

ТЕХНИЧЕСКО ПРЕДЛОЖЕНИЕ

за участие в процедура за възлагане на обществена поръчка с предмет:

"Доставка на измервателни трансформатори за напрежение 110 kV", Обособена позиция № 2 "Напреженови измервателни трансформатори 110 kV"

От АББ България ЕООД

(наименование на участника)

УВАЖАЕМИ ДАМИ И ГОСПОДА,

- 1. Предлаганият от нас срок за доставка е 150 (Сто и петдесет) календарни дни, считано от датата на влизане на договора в сила.
 - 2. Предлаганият от нас гаранционен срок е 24 (Двадесет и четири) месеца от датата на доставка.
- 3. Предлаганият от нас срок за отстраняване възникнали повреди на доставените трансформатори или за замяната им с нови по време на гаранционния срок е 30 (Тридесет) календарни дни след получаване на писмено уведомление от страна на възложителя.

Техническите характеристики на предлаганите от нас за доставка напреженови измервателни трансформатори 110 kV са посочени в таблиците по-долу:

Пакет 1 – Таблица № 2.1. Техническа спецификация за 9 (девет) напреженови трансформатора.

Nº	Технически характеристики	Мярка	Минимални Технически изисквания	Предложение на участника
1	2	2	4	5
	Общи данни			
1	Фирма-производител		да се посочи	АББ
2	Стандарт		IEC 61869-1, IEC 61869-3 или еквивалент	IEC 61869-1, IEC 61869-3
3	Тип конструктивно изпълнение		индуктивен	индуктивен
	Електрически параметри			
1	Максимално работно напрежение	kV	123	123
2	Номинално първично напрежение	kV	110/√3	110/√3
3	Номинална честота	Hz	50	50
4	Изпитвателни напрежения на първичната намотка:			
4.1	Със стандартна импулсна вълна 1,2/50 µs	kV	550	550
4.2	С промишлена честота, 1 min	kV	230	230
5	Минимален път на тока на утечка	mm	3813.k _D	4250 (>3813.k _D)
6	Частични разряди при изпитвателно напрежение	рС	10	≤10

АББ България ЕООД Адрес на управление (ЦУ): бул. "Христофор Колумб" № 9, ет.3

София 1592, България тел..: (+359 2) 807 55 00 факс: (+359 2) 807 55 99 уеб страница: www.abb.bq ел. поща: office@bg.abb.com Ид. номер по ЗДДС: BG 831133152 Банкови данни: ИНГ Банк, клон София IBAN: BG13INGB91451000027317 (BGN) IBAN: BG60INGB91451400027311 (EUR)

BIC: INGBBGSF

ЕИК: 831133152









Nº	Технически характеристики	Мярка	Минимални Технически изисквания	Предложение на участника
1	2	2	4	5
	Um			
7	Частични разряди при изпитвателно напрежение 1,2Um/ √3	рС	5	≤5
8	Напреженов фактор на системата:			
8.1	Напреженов фактор / продължително време	p.u	1,2	1,2
8.2	Напреженов фактор / време на действие 30 s	p.u.	1,5	1,5
9	Количество вторични намотки	бр.	3	3
10	Първа намотка:			
10.1	Номинално вторично напрежение	٧	100/√3	100/√3
10.2			0,2	0,2
10.3			15	15
11	Втора намотка:			
11.1	Номинално вторично напрежение	٧	100/√3	100/√3
11.2	Клас на точност (при товар на останалите намотки ст 0 до 100% от номиналния им товар)	_	1	1
11.3	Номинална мошност	VA	100	100
12	Трета намотка (намотка за защита):			
12.1	Номинално вторично напрежение	V	100	100
12.2	Клас на точност		3 P	3 P
12.3	Номинална мощност	VA	100	100
13	Обща номинална мощност	VA		215
14	Устойчивост на къси съединения	S	1	.1
15	Ниво на радио смущения при 1,1U ₂ /3	μV	≤ 2500	≤ 2500
16	Изпитвателно напрежение на вторичните намотки	kV	3	3
	Механични параметри			
1	Допустимо статично натоварване на първичните клеми			
1.1	Хоризонтално натоварване	N	2000	2000
1.2	Вертикално натоварване	N	2000	2000
2	Допустимо динамично натоварване на първичните клеми	N	≥ 3000	3000
3	Сеизмична устойчивост на нивото на монтажа		0,3 g	0,3 g
	Конструктивни параметри			
1	Технология на външната изолация		Порцелан	Порцелан
2	Първична клемна връзка	 		
2.1	Материал	+	Al	Al
		+	планка отгоре	планка отгоре
2.2	Вид			
2.3	Осево разстояние между отворите	mm	да се посочи	50
3	Клемна кутия – защита	1	IP55	IP55

Пакет 2 –Таблица № 2.2. Техническа спецификация за 84 (осемдесет и четири) напреженови трансформатора

Nº	Технически характеристики	Мярка	Минимални Технически изисквания	Предложение на участника
1	2	3	4	5
	Общи данни			
1	Фирма-производител		да се посочи	АББ
2	Стандарт		IEC 61869-1, IEC 61869-3 или еквивалент	IEC 61869-1, IEC 61869-3
3	Тип конструктивно изпълнение		индуктивен	индуктивен
	Електрически параметри			
1	Максимално работно напрежение	kV	123	123
2	Номинално първично напрежение	kV	110/√3	110/√3
3	Номинална честота	Hz	50	50
4	Изпитвателни напрежения на първичната намотка:			
4.1	Със стандартна импулсна вълна 1,2/50 µs	kV	550	550
4.2	С промишлена честота, 1 min	kV	230	230
5	Минимален път на тока на утечка	mm		3075 (3075.k _D)
6	Частични разряди при изпитвателно напрежение Um	рС	≤ 10	≤ 10
7	Частични разряди при изпитвателно напрежение 1,2Um/ √3	рС	≤ 5	≤ 5
8	Напреженов фактор на системата:			
8.1	Напреженов фактор / продължително време	p.u	1,2	1,2
8.2	Напреженов фактор / време на действие 30 s	p.u.	1,5	1,5
9	Количество вторични намотки	бр.	3	3
10	Първа намотка:			
10.1	Номинално вторично напрежение	٧	100/√3	100/√3
10.2	Клас на точност (при товар на останалите намотки от 0 до 100% от номиналния им товар)		0,2	0,2
10.3	Номинална мощност	VA	15	15
11	Втора намотка:			
11.1	Номинално вторично напрежение	٧	100/√3	100/√3
11.2	Клас на точност (при товар на останалите намотки от 0 до 100% от номиналния им товар)		1	1
11.3	Номинална мощност	VA	100	100
12	Трета намотка (намотка за защита):			
12.1	Номинално вторично напрежение	٧	100	100
12.2	Клас на точност		3 P	3 P
12.3	Номинална мощност	VA	100	100
13	Обща номинална мощност	VA		215
14	Устойчивост на къси съединения	s	1	1
15	Ниво на радио смущения при 1,1U _r /3	μV	≤ 2500	≤ 2500
16	Изпитвателно напрежение на вторичните намотки	kV	3	3
	Механични параметри			
1	Допустимо статично натоварване на първичните клеми			
1.1	Хоризонтално натоварване	N	2000	3600
1.2	Вертикално натоварване	N	2000	3600
2	Допустимо динамично натоварване на	N	≥ 3000	5000

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Nº	Технически характеристики	Мярка	Минимални Технически изисквания	Предложение на участника
1	2	3	4	5
3	Сеизмична устойчивост на нивото на монтажа		0,3 g	0,3 g
	Конструктивни параметри			
1	Технология на външната изолация		порцелан	порцелан
2	Първична клемна връзка			
2.1	Материал		Al	Al
2.2	Вид		планка отгоре	планка отгоре
2.3	Осево разстояние между отворите	mm	да се посочи	50
3	Клемна кутия – защита		IP55	IP55

Като неразделна част от настоящото техническо предложение прилагаме следните документи:

- 1. Технически данни съгласно приложените таблици, с полълнени всички изисквания в колона № 5;
- 2. Документи, доказващи параметрите на декларираните (посочените) технически данни, като каталози, проспекти, технически характеристики заверени от фирмата производител и др.
- 3. Протоколи от всички типови изпитания, проведени в специализирана и акредитирана лаборатория, отговаряща на изискванията на IEC на английски или български език;
- 4. Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания. (заверено копие и превод на български език, в случай че документът е издаден на чужд език)
- 5. Протокол от сеизмични изпитания или изчисления на английски или български език;
- 6. Сертификат за типа и характеристиките на маслото на маслонапълнените трансформатори на английски или български език;
- 7. Изискванията към конструкцията върху която оборудването ще бъде монтирано или проект на конструкцията, осигуряваща сеизмична устойчивост на оборудването.
- 8. Монтажни чертежи с габаритни размери и тегла;
- 9. Детайлен чертеж на клемната връзка;
- 10. Детайлен чертеж за начина на закрепване на съоръжението към носеща стоманена конструкция;
- 11. Списък на всички стандарти използвани при разработването и тестването, изготвен от участника.

