltung
Sans commutation primaire

Verbindlich für / Valid for : US Steel Kosica
Kunde / Customer No. : Areva Energietechnik GmbH
PFIFFNER Com. No. : 2005.1381.02
Erstellt / Prepared : 21.12.05 MK

CAD-Datei: 051019

PRIMARY CONNECTION
Primär-Anschluss EJOF / JOF.
CONNEXION PRIMAIRE

PFIFFNER Messwandler AG
CH-5042 Hirschthal

Gezeichnet: 11.12.96 SL
Freigegeben: sig. 11.12.96 Lu

4-81.259

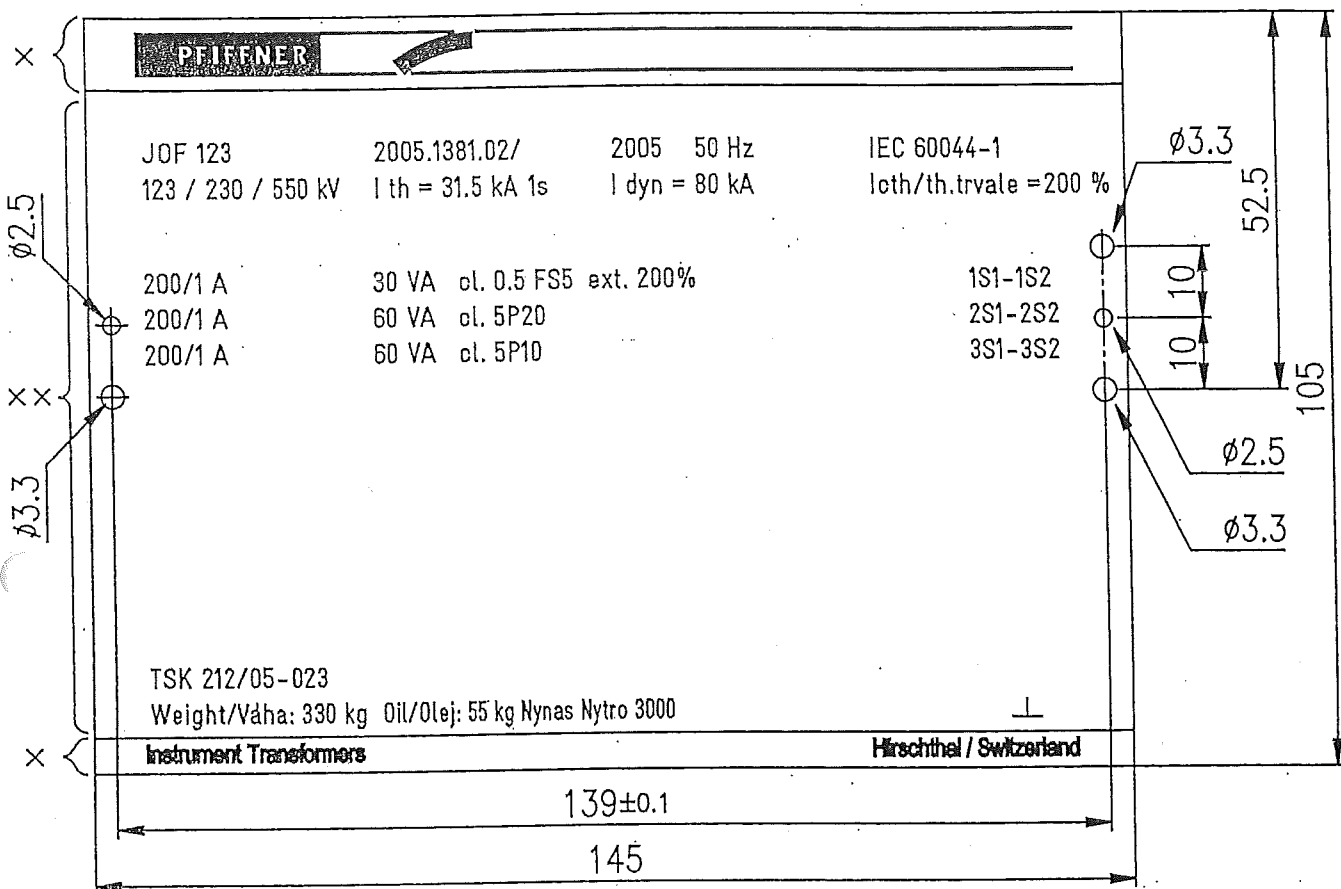
Ersetzt:

Ersetzt durch:

Änderungen/Modification

6 20.01.04 MM

86/99



1.) Material : Al 0.8 mm thickness
Material : Aluminium 0.8 mm dick
Matériau : Al 0.8 mm fort

Treatment
Ausführung
Exécution

: Anodic oxidation, faint polished
: ANOX matt, fein gebürstet
: Anodiser, fin brosse

× Ground : Silver
Grund : Aluminiumfarbig, matt
Base : Argent

× Characters
Schrift
Ecriture

: Pantone 293 / 185
: Pantone 293 / 185
: Pantone 293 / 185

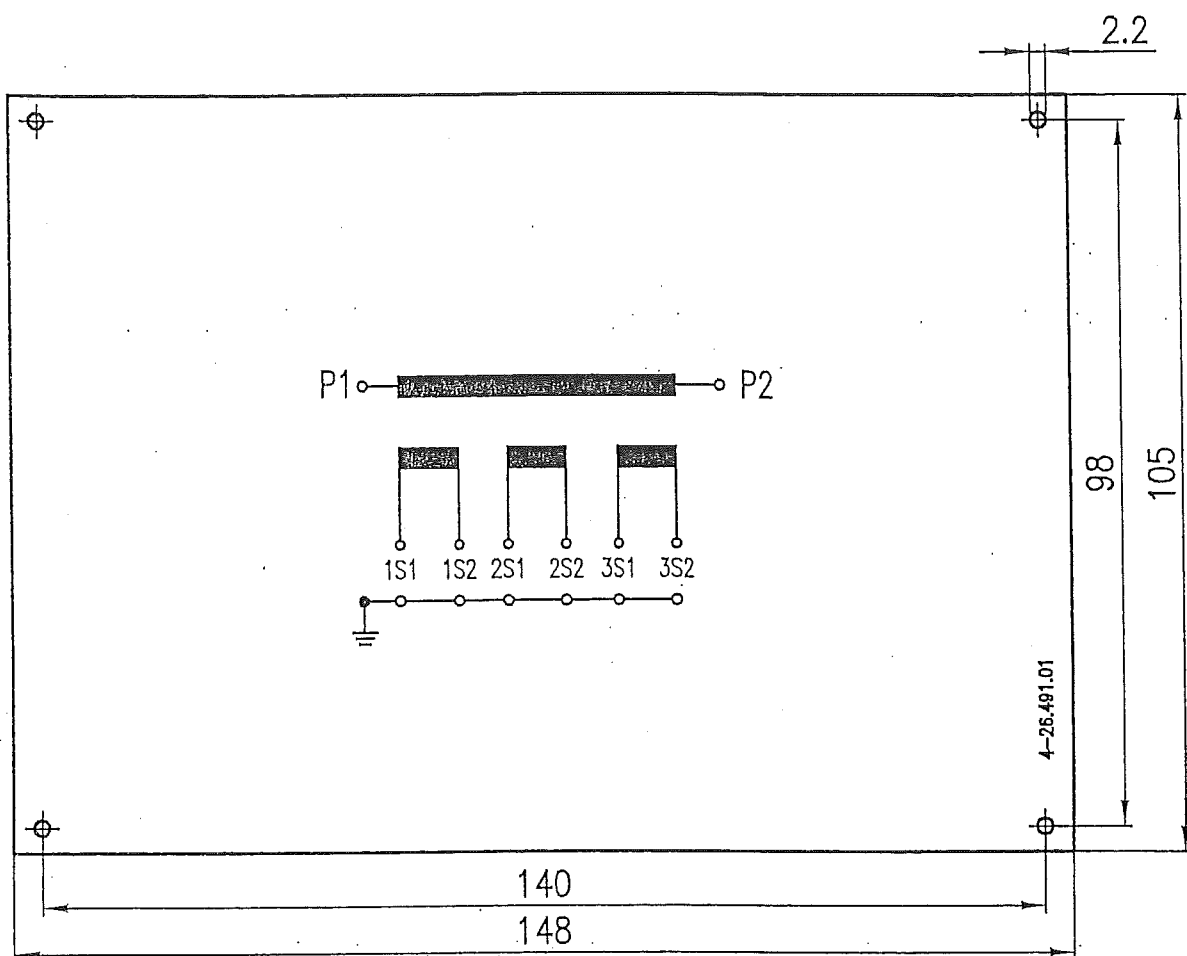
×× Ground : Pantone 293
Grund : Pantone 293
Base : Pantone 293