Гарантираме, че сме в състояние да изпълним качествено поръчката в пълно съответствие с изискванията на възложителя.

Заличено по чл.2 от ЗЗЛД Заличено по чл.2 от ЗЗЛД

Дата: 18.02.2016

София

Ексхарт Нойрайтер
Управител
АББ България ЕООД

Стефан Минчев Управител АББ България ЕООД

Data Schedule : Inductive Voltage Transformer

Date :	2015-12-15	Name:	bozena.trajer@	pl.abb.com
Our ref:	KU 1319/15	Revision:	A	
Project :	15Q2843089 - ESO			<u> </u>
General data				
Quantity				9
Type				PV 123
Standards				IEC 61869-3
Design				Outdoor
insulation				Oil / paper hermetic
Manufactur	er, country			ABB, Poland
Service condi	tions			
Highest volt	age of a system (phase-to-phase) Usys		kV r.m.s.	123
Rated frequ	ency f _R		Hz	50
Ambient air	temperature (Temperature category)		°C	-40/ +40
Average am	pient air temp. (period 24h)		°C≤	35
Altitude			m	1000
Selsmic activ	rity			0,3g
Rated insulati	on level			
Highest volta	age for equipment (phase-to-phase) U _m		kV r.m.s.	123
Rated lightni	ng Impulse withstand voltage 1,2/50 μs		kV peak	550
Rated power	-frequency withstand voltage, dry		kV r.m.s.	230
Rated power	-frequency withstand voltage, wet		kV r.m.s.	230
Voltage rating	5		***************************************	
Rated prima	ry voltage Upr		V	110000 / v 3
Rated voitag	e factor Fv / Rated time			1.2/continuous &

Accuracy ratings

wi	nding No.	Rated sec. voltage U _{sr}	Rated output Sr	Class	Total simult. output	linalting	No. of terminal box	Cover for sealing
1	(1a - 1n)	100 : V3 V	15 VA	0,2*	115 VA	1000 VA	1	-
Ш	(2a - 2n)	100 : √3 V	100 VA	1,0*	115 VA	1000 VA	1	-
111	(da - dn)	100 V	100 VA	3P	215 VA	450 VA	1	-

Product data		
Dimension drawing		2GKV614615A1319;rev.A
Rating plate language		Bulgarian
Insulator type / colour		Porcelain/ brown
Minimum creepage distance	mm	4250
Minimum arcing distance	mm	1425
Primary terminal type		Al flat pad 100x120 T=20 mm;
		4xD=14/50x50mm
Earthing terminals type		4xø14/50x50mm
Secondary terminal type		Phoenix rail terminal blocks;
		spring, type ST 10
Cable glands – terminal box No. 1		Polyamide; 2xM32
		M32 (cable diam. 11-21 mm), with
		strain relief;
Withstand test load on primary terminal FR	(Static/Dyn)N	2000/3000
Painting (colour)		///
 Housing above insulator 		RAL 7035 Light grey
 Housing below insulator 		RAL 7035 Light grey

1.5/30s

Total weight Weight of oil Insulating oil type	kg kg	310 60 Nynas Nytro 10XN — Inhibited mineral insulating oil acc. to IEC 60296
Packing		Vertical -3-pack wooden base
Shipping weight	kg/3units	1030
Shipping volume	m3/3units	5,6



Заличено по чл.2 от ЗЗЛД

tol. (22) 323 0949, fell (32) 223 0966 (18)



Data Schedule: Inductive Voltage Transformer

Date : Our ref : Project :	2015-12-15 KU 1320/15 15Q2843089 - ESO	Name : Revision :	bozena.trajer@ A	ppl.abb.com
General data				
Quantity				84
Туре				PV 123
Standards				IEC 61869-3
Design				Outdoor
Insulation				Oil / paper hermetic
Manufactur	er, country			ABB, Poland
Service condi	tions			
Highest volt	age of a system (phase-to-phase) Usys		kV r.m.s.	123
Rated freque	ency f _R		Hz	50
Ambient air	temperature (Temperature category)		°C	-40/ +40
Average am	bient air temp. (period 24h)		°C ≤	35
Altitude			m	1000
Seismic activ	vity			0,3g
Rated insulati	on level		-	
Highest volta	age for equipment (phase-to-phase) Um		kV r.m.s.	123
Rated lightni	ing impulse with <mark>stand voltage 1,2/5</mark> 0 μs		kV peak	550
Rated power-frequency withstand voltage, dry			kV r.m.s.	230
Rated power	r-frequency withstand voltage, wet		kV r.m.s.	230
Voltage rating	rs			
Rated prima	ry voltage U _{pr}		V	110000 /v3
Rated voltag	e factor Fv / Rated time			1.2/continuous & 1.5/30s

Accuracy ratings

Wi	nding No.	Rated sec. voltage U _{sr}	Rated output Sr	Class	Total simult. output	Thermal limiting output	No. of terminal box	Cover for sealing
	(1a - 1n)	100 : √3 V	15 VA	0,2	115 VA	1000 VA	1	-
П	(2a - 2n)	100 : v3 V	100 VA	1,0	115 VA	1000 VA	1	-
Ш	(da - dn)	100 V	100 VA	3P	215 VA	450 VA	1	-

Product data		
Dimension drawing		2GKV614615A1320;rev.A
Rating plate language		Bulgarian
Insulator type / colour		Porcelain / brown
Minimum creepage distance	mm	3075
Minimum arcing distance	mm	1005
Primary terminal type		Al flat pad 100x120 T=20 mm;
		4xD=14/50x50mm
Earthing terminals type		4xø14/50x50mm
Secondary terminal type		Phoenix rail terminal blocks;
		spring, type ST 10
Cable glands – terminal box No. 1		Polyamide; 2xM32
		M32 (cable diam. 11-21 mm), with
		strain relief;
Withstand test load on primary terminal FR Painting (colour)	(Static/Dyn)N	3600/5000

Housing above insulator

Housing below insulator

RAL 7035 Light grey RAL 7035 Light grey

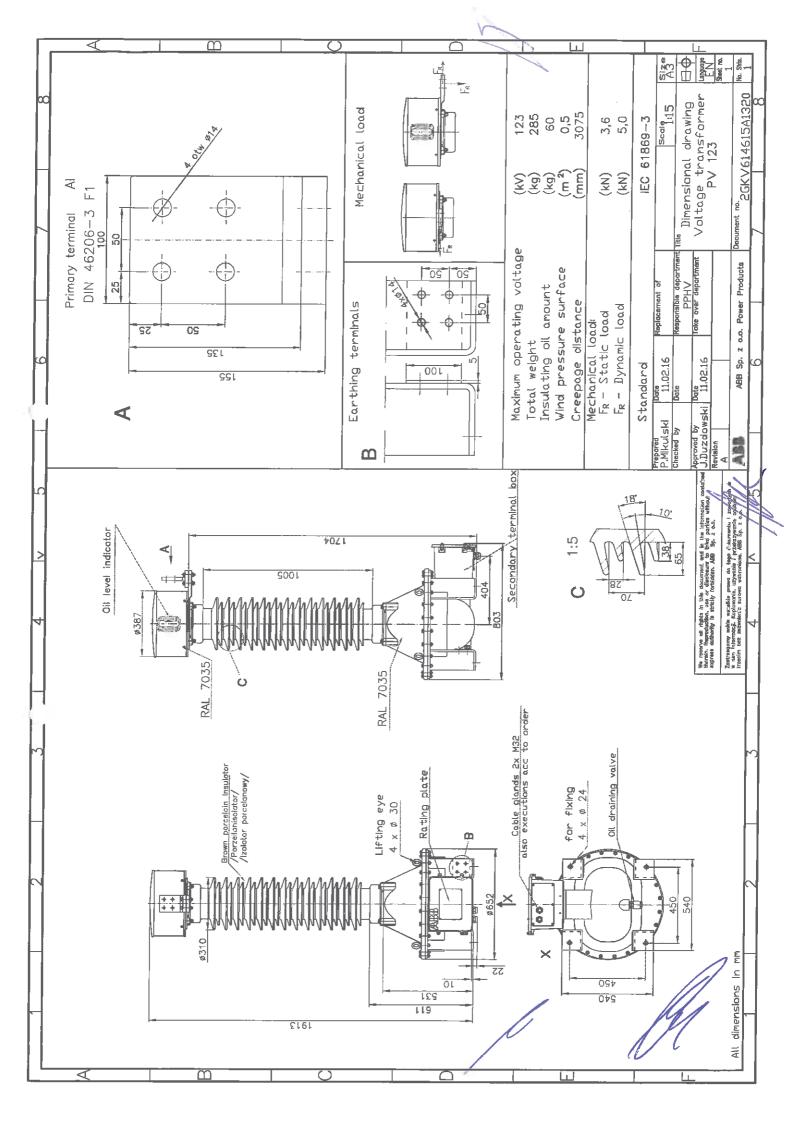


Total weight	kg	280
Weight of oil	kg	60
Insulating oil type		Nynas Nytro 10XN – Inhibited mineral insulating oil acc. to IEC 60296
Packing		Vertical -3-pack wooden crate
Shipping weight	kg/3units	1010
Shipping volume	m3/3units	5,6



Заличено по чл.2 от ЗЗЛД

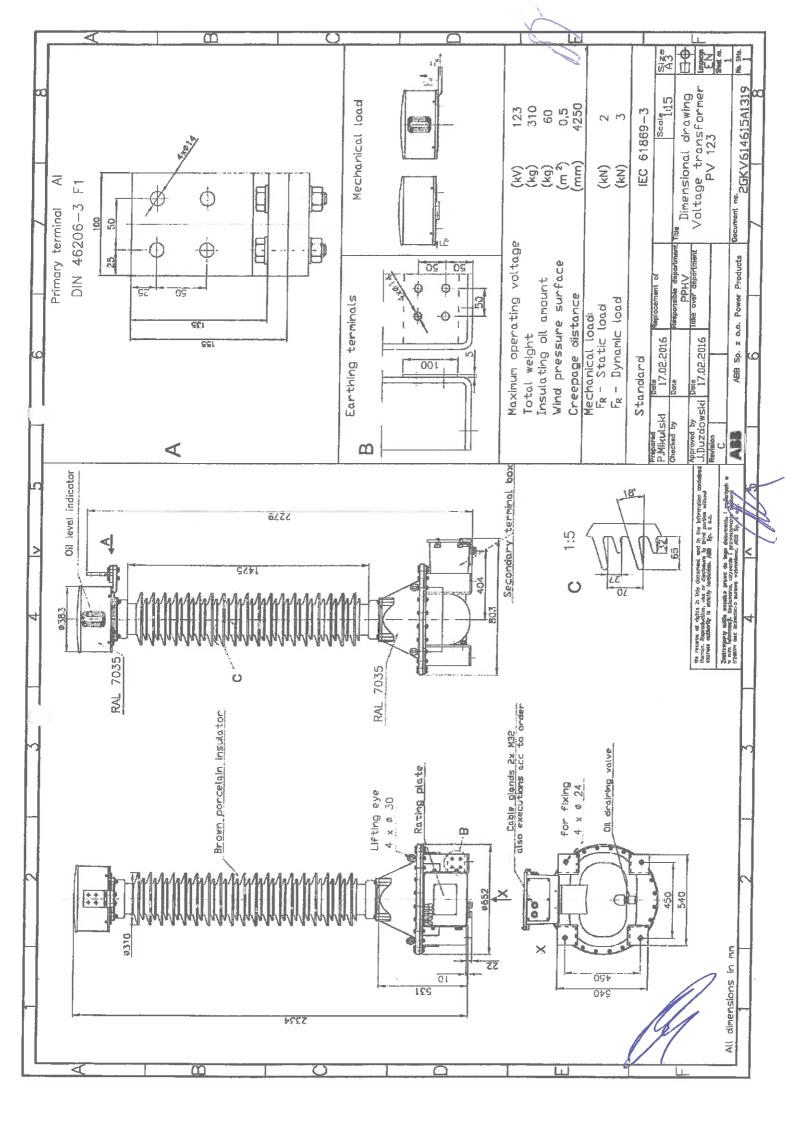
P R Z A S N Y S Z U 72 d849, fax (22) 223 8958



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Заличено по чл.2 от ЗЗЛД

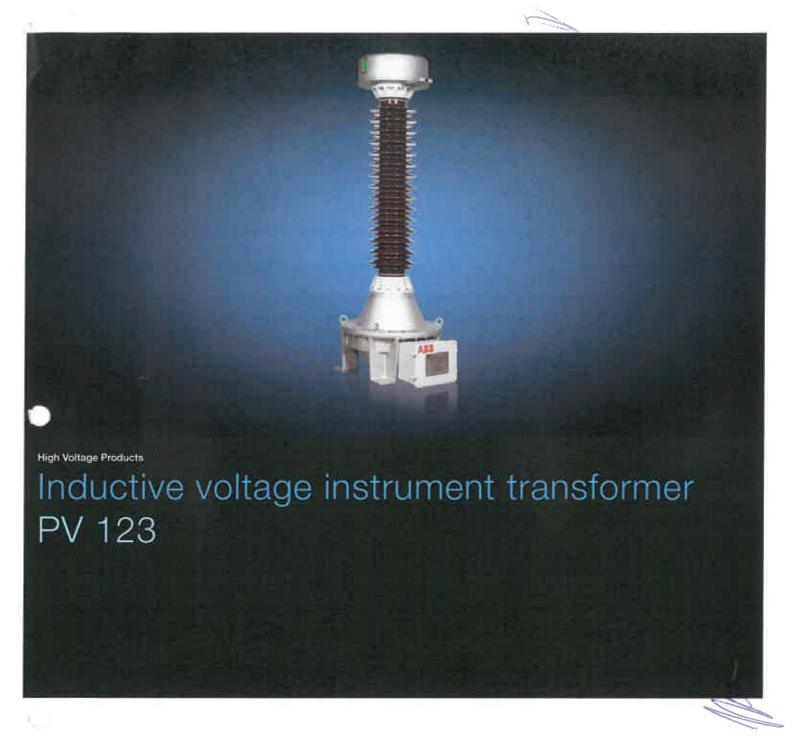
Ul. Leszno 59, 06-300 Przesnysz tel. (22) 223 8849, fax (22) 223 8958 (16)



tel. (22) 223 8846, fax (72) 223 8958 (16)

Заличено по чл.2 от 33ЛД

ABG Sp. 20.0.





General information

The PV 123 voltage instrument transformers are used for feeding measurement and protection systems in electric power grids with highest system voltage up to 123 kV and frequency of 50 Hz.

They are designed to operate in grids with effectively earthed or insulated neutral points as well as in resonant (compensated) earthed systems. The PV 123 voltage instrument transformers are suitable to operate in outdoor conditions with ambient temperature from 233 K (– 40°C) to 313 K (40°C) and at relative humidity of up to 100% at 303 K (30°C) and at the altitude not exceeding 1000 m above the sea level.

General information

The PV 123 voltage instrument transformer contains high voltage coil, secondary windings and a core encapsulated in hermetic housing filled with PCB free transformer oil. The transformer's stainless steel expansion beliows is fixed to the head and shielded with aluminium cover. The expansion beliows compensates for thermal changes in oil volume.

Primary and secondary windings and accuracy classes

The secondary windings are made of highest quality electrical copper, enabling us to deliver to customers high accuracy classes starting from 0.1.

Our in factory test laboratory is one of the most modern units of this type in the world.

Main insulation

The main insulation is made of insulation paper impregnated with transformer oil. We use high quality oil conforming to IEC 60296 Standard requirements. This oil does not contain PCB's nor any other toxic substances and has low environmental impact.

Hollow insulator

The standard insulator is made of brown porcelain with creepage distance of 25 mm/kV. A grey composite insulator with creepage distance of 31 mm/kV is available upon request. All materials used in production of our insulators conform to relevant IEC Standards.

Housing

All external parts are robust and made of corrosion resistant materials.

The PV 123 voltage instrument transformers are leak proof due to o-ring sealing system in the housing that is made of high quality aluminium alloy. The expansion beliows is equipped with large oil level indicator that enables observations of thermal changes in oil volume even from a distance. Each completely assembled unit is subject to stringent leakage checks during routine testing.

Primary terminals

The standard primary terminals are flat, made of aluminium, 100 mm width. Upon request we can offer pin type primary terminals, made of aluminium, with diameter of 30 mm.

Secondary terminal box

The secondary terminal box is IP55, constructed of aluminium. The terminal box is fixed to the transformer's bottom base. Secondary terminals are available for connection of up to 10 mm² conductors. Sealing of voltage measurement secondary terminals is also possible upon request. The secondary terminal box has two M32 cable glands (for cables from Ø 11 mm to Ø 21 mm). We offer secondary terminal boxes with higher number of cable glands upon request.

On all secondary windings of the transformer the breaking points made of copper Cu-ETP 1.2 mm dia 50mm were applied. Breaking points protect the transformer from damage in case of secondary terminal short circuit. This protection is sufficient to protect the transformer for a short distance to the nearest point where adequate protections are installed. Additional fuses in terminal box of the transformer are not needed.