×× Characters
Schrift
Ecriture

: Silver
: Aluminiumfarbig, matt
: Argent

| | | | |
|---|------------|------------------------------|-------------|
| L'Schild Auftragsbez. graviert | | 99 | 4-26.643.86 |
| Leistungsschild | | 86 | 1.) |
| Stück | Gegenstand | Var. | Werkstoff |
| Ersetzt: | | Ersetzt durch: | |
| Massstab: 1:1 | | | |
| Nennmass | 0,5..6 | > 6..30 | > 30..120 |
| Abmasse | ±0,1 | ±0,2 | ±0,3 |
| | | ±0,5 | ±0,8 |
| Rating plate Leistungsschild Plaque Indicatrice | | | |
| Pfiffner Messwandler AG | | Gezeichnet: 19.11.04 RA | |
| CH-5042 Hirschthal | | Freigegeben: sig.19.11.04 FI | |
| Aenderungen: | | Blatt 1/1 | |
| 1 02.12.04 RA | | | |
| 2 03.12.04 RA | | | |
| 3 | | | |
| 4-26.643 | | | |

1



Material : Aluminium 1 mm dick
 Ausführung : ANOX matt, fein gebürstet
 Grund : Schwarz
 Schrift & Linien : Aluminiumfarbig, matt

CAD-Datei: 051023

Erstf. 1.12.05 MK

Kunde : Areva Energietechnik GmbH · US Steel Kosica

Komm. No. : 2005.1381.02

Typ : JOF 123 Stk. :

Stücktermin :

| | | | | | | | | | | | | | | | | | |
|-------------------------|------------|---------------|-----------|------------|-------------|---|-------------|--|--|--|--|--|--|--|--|--|--|
| Schaltschild | | | | 01 | 26.657.86 | | | | | | | | | | | | |
| Stück | Gegenstand | | | | Var. | Werkstoff | Bemerkungen | | | | | | | | | | |
| Ersetzt: | | Massstab: 1:1 | | | | <div>Änderungen:</div> <table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Ersetzt durch: | | | | | | | | | | | | | | | | | |
| Nennmass | 0,5..6 | > 6..30 | > 30..120 | > 120..400 | > 400..1000 | | | | | | | | | | | | |
| Abmasse | ±0,1 | ±0,2 | ±0,3 | ±0,5 | ±0,8 | | | | | | | | | | | | |
| JOF. Schaltschild | | | | | | | | | | | | | | | | | |
| PFIFFNER Messwandler AG | | | | | | Gezeichnet: 06.02.03 MM | | | | | | | | | | | |
| CH-5042 Hirschthal | | | | | | Freigegeben: sig. 06.02.03 MB | | | | | | | | | | | |
| | | | | | | 4-26.491 | | | | | | | | | | | |
| | | | | | | Blatt 1/2 | | | | | | | | | | | |

Vonkajší merací transformátor prúdu

Typ JOF 123 - 170

Návody na montáž a údržbu

1 Kontrola

1.1 Obal

Baliaci materiál musí byť kontrolovaný pred poškodením. Ak sú k dispozícii, skontrolovať indikátory preklopenia. Pri poškodení obalu alebo indikátorov preklopenia informovať výrobcu.

1.2 Menič

Dodané meniče sú kusovo skúšané, kalibrované a pripravené k použitiu. Pred montážou sú prístrojové transformátory kontrolované z hľadiska možného poškodenia.