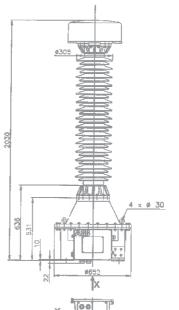
Technical data

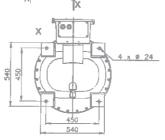
Parameter	4
Туре	PV 123
Corpoliones with the standards	IEC 61869-3;
Compliance with the standards	IEC 61869-1
Rated primary voltage	110: √3 kV
Highest system voltage	123 kV
Rated power - frequency withstand voltage at 50 Hz	230 kV
Rated lighting - Impulse withstand voltage 1.2/50 µs	550 kV
Minimum creepage distence	16; 20; 25; 31 mm/kV
Rated frequency	50 Hz
Total weight	280, 220* kg

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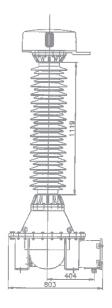
~ accuracy classes

Voltage module			
Voltage factor and time	1.2 continuous	and 1.5/30 s; 1	.9/30 s; 1.9/8 h
Number of windings:			1–5
Measuring/protection windir	ıgs:		
 rated secondary voltage 	4	100:	√3 V ; 110: √3 V
 total rated output 	up to 75 VA	up to 150 VA	up to 400 VA
- accuracy clases	0.1; 0.1/3P	0 .2; 0.2/3P	0.5; 0.5/3P
Residual winding:			
 rated secondary voltage 	1	00 V; 110 V; 10	00:3 V; 110:3 V
 rated output 			up to 400 VA





1; 3; 3P; 6P







Contact us

ABB Contact Center

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To: Whom it may concern

Przasnysz, Poland; 15.01.2016

Declaration of Patent Clearance

Tender: Tender 15Q2843089 – ESO- tender HV IT's (110 kV)

Equipment: High voltage instrument transformers type PVA123a, PA123 and PV123

We, ABB Sp. z .o.o., Poland, declare herewith, that our product quoted under the above mentioned tender are protected by below listed patents:

Combined IT type PVA123a- patent no.EP2602802B1

Current IT type PA123- patent no. EP2573781B1

Voltage IT type PV123- patent no. EP2565884B1

Kierownik Sekeji Eksportu PPHV ABB 8p. z o.o.

ADD

Заличено по чл.2 от ЗЗЛД

O D D Z I AŁ W P R Z A S N Y S Z U Ul. Leazno 59, 08-300 Przeanysz tel. (22) 223 8849, fax (22) 223 8958 (16)

ABB Sp. z o.o. Headquarter: 1, Żeganska St. 04-713 Warsaw, Poland Phone: +48 2222 02 000, +48 2222 02 001 Fax: +48 2222 02 031, +48 2222 02 231

Branch Office in Przasnysz 59, Leszno St. 06-300 Przasnysz, Poland Phone: +48 29 75 33 200 Fax: +48 29 75 33 321 District Court for the capital city of Warsaw, XIII Economic Department, Polish Court Register No: KRS 0000004745 Tax identification: 526-030-44-84, PL 5260304484 Environmental Protection No GIOŚ E0008536WBW Share capital: PLN 260 643 548.88 w = A

До: Всички заинтересовани

Пшашниш, Полша; 15/01/2016

Декларация за Патентна Чистота

Търг: ECO – търг за доставка на измерителни трансформатори ВН (110 кV)

Оборудване:

Измервателни трансформатори високо напрежение тип

PVA123a, PA123 и PV123

Ние, ABB Sp. z .o.o., Полша, с настоящото декларираме, че нашите продукти, предложени във връзка с по-горе споменатия търг, са защитени от по-долу изброените патенти:

Комбиниран измерителен трансформатор тип PVA123a - патент №EP2602802B1 Токов измерителен трансформатор тип PA123 - патент № EP2573781B1 Напреженов измерителен трансформатор тип PV - патент № EP2565884B1







AC 117

INSTYTUT ENERGETYKI

Research Institute

01-330 Warszawa, ul. Mory 8 tel. +48 22 34 51 299 fax. +48 22 836 63 63 instytut.energetyki@ien.com.pl

CERTIFICATE OF CONFORMITY

No. 013/2016 Issue No. 01 of 2016.02.12

Name and address of

the Certificate Holder: ABB Sp. z o.o.

1 Żegańska Str. 04-713 Warsaw

Poland

Name of the product:

Inductive voltage transformer

Type:

PV 123

Manufacturer:

ABB Sp. z o.o. Branch Office in Przasnysz

59 Leszno Str. 06-300 Przasnysz

Poland

Parameters and

application of the product:

According to appendix

Outdoor inductive voltage transformer designed for installing in

electrical grid with highest voltage up to 123 kV

The product meets

requirements of:

IEC 61869-1 ed. 1.0 (2007) and IEC 61869-3 ed. 1.0 (2011)

According to the evaluation

report made by:

Instytut Energetyki

Number of the

evaluation report:

DZC/16c/E/2016

Period of validity:

from 12th of February 2016 until 12th of February 2019

The right to use the certificate of conformity within its validity period applies only to:

- these copies that meet the requirements specified above and have the same characteristics (parameters) as the model / product samples submitted for testing.
- · certificate owner or his authorized representative.

The list of evidenced parameters is included in the appendices to the certificate of conformity.

Number of appendices: 1

THE SYSTEM OF PRODUCT CERTIFICATION 1a (PN-EN ISO/IEC 17067:2014-01) (product parameters confirmed by type test)

nn of the DIRECTOR OF

Заличено по чл.2 от ЗЗЛД

Warsaw, 2016.02.12

dr hab. inz. Tomasz Galka prof. IEn







AC 117

APPENDIX TO THE CERTIFICATE OF CONFORMITY

No. 013/2016
Issue No. 01 of 2016.02.12
LIST OF EVIDENCED PARAMETERS

Inductive voltage transformer typ	ne PV 123
Rated primary voltage U _P ,	≤ 110/√3 kV
Highest voltage for equipment U_m	≤ 123 kV
Rated frequency f_R	50 Hz
Rated insulation level	AC 230 kV / LI 550 kV
Static withstand test load F_R	3600 N
External insulation – creepage distance of insulators porcelain insulator composite insulator	3075 mm, 3640 mm 3800 mm
Degree of protection against mechanical impact of enclosure 1)	<u>Г</u> К7
Degree of protection of secondary terminals enclosure	IP55
Rated voltage factor F_V	$1.5U_n / 30 \text{ s or } 1.9U_n / 8 \text{ h}$
Rated secondary voltage U_{Sr}	100/√3 V; 110/√3 V
Windings accuracy class to measurements and to protection	0,1; 0,2; 0,5; 1; 3; 3P; 6P
Rated output of measurement and to protection windings S_r	≤1000 VA
Rated voltage of residual voltage winding U_{Sr} (da-dn)	100/3 V; 110/3 V; 100 V; 110 V
Residual voltage winding accuracy class	0,5; 1; 3; 3P; 6P
Residual voltage winding output S _r	≤450VA
Total thermal limiting output $S_{\Sigma h}$	4000 VA

REMARKS:

1. 1) Does not apply do porcelain insulators





ИНСТИТУТ ПО ЕНЕРГЕТИКА ИНСТИТУТ ЗА ИЗСЛЕДВАНИЯ ул. Мори 8, 01-330 Варшава тел.: +48 22 34 51299

факс: +48 22 836 63 63 instytut.energetyki@ien.com.pl

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

№ 013/2016 Издание №01 от 12.02.2016 г.

Име и адрес на

притежателя на сертификата:

ABB Sp. z o.o.

ул. Зеганска 1

04-713 Варшава, Полша

Име на продукта:

Индуктивен напреженов трансформатор

Тип:

PV 123

Производител:

АВВ Sp. z о.о. клон в Пшашниш

ул. Лешно 59 06-300 Пшашниш

Полша

Параметри и приложение

на продукта:

Съгласно Приложение

Индуктивен напреженов трансформатор, за открит монтаж, предназначен за монтаж в

електрически мрежи с най-високо напрежение до

123 kV

Продуктът отговаря на

изискванията на:

IEC 61869-1 изд. 1.0 (07 и IEC61869-3 изд.1.0 (2011)

Според доклада, изработен от:

Институт по енергетика

Номер на доклада за оценка:

DZC/16c/E/2016

Период на валидност:

от 12-ти Февруари 2016 г. до 12-ти Февруари 2019

Правото на използване на сертификата за съответствие, в рамките на срока на валидност, важи само за:

- тези копия, които отговарят на изискванията, посочени по-горе и имат същите характеристики (параметри), като модела/продукта представен за изпитания,
- собственика на сертификат или негов упълномощен представител.

<u>Списъците с доказани параметри са включени в приложенията към сертификата за съответствие. Брой приложения: 1</u>

СИСТЕМАТА НА СЕРТИФИКАЦИЯ НА ПРОДУКТИ 1a (PN-EN ISO/IEC 17067:2014-01)

(Параметри на продукта потвърдени от типовите изпитания)

Директор на Института по енергетика др. инж. Томаш Галка



ПРИЛОЖЕНИ КЪМ СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ № 007/2013

Издание №01 от 12.02.2016 г. СПИСЪК НА ДОКАЗАНИТЕ ПАРАМЕТРИ

Индуктивен напреженов трансформатор тип	PV 123
Номинално първично напрежение (Up)	≤110/√3 kV
Най-висока напрежение на индуктивен трансформатор (Um)	≤123 kV
Номинална честота (f _R)	50 Hz
Номинално ниво на изолация	AC 230 KV / LI 550 KV
Статичен товар FR	3600 N
Външна изолация –път на утечка: • порцеланов изолатор • композитен изолатор	3075 mm, 3640 mm 3800 mm
Клас на защита срещу механично въздействие на външната обвивка »	IK7
Степен на защита на вторичната клемна кутия	IP <u>55</u>
Номинална фактор на напрежение (F _v)	1.5Un/30s или 1.9Un/8 часа_
Номинално вторично напрежение (Usr)	100/√3 V; 110/√3 V
Клас на точност на вторичните намотките за мерене и защита	0.1, 0.2, 0.5, 1, 3, 3P, 6P
Номинална мощност на вторичните намотките за мерене и защита S _т	≤ 1000 VA
Номинално напрежение на остатъчната намотка (Usr(da-dn))	100/3 V, 110/3 V, 100 V, 110 V
Клас на точност на остатъчната намотка	0.5, 1, 3, 3P; 6P
Номинална мощност на остатъчната наметка S _r	≤ 450 VA
Обща теплинне ограничаваща мощност (Sim)	4 000 VA

ЗАБЕЛЕЖКА:

1, ¹⁾ Не е приложимо за порцеланови изолатори.

No Spraw		FRZER	PRZEKŁADNIKÓW WN		FLAN KONTRULI ORAZ GŁOW. YCH CZYNNOSCI TECHNOLOGICZN, CH PRZEKŁADNIKÓW WN	H7 Y	Numer / <i>Number</i> 1T 08-01-007	Number	
Spraw VT lov		and main assem	Routine test plan and main assembly operations for HV instrument transformers	V instrumen	t transform	ers	0.00	/00-1	Stron / Fages 9
Spraw * * * * * * * * * * * * *							TYP	TYP PRZEKŁADNIKA	DNIKA Separate
Spraw ** ** ** ** ** ** ** ** **	Badanie	Badanie według:	Wymaganie	Miejsce badania:	япіа:	Uwagi	Kombinowany	Napięciowy	Pradowy
Spraw 1 VT lov	Test	Test according to:	Requirement	Place of test:		Remarks	Combined IT	Voltage IT	Curront IT
VTlov	Sprawdzenie wykonania cewki nn: sprawdzenie poprawności oznaczeń kolejnych uzwojeń pomiar liczby zwojów pomiar rezystancji uzwojeń	- Dokumentacja techniczna 2GKK314041 2GKK314095	- pkt. 3a, 3b, 3c - pkt. 6a, 6b, 6c	Nawiialnia Mr 7	S. Z.		*		
•	VT low voltage coil inspection: Verification of terminal markings No. of turns measurement Resistance measurement	- Technical documentation 2GKK314041 2GKK314095	- item 3a, 3b, 3c - item 6a, 6b, 6c	Coil winding shop	shop	1	* część napięciowa voltoge part onty	>	1
Kontroli Sp Pr (by Pr Po Po Po Po Po Po Po Po Po Po Po Po Po	Kontrola uzwojonego rdzenia CT: Sprawdzenie oznaczeń zacisków Próba izolacji międzyzwojowej (badanie kontrolne na próbce) Pomiar rezystancji i liczby zwojów Badania dokładności Pomiar współczynników: FS/ALF/Kssc*Ktd/Ka/Ts/Ek/Ie	Dokumentacja techniczna 2GKK314020 IEC 61869-2	-pkt. I -pkt. 7.3.6; 7.3.204; 7.3.5; 7.2.6.202;	Nawijalnia Nr 2	Ŋ- 2				
2 CTwom	Verification of terminal markings Nerification of terminal markings Intern-turn overvoltage test (sample test) Resistance and No. of turns measurement Tests for accuracy Measurement of factors: FS/ALF/Kssc*Ktd/Ka/Ts/Ek/Ie Measurement of geometric dimensions	Technical documentation, 2GKK314020 IBC 61869-2	3.67	Coil winding shop No.2	doys	I	*część prądowa current part only	ı	>
Opracował Prepared by	ał Podpis by Signature	Data Date	Sprawdził I	Podpis Signature	Data <i>Date</i>	Zai	Zatwierdził Approved by	Podpis Signature	Data Date
Ł. Lubieniecki	seki	16.03.2015 J	J. Duzdowski		16.03.2015		P. Dębski		17.03.2015

	PL.	AN KONTROLI	FORAZ GŁÓWN PRZEK	PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TEGHNOLOGICZNYCH PRZEKŁADNIKÓW WN	I TECHNOL	OGICZNYC		Numer / <i>Number</i> IT 08-01-007		Strona / Page 2 Stron / Pages 9
1	ABB	Routine test plan	and main assemb	Routine test plan and main assembly operations for IIV instrument transformers	V instrument	transformers				
								TYP	TYP PRZEKŁADNIKA	NTKA
	_			ļ				Instrum	Instrument transformer's type	ner's type
ŝ	Bat	Badanie	Badanie według:	Wymaganie według:	Miejsce badania:	nia: Uwagi		Kombinowany	Napięciowy	Pradowy
32.		Test	Test according to:	Requirement according to:	Place of test:	t: Remarks	rks	Combined IT	Voltage IT	Current II
	Kontrola wejściowa materiałów: sprawdzenie i weryfik materiałów wejściowych	wa materiałów: i weryfikacja ciowych	Plan kontroli w SAP QM	Dokumentacja	Kontrola jakości	sści	·	>	>	>
'n	Incoming goods control: inspection and ver incoming goods	ming goods control: inspection and verification of incoming goods	Inspection plans in SAP QM	Documentation	Quality control	lor				
	Kontrola procesu uzwajania cewki napięciowej: Pomiai średnicy końcowej cewki Liczba lutowań	vajania cewki nnoowej cewki	- Dokumentacja techniczna 2GKK338001 2GKK314111	Parametry wg dokumentacji	Nawijalnia nr I	ı.		`		
4	Winding process control of voltage coil: Measurement of the final diameter Number of soldering	urol of voltage coil: c final diameter ng	- Technical documentation 2GKK338001 2GKK314111	Parameters acc. to documentation	Coil winding shop	doys	_	>	>	ı
2	Opracował Prepared by	Podpis Signature	Date Date	Sprawdził Si Checked by Si	Podpis Signature	Data Date	Zat App	Zatwierdził Approved by	Podpis Signature	Data Date
- 14	E. Lubieniecki		16.03.2015 J	J. Duzdowski		16.03.2015	a.	P. Dębski		17.03.2015

L	ŀ										
		PLAN KONTROLI ORAZ GŁOWNYCH CZYNNOSCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN	JORAZ GŁOW	PRZEKŁADNIKÓW WN	NOSCI TECHIN	OLOGICZ	NYCH	Numer / <i>Number</i> IT 08-01-007	umer / <i>Number</i> IT 08-01-007	Strona / Page 3 Stron / Pages 9	
	ABB	Routine test pla	Routine test plan and main assembly operations for HV instrument transformers	nbly operations ₃	for HV instrume	nt transforn	ners				
								TY	TYP PRZEKŁADNIKA	NIKA	
	-			-		-		Instru	Instrument transformer's type	ner's type	$\overline{}$
ž		Badanie	Badanie według:	wymaganie według:	Miejsce badania:	adania:	Uwagi	Kombinowany	Napięciowy	Prądowy	
SI.	$\neg \neg$	Test	Test according to:	a a	nt Place of test:		Remarks	Combined IT	Voltage IT	Current IT	
	Proces izolowania cewki napięciowej - sprawdzenie wymiarów zewnętrznych (średnica, s	Proces izolowania cewki napięciowej - sprawdzenie wymiarów zewnętrznych (średnica, szerokość cewki)	Instrukcja technolog IT 08-01-015; - oraz 2GKK338001	- pk	Nawijalnia nr 1	ia nr 1					T
ν.	- pomiar rezystancji Insulation process of volt - Check of the external (diameter, width) -Resistance measurement	 pomiar rezystancji Insulation process of voltage coil Check of the external dimensions (diameter, width) Resistance measurement 	Technological instruction IT 08-01-015 and 2GKK338001 2GKK314111	- cl. 4.3	Coil winding shop No. I	doys Bu	I	>	>	1	
	Montaż rdzenia i cewk napięciowej pierwotnej - Sprawdzenie montażu.	Montaż rdzenia i cewki nn w cewce Instrukcja technolog. napięciowej pierwotnej - Sprawdzenie poprawności montażu.	Instrukcja technolo IT 08-01-009	.g. pkt. 7	Nawijalnia nr 1	ia nr 1					1
9 ///	Assembly pricore in prima Assembly c	Assembly process of LV coil and core in primary voltage coil Assembly correctness inspection	Technological instruction.	cl. 7	Coil winding shop	doys suob	1	>	>	1	
- M4	Opracował Prepared by	Podpis Signature	Data Date	Sprawdził Checked by	Podpis Signature	Data Date	Za Apj	Zatwierdził Approved by	Podpis Signature	Data Date	
Αį	Ł. Lubieniecki		16.03.2015	J. Duzdowski	0	16.03.2015		P. Dębski		17.03.2015	

		PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN	ORAZ GŁÓWN	ZŁÓWNYCH CZYNNOŚC PRZEKŁADNIKÓW WN	T TECHNOLO	GICZNYCH	Numer / <i>Number</i> IT 08-01-007		Strona / Page 4 Stron / Pages 9
=		Routine test plan	and main assembl	Routine test plan and main assembly operations for HV instrument transformers	V instrument tra	nsformers			
							TYP	TYP PRZEKŁADNIKA Instrument transformer's type	VIKA er's type
S _o		Badanic	Badanie według:	Wymaganie według:	Miejsce badania:	: Uwagi	Kombinowany	Napięciowy	Prądowy
'XS'		Test	Test according to:	Requirement according to:	Place of test:	Remarks	Combined IT	Voltage IT	Current IT
	Proces wstępu prądowej	ewki	Instrukcja technolog. IT 08-01-001	pkt. 17	Nawijalnia 111		,		`
7	Pomiar sreduicy Initial insulation c Measurement	Pointar srednicy wewnetrznej Initial insulation of the current coil Measurement of the internal	Technological instruction. - IT 08-01-001	cl. 17	Coil winding shop No.1	ď	>	ı	>
	Proces izolow	Drows izolowania cewki pradowei	Dokumentacia		Nawijalnia nr 1				
	-Pomiar wym	Poniar wymiarów geometrycznych	2GKK328018 2GKK314163	pkt. 6	,			i i	`
oc	Insulation of Dimensions	Insulation of the current coil Dimensions measurement	The technical documentation.	cl. 6	Cou winding snop No.1	d d	>	ı	•
			2GKK314163				9		
	Proces nawijania prądowego i napięcioweg - Sprawdzenie wymiarów	Proces nawijania przepustu prądowego i napięciowego - Sprawdzenie wymiarów	Instrukcja tochnolog. IT 08-01-017; oraz 2GKK310230 2GKK310314 2GKK314121	pkt. 4	Nawijalnia nr 1 Coil winding shop		<u>`</u>	>	>
	Voltage and cr winding process - Dimensions check	ud current bushing ess s check	Technological instruction IT 08-01-017;and 2GKK310230 2GKK310314 2GKK314121		No.1				
20	Opracował Prepared by	Podpis Signature	Data Date	Sprawdził Checked by	Podpis Signature	Data A	Zatwierdził Approved by	Podpis Signature	Data Date
£.1	Ł. Lubieniecki		16.03.2015 J	J. Duzdowski		16.03.2015	P. Dębski		17.03.2015

Strona / Page 5 Stron / Pages 9

Numer / Number IT 08-01-007

				-						
	VIKA	er's type	Prądowy	Current IT		>		>	Data Date	17.03.2015
	TYP PRZEKŁADNIKA	Instrument transformer's type	Napięciowy	Voltage IT		>		>	Podpis Signature	
	TYT	Instrur	Kombinowany	Combined IT		>		>	Zatwierdził Approved by	P. Dębski
			Uwagi	Remarks		ŀ		ł	Data Z Date Aj	16.03.2015
			Miejsce badania:	Place of test:	claw	lave	Kontrola jakości	Quality control		16.03
					Autoklaw	Autoclave	Kontr	Quali	Podpis Signature	
			Wymaganie według:	Requirement according to:	pkt. V i VI	Cl. V and VI	Pkt.4	Item 4.	Sprawdził Checked by	J. Duzdowski
			Badanie według:	Test according to:	Instrukcja technolog. IT 08-01-003	Technological instruction IT 08-01- Cl. V and 003	zalania Instrukcja technolog. IT 08-01-035	Technological instruction IT 08-01-035	Data Date	16.03.2015 J.
			Badanie	Test	nia cewek	Coils' vacuum drying proces	any do ekładników	ery r IT filling ng	Podpis Signature	
-		$\frac{1}{2}$			Proces suszenia cewek	Coils' vacuu.	Badanie oleju: - przy dostawie - przygotowany przekładników - po zalaniu przekła	Oil tests: - at the delivery - prepared for IT filling - after IT filling	Opracował Prepared by	Ł. Lubieniecki
			Š.	Si.		10		11	Pr	F. I

17.03.2015

PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN Routine test plan and main assembly operations for HV instrument transformers	IN KONTROLI OR.	OR	AZ GŁÓWN PRZEKI main assembl	PRZEKŁADNIKÓW WN assembly operations for HI	I TECHNOLOGI	CZNYCH	Numer / Number IT 08-01-007	lumber 1-007	Strona / Page 6 Stron / Pages 9
							TYP	TYP PRZEKŁADNIKA Instrument transformer's type	NIKA ner's type
Badanie Badanie według:		Badanie według:		Wymaganie według:	Miejsce hadania:	Uwagi	Kombinowany	Napięciowy	Prądowy
Test according to:		Test according to:		Requirement according to:	Place of test:	Remarks	Combined IT	Voltage IT	Current IT
Instrukcja technolog. TT 08-01-003; oraz 2GKK310202, 2GKK310302, 2GKK310302,	Instrukcja technolog. TT 08-01-003; oraz 2GKK310202, 2GKK310302, 2GKK310302,		pkt	pkt. VII	Stanowisko mentażowe				
- sprawdzene rezystancji uzwojenia pierwotnego cewki prądowej					przekładników	!	>	>	>
IT assembly: Technological instruction IT 08-01-003 and:		Technological instruction IT 08-01-003 and:							
- Primary winding resistance 2GKK310202, Cl. VII neasurement of the current coil 2GKK310302	2GKK310202, 2GKK310302 2GKK2100001		CI. V	II	II"s assembly station				
p. 6.13; p. 6.13; p. 6.13 p.	IEC 61869-1		p. 6.1 p. 6.1 p. 6.1	3,7.3.6 3	Kontrola jakości				
Verification of the terminal IEC 61869-2 CI. 6.13; markings CI. 6.13 CI. 6.13	IEC 61869-2 IEC 61869-3		CL 6.	13; 7.3.6 13 13	Quality control	I	>	>	>
Napchianie olejem i proces Instrukcja technolog. pkt. impregnacji przekładników IT 08-01-003	proces Instrukcja technolog. Tr 08-01-003	Instrukcja technolog. IT 08-01-003		pkt. VIII	Stanowisko impregnacji		,	\	_
Oil filling and impregnation process Technological Cl. VIII of the II's 1108-01-	Technological instruction IT 08-01-		<u>2</u> . Z	III	Impregnation station	1	>	>	>
	Data Date		Spra Check	Sprawdził Checked by	Podpis L Signature L	Data Z Date Ap	Zatwierdził Approved by	Podpis Signature	Data Date
E. Lubieniccki J. Du			<u> </u>	J. Duzdowski	16.0	16.03.2015	P. Dębski		17.03.2015