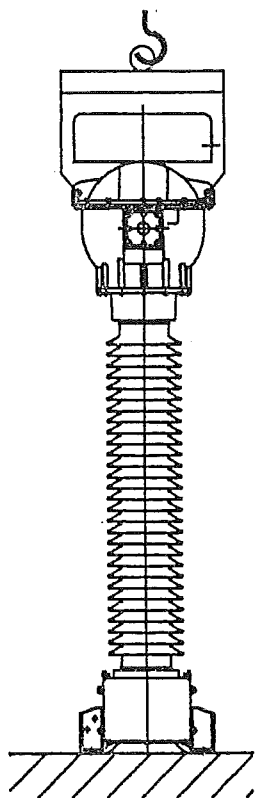
Je potrebné skontrolovať:

- nesmú byť priesaky oleja
- tmelenie, izolátory a primárny vývod nesmú byť poškodené.

2 Montáž

2.1 Zdvíhanie meničov

Drevenné debny sa zdvíhajú popruhmi, lanami alebo vysokozdvížným vozíkom. Zdvíhanie meničov sa prevádza pomocou špeciálneho zdvíhacieho prípravku upevneného do k tomu určených ok na hlave meniča. Kryt musí zostať voľný, prípadne vypolstrovaný. Odporúčame používať zdvíhacie zariadenie firmy Pfiffner.



2.2 Montáž na podstavec:

Pri nerovnosti podstavnej plochy je potrebné pätky meracieho transformátoru vypodložiť.

2.3 Montáž na koľajnice:

Merací transformátor postaviť na podvozok a nad kolesami pripevniť dvomi navzájom uhlopriečne posadenými upevňovacími prípravkami.

3 Uvedenie do prevádzky

3.1 Uzemňovacie vývody

Pred montážou odstrániť oxidovú vrstvu a použiť pribalené nerezové skrutkovanie.

3.2 Primárne vývody

Pri Al-vývodoch musí byť kontaktná plocha pred montážou zbavená oxidu a chránená pred ďalšou oxidáciou pomocou kontaktnej vazelíny*.

3.3 Primárne prepnutia

Pri meničoch s primárnym prepnutím pozícia prepínacej doštičky podľa prepínacieho štítku na hlave meniča. Kontaktné plochy potrieť kontaktnou vazelínou*.

Prepínaciu doštičku pri meničoch bez primárneho prepnutia neprekladať.

3.4 Sekundárne vývody

Každé sekundárne vinutie musí byť na jednom konci uzemnené.

Vyhotovenie pomocou zaskrutkovania skrutiek na zemniacej zbernici.

⇒ **Sekundárne vinutie meracieho transformátoru prúdu nesmie byť nikdy prevádzkované rozpojené (vysoké napätie na svorkách).**

3.5 Uťahovacie momenty

| | Uťahovací moment (Nm) |
|---|--------------------------|
| Primárne prepnutia | 20 |
| Sekundárne svorníky M10 (v prípade ak sú k dispozícii) | 10 |
| Zemniaci vývod, podvozok | 72 |
| Kryt svorkovnicovej skrine | 10 |

* Odporúčame „Penetrox A“ od výrobcu Burndy Corporation, Manchester

4 Údržba

4.1 Primárne pripojenie

Preskúšanie spojovacej svorky na koróziu, stopy termického prehriatia alebo uvoľnené skrutky.

4.2 Vizuálna kontrola

Kontrolovať na stratu oleja, napr. olejové stopy v oblasti hlavy.
V prípade strát oleja ihneď informovať výrobcu alebo zástupcu.

Olejoznak:

| | |
|-----------------------------------|---|
| Ukazovateľ v zelenom poli | Menič v normálnej prevádzke |
| Ukazovateľ v hornom červenom poli | Menič má pretlak, nutná kontrola |
| Ukazovateľ v dolnom červenom poli | Menič má podtlak, príp. netesnosť, kontrola nutná |

Poruchy sú signalizované, keď olejoznak dosiahne červené koncové značky, prípadne keď sa poloha ukazovateľa podstatne líši od susedných meničov.

Pri extrémnych teplotných podmienkach môže ukazovateľ dosiahnuť červené značenie.

Rozsah teploty okolia počas prevádzky: -25°C (-40°C na požiadanie) do +40°C (+50°C na požiadanie).

4.3 Ošetrovanie / čistenie

Vonkajšie čistenie podľa firemných predpisov prevádzkovateľa.

Kontrolovať priepustnosť vzduchu vetracieho filtra na dne svorkovnicovej skrine.

Pre dlhodobé ošetrovanie každého druhu kontaktovať výrobcu.