Strona / Page 7 Stron / Pages 9 DNIKA mer's type Pradowy Current IT	TYP PRZEKŁADNIKA TYP PRZEKŁADNIKA Instrument transformer's type towany Napięciowy Prąd ned IT Voltage IT Curre ** ** ** ** ** ** ** ** **			PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN Sczechości Test according to:	AN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYC PRZEKRADNIKÓW WN Routine test plan and main assembly operations for HV instrument transformers rest rest Test according to: Instruction T Geolnological Instruct	PRZEKA PRZEKA and main assemble Badanie według: Test according to: IT 08-01-003 Technological instrukcja technolog. IEC 61869-1 IEC 61869-2 IEC 61869-2 IEC 61869-2 IEC 61869-2 IEC 61869-1 IEC 61869-2 IEC 61869-2		No Sprawdzenie przekładnika 15 Oil tightness oil napięciem o ciezupełnych Próba izolacji napięciem o partial discho partial discho partial discho partial discho propertial discho propertial discho propertial discho propertial discho propertial discho praciowej 17 Próba izolacji Próba izolacji Próba izolacji Próba izolacji Próba izolacji Próba izolacji Proba izolacji
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>	Ľ	*część prądowa current part only		Quality control	7.2.6.206		accuracy of the current	Tests for transforme
	9	*		Kontrola jakosci	·	IEC 61869-2	JONIAMIUSVI ĮRKKAIAMIINA	
	1	*część prądowa current part only		Quality control			overvoltage test	Inter-turn
		*	ŀ	Kontrola jakości	p. 7.3.204	IEC 61869-2	acji międzyzwojowej	
•	•			Quality control	Cl. 7.3.3 Cl. 7.3.4		quency voltage withstand ondary windings	Power-free test on sec
>	>	>	1		p. 7.3.4		0	
				Kontrola jakości	p. 7.3.3		olacji uzwo	Próba izo
>	>	>	ı	Quality control	Cl. 7.3.1 and 7.3.2 Cl. 7.3.1 Cl. 7.3.1 and 7.3.2	IEC 61869-3 IEC 60270	quency voltage withstand imary windings and charge measurement	
					p. 7.3.1 p.7.3.1; 7.3.2		o częstotliwości oraz pomiar wyładowań och	
				·				
>	>	>	1	Quality control	CI. IX	Technological	sss verification	
				Kontrola jakości	pkt. IX	Instrukcja technolog. IT 08-01-003	nie szczelności ika	Sprawdzei przekładni
Current IT	Voltage IT	Combined IT	Remarks	Place of test:	Requirement according to:	Test according to:	Test	
	Napięciowy	Kombinowany	Uwagi	Miejsce badania:	Wymaganie według:	Badanie według:	Badanie	
mer's type	nent transforn	Instrun						1
DNIKA	PRZEKŁAD	TYP						
			formers	V instrument trans	y operations for H	and main assembl	Routine test plan	
	vumber 1-007	Numer / / IT 08-0	ICZNYCH	A LECTIVOROGY	EADNIKÓW WN	PRZEKI		
	Vumber	Numer / /	ICZNVCH	TECHNOLOG	YCH CZYNNOŚC	I ORAZ GŁÓWN	PLAN KONTKOL	_

17.03.2015

P. Dębski

16.03.2015

Duzdowski

16.03.2015

Ł. Lubieniecki

Strona / Page 8 Stron / Pages 9		NIKA ner's type	Pradowy	ć angert	Current IT	900	ı		•		>			>		>	Data Date	17.03.2015
		TYP PRZEKŁADNIKA Instrument transformer's type	Naniociowy	INADIÇCIONY	Voltage IT				>		>		\	>		>	Podpis Signature	
Numer / <i>Number</i> IT 08-01-007		TYP	V. come him contrary	Копприноману	Combined IT	*	*część napięciowa voltuge part only		>		>			>		>	dził d by	ski
CZNYCH	ormers			Uwagi	Remarks	Victoria			1		ŀ			ï		1	Zatwiordził Approved by	P. Dębski
PLAN KONTROLI ORAZ GŁÓWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN	Routine test plan and main assembly operations for HV instrument transformers			Micjsec badania:	Place of test:	Kontrola jakości	Quality control	Kontrola jakości	Quality control	Kontrola jakości		Quality control	Kontrola jakości	Quality control	Kontrola jakości	Quality control	Data Date	16.03.2015
PRZEKŁADNIKÓW WN	operations for HV		W.	wymaganic według:	Requirement according to:	p. 7.3.5	cl. 7.3.5	Zamówienie (wg wymagania spec.)	Order (on request only)		pkt. 7.4.3	cl. 7.4.3	pkt. X	Item: X	Dokumentacja techniczna, zamówienie	Technical documentation, order	Podpis Nignature	
ORAZ GŁÓWNY PRZEKŁ	and main assembly			Badanic wedlug:	Test according to:		IEC 61869-3		ı		IEC 61869-1 IEC 61869-2		Instrukcja technolog. IT 08-01-003	Technological instruction IT 08-01- 003	hnolog. 003	Technological instruction If 08-01- 003	Sprawdził Checked by	J. Duzdowski
ONTROLL	ne test plan			_		przekładnika	the voltage	ojeń	windings'	spółczynnika		dielectric urement	znika	ection			Data Date	16.03.2015
PLAN K	Routi			Badanic	Test	adności	Tests for accuracy of the voltage	Pomiar rezystancji uzwojeń	ent of the	Pomiar pojemności i współczynnika	strat dielektrycznych	Capacitance and diele dissipation factor measurement	nie ustawieni deju	Oil level indicator inspection	oględziny	l'inal visual inspection	Podpis Signature	
	ARR					Badania doki napięciowego	Tests for a	Ponniar rez	Measurement of internal veristance	Pomiar po		1	Sprawdzenie 1 poziomu oleju		Końcowe oględziny		Opracował Prepared by	E. Lubieniecki
				No	SI.	1	20		21	Ì	22	1		23	1	24		Ä

L										
		PLAN K	KONTROL	PLAN KONTROLI ORAZ GŁOWNYCH CZYNNOŚCI TECHNOLOGICZNYCH PRZEKŁADNIKÓW WN	SŁOWNYCH CZYNNOŚC PRZEKŁADNIKÓW WN	I TECHNOLOGI	CZNYCH	Numer / <i>Number</i> IT 08-01-007	Number 01-007	Strona / Page 9 Stron / Pages 9
	466	Routi	ne test plan	Routine test plan and main assembly operations for HV instrument transformers	y operations for H	V instrument trans	formers			
								TY	TYP PRZEKŁADNIKA	NIKA
1	1							Instru	Instrument transformer's type	ner's type
°Z		Badanie		Badanie według:	Wymaganie według:	Miejsce badania:	Uwagi	Kombinowany	Napięciowy	Prądowy
SI.		Test		Test according to:	Requirement according to:	Place of test:	Remarks	Combined IT	Voltage IT	Current IT
_	Odbiór klienta	enta		Instrukcja technolog. IT 08-01-003	pkt. XIV	Według odrębnych ustaleń	Pracownicy ABB i			
č							przedstawiciele	`		,
C7							KIIGIIZ	>	>	>
	Customer's	Customer's inspection		Technological instruction IT 08-01- 003	Item: XIV	According to separate agreement	ABB's staff and customer's			
	Pakowanie magazynu	•=	przekazanie do	do Instrukcja technolog. IT 08-01-003	pkt. XIV	Kontrola jakości				
26							ı	>	>	>
	Packing an	Packing and transfer to warehouse	warehouse	Technological instruction IT 08-01- 003	Item: XIV	Quality control				•
0 Pr	Opracował Prepared by	Podpis Signature	Data Date	Sprawdził Checked by	Podpis Signature	Data Date	Zatwierdził Approved by	ził I by	Podpis Signature	Data Date
Ł. 1	Ł. Lubieniecki		16.03.2015	J. Duzdowski		16.03.2015	P. Dębski	ķi,		17.03.2015

Uwaga / Remark - ma zastosowanie / applicable

- - nie ma zastosowanie / not applicable







РЕПУБЛИКА БЪЛГАРИЯ

Вългарски институт по метрология

REPUBLIC OF BULGARIA

Bulgarian Institute of Metrology



УДОСТОВЕРЕНИЕ ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ

Measuring Instrument Type-approval Certificate

№ 14.06.5042

Издадено на производител: ABB Sp. zo.o., Полша

Issued to manufacturer:

На основание на:

чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от

In Accordance with:

2002 г., изм. бр. 88 от 05 г., изм. и доп. бр. 95 от 2005 г.)

Относно:

In Respect of:

напреженови измервателни трансформатори тип PV 123

Знак за одобрен тип: Type Approval Mark:

Технически и метрологични

характеристики:

Technical and metrological

characteristics:

приложение, неразделна част удостоверение за одобрен тип средство за измерване

Срок на валидност:

Valid until:

13.06.2024 г.

Вписва се в регистъра на одобрените за използване

типове средства за измерване под №:

5042

Reference Nº:

Дата на издаване на удостоверението за

одобрен тип:

13.06.2014 г.