4.4 Kontrola oleja

Skúšky oleja výrobca odporúča najskôr po 25-tich rokoch prevádzky.

**Outdoor current transformer
Type JOF 72-245**

MU 20e

Process Owner: MB

Released: MB

Edition: 05.06.03

Page 1 of 3

Installation & Maintenance Instructions

1 Inspection

1.1 Packing material

The packing material must be checked for external damage. If supplied, the 3D-Tilt indicator must also be checked.

In the event of damaged packing material or activated 3D-Tilt indicators, PFIFFNER or its representative is to be contacted.

1.2 Transformer

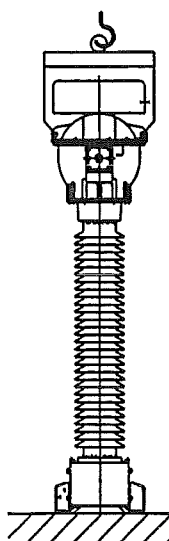
Each transformer supplied is tested, calibrated and ready for use. Before installation, the transformers must be checked for any damage. The following should be ascertained:

- that there is no oil leakage
- that there is no damage to the cementing, insulator, primary terminals or cover.

2 Installation

2.1 Lifting the transformer

Wooden boxes are lifted with straps, cables or forklifts. To lift the transformer, use the appropriate ring hooks on the transformer head. Protect the cover by placing a soft material in between. The use of the PFIFFNER lifting device is recommended.



| | | | |
|--|--------------|-------------------|-------------|
| Outdoor current transformer Type JOF 72 - 245 | | | MU 20e |
| Process Owner: MB | Released: MB | Edition: 05.06.03 | Page 2 of 3 |

2.2 Arrangement on mounting structure:

Ensure that the mounting surface of the support frame is even.

2.3 Arrangement on rails

Place the transformer on the chassis and fix it diagonally across the wheels with the two special clamps.

3 Connections

3.1 Earth terminals

Before connection and to prevent further oxidation, clean off the oxide layer and coat with contact grease*. Use the rustproof screws supplied.

3.2 Primary terminals

With aluminium terminals and to prevent further oxidation, clean off the oxide layer and coat with grease* before connection.

3.3 Primary changeover

If the transformer is equipped with a primary changeover, the position of the switching plate must be in accordance with the switching label on the transformer head. Be sure to coat the contact surfaces with contact grease*.

Do not displace the switching plate when the transformer has no primary changeover.

3.3 Secondary terminals

Every secondary winding must be earthed at one end. Screwing in the appropriate screw on the earthing bus bar does this.

⇒ **Never operate the current transformer with an open secondary winding (high voltage across terminals).**

3.4 Torques

| | Torque (Nm) |
|---|-------------|
| Primary changeover | 20 |
| Secondary bolts M10 (if available) | 10 |
| Earth connection bottom housing, chassis | 72 |
| Terminal box lid | 10 |

*We recommend 'Penetrox A' from FCI-Burndy, Manchester NH, USA

**Outdoor current transformer
Type JOF 72 - 245****MU 20e**

Process Owner: MB

Released: MB

Edition: 05.06.03

Page 3 of 3

4 Maintenance**4.1 Primary connection**

Inspect the terminals for corrosion, traces of thermal stress or loose bolts.

4.2 Visual control

Check the transformer for oil loss, e.g. oil streaks on the head or bottom housing. Inform the manufacturer or representative immediately in the event of an oil leakage.

Oil expansion:

| | |
|-----------------------------|--|
| Indicator in green area | Transformer operating normally |
| Indicator in upper red area | Transformer has overpressure, check is necessary |
| Indicator in lower red area | Transformer has low pressure, possible oil leakage, check is necessary |

If the transformer oil expansion indicated is different between the three phases, there may be a fault. Under extreme temperature conditions, the indicator can reach the red area.
Range of ambient temperature: -25°C (-40°C on demand) to +40°C (+50°C on demand).

4.3 Care / cleaning

Exterior cleaning in accordance with the operator's internal regulations.
Check for a clean ventilation grille and unobstructed air flow in the base of the terminal box.

4.4 Further maintenance

An oil check is recommended only after 25 years.
The manufacturer is to be contacted for all other types of maintenance.