Date:

Заличено по чл.2 от ЗЗЛД

доц. д-р Димитър Станков

страница 1 от 2

Приложение към удостоверение за одобрен тип № 14.06.5042

Издадено на производител: ABB Sp. zo.o., Полша

Относно: напреженови измервателни трансформатори тип PV 123

1. Описание на типа:

Напреженовите трансформатори тип PV 123 се използват за измерване и защита на електрически мрежи с максимално работно напрежение 123 кV и честота 50 Hz. Те са проектирани да работят в системи с ефективно заземен или изолиран звезден център, както и в компенсирани системи. Напреженовите трансформатори тип PV 123 са подходящи за работа в условия на открито, с температура на околната среда от -40 °C до +40 °C, при относителна влажност на въздуха до 100% при 30 °C и надморска височина до 1000 м.

Активната част на напреженовия трансформатор тип PV 123 се състои от намотка високо напрежение, вторични намотки и сърцевина, капсулирана в херметичен корпус запълнен с трансформаторно масло. Ядрото с намотките се намира в долната част на резервоара. Вторичните намотки са една или няколко (до 5) на брой. Първичната и вторичните намотки са направени от висококачествен материал, позволяващ висок клас на точност започващ от 0,1. Стандартно изолаторът е направен от кафяв порцелан с път на тока на утечка 25 mm/kV. Възможно е той да бъде изработен и от сив композитен материал с път на тока на утечка 31 mm/kV.

Вторичните клеми са обозначени със стандартни маркировки на изводите.

2. Технически и метрологични характеристики:

Тип на трансформатора	PV 123				
Ниво на изолация, kV	123/230/550 kV				
Номинално вторично напрежение, V	100/√3, 100/3, 110/√3, 100, 110				
Номинална честота, Hz	50				
Клас на точност	0,1; 0,2; 0,5; 1; 3 3Р и бР				
Коефициент на напрежение/време на прилагане	1,2/продължително; 1,9/8 h 1,5/30 s; 1,9/30 s;				
Мощност на вторичните намотки, VA	до 400				

3. Типово означение: тип PV 123

4. Описание на местата, предназначени за поставяне на знаци от метрологичен контрол:

- Знакът за одобрен тип се нанася до табелката с технически данни, над клемите на вторичните верги.
- Знакът за първоначална проверка (марка за залепване) се поставя под знака за одобрен тип.

MYSOKICH NAPIEC LABORATORIUM



YTOTO ENERGETY



LABORATORY ACCREDITED
BY THE POLISH CENTRE FOR ACCREDITATION

Accreditation Certificate of Testing Laboratory No AB 272

TEST REPORT

No. EWN/11/E/12-1

of voltage instrument transformer type PV 123 manufactured by ABB sp. z o.o. Type test and special tests

Warsaw, March 2012



HIGH VOLTAGE LABORATORY **INSTYTUT ENERGETYKI**

EWN/11/E/12-1

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TESTS REPORTS No EWN/11/E/12-1

TEST OBJECT:

Voltage instrument transformer type PV 123

Serial No: 2GKP011V1084703 (84703/11)

ABB Sp. z 0.0. **IEST ORDERED BY:**

04-713 Warszawa, ul. Żegańska 1

4500380553/1 - 20.01.2012

ORDER NO:

Type test

SCOPE OF TEST:

PROCEDURA OF TESTS:

PN-EN 60044-2:2001 (EN 60044-2:1999) in accordance with standards:

January 2012 RECEIVING OBJECT DATE:

January 2012 - March 2012 DATE OF TESTS:

TESTS RESULTS:

are presented in following parts of report Test results are concern to tested object only.

Tests was performed in witness of representatives of ABB sp. z o.o.:

Jarosław DUZDOWSKI M.Sc.E.E. Zbigniew WESOŁOWSKI M.Sc.E.E. Marcin TARNOWSKI M.Sc.E.E. Paweł DĘBSKI M.Sc.E.E.

Jan SZOKALSKI M.Sc.E.E. TEST PERFORMER

Jerzy MIKOŁAJCZYK M.Sc.E.E. TEST OVERSEERER

Заличено по чл.2 от ЗЗЛД

Заличено по чл.2 от ЗЗЛД

HEAD OF HIGH VOLTAGE DEPARTMENT:

January L. MIKULSKI, Ass. Prof., Dr. hab. E. E.

Warsaw, March 2012

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1. COMPETENCE OF LABORATORY 2. DESCRIPTION OF TEST OBJECT

3. AGREED SCOPE OF TESTS

4. PERFORMED TESTS

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POLAND

HIGH VOLTAGE LABORATORY **INSTYTUT ENERGETYKI**

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1. COMPETENCE OF THE LABORATORY

possession of accreditation issued by the Polish Centre for Accreditation (Accreditation Certificate The High Voltage Laboratory of Institute of Power Engineering (IEn) in Warsaw is in of Testing Laboratory No AB 272) concerning following tests:

> l/i ¢ 90

Insulators and insulator strings	4	lightning and switching impulse tests
	1	power-frequency voltage 50 Hz tests
	£	radio interference measurements
Distribution substations	a	lightning and switching impulse tests
	1	power-frequency voltage 50 Hz tests
	i	radio interference measurements
Circuit breakers, disconnectors	31	lightning and switching impulse tests
	T	power-frequency voltage 50 Hz tests
	Ü	radio interference measurements
Insulators	i	lightning and switching impulse tests
	17731	power-frequency voltage 50 Hz rests radio interference measurements
Current and vollage transformers	Y	lightning and switching impulse tests
;	ES.	power-frequency voltage 50 Hz tests
Power transformers	ş	lightning and switching impulse tests
	100	power-frequency voltage 50 Hz tests
Lightning arresters and limiters	TY.	lightning and switching impulse tests
	į.	power-frequency voltage 50 Hz tests
Cables and cable fittings	1	lightning and switching impulse tests

10 10 2 13 14 16 16 17 17 90 16

Short-circuit withstand capability of main circuit

Routine test and determination of errors before tests

0.4

in IEn and after tests finishing

Temperature-rise test

4.1

Note! Tests described in sub clauses 4.10, hereby Report are not comply the scope of Laboratory

Measurement of capacitance and dielectric dissipation factor

8.5 4.9 4.10 Transmitted overvoltage measurement

Mechanical tests

6. LIST OF APPENDIXES

S. SUMMARY

Chopped impulse test on the primary winding

Radio interference voltage measurement

4.6 4.7

Wet test for outdoor transformers

Lightning impulse test

4.3 4.2

Determination of errors

4.5 4.4

Distribution Equipment Laboratory of Institute of Power Engineering in Warsaw Hereby Report concerning test results obtained in other competent laboratories haying Accreditation Certificate PCA Nr AB 324 (see Appendixes 2,3,4):

- High Current Laboratory of Institute of Power Engineering in Warsaw
- having Accreditation Certificate PCA Nr AB 323
- Factory Laboratory of ABB sp. z o.o. in Przasnysz Regional Verification Office in Warsaw determination of errors and test in range of type tests at supervision of representative of High Voltage Laboratory of Institute of Power Engineering in Warsaw

and non numbered diagrams and tables

1 numbered table

5 drawing

In Report are presented:

The Report contain:

6 appendixes

19 numbered pages



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2. DESCRIPTION OF TEST OBJECT

The tested object was voltage instrument transformer type PV 123 manufactured by ABB sp. z o.o. 04-713 Warszawa, ul. Żegańska 1, had following parameters:

Serial number 2GKP011V1084703 (84703/11)

- Rated primary voltage
- □ Rated primary volt
 □ Rated frequency
 □ Rated insulation le
 □ Minimum creepage
- Minimum creepage distance Rated insulation level
- LI 550kV/ AC 230kV 110/√3 kV

3640 rnm (porceline insolator)

View of rated nameplates of tested transformers show figure 1.



Fig. 1 Rated nameplate of tested transformer





HIGH VOLTAGE LABORATORY **INSTYTUT ENERGETYKI**

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Identification of tested object was done at following documents attached to hereby Report (Appendix 1):

- Manufacturer Conformity Declaration,
- Dimension drawing No. 2GKV614114/ (19.01.2012),
- □ Electric diagram of Voltage instrument transformer,
- Drawing of rated nameplate.

AGREED SCOPE OF TESTS ಣೆ

According to ordered the type test and selected special test were done comply following

PN-EN 60044-2:2001 + A1:2003 +A2:2004 "Przekładniki. Część 2: Przekładniki napięciowe indukcyjne" (EN-60044-2:1999 + A1:2000 + A2:2003 "Instrument transformers. Part 2; Inductiv voltage transformers"). On request of ordering party the additional special test were performed. The performed test results are contained in Table 1.



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POLAZ

HIGH VOLTAGE LABORATORY INSTYTUT ENERGETYKI

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Table 1. List of performed tests

Item	Performed tests	Requirement
TYP	TYPE TESTS	
-	Temperature-rise test	PN EN 60044-2, p.8.1
2	Short-circuit withstand capability test of secondary windings	PN EN 60044-2, p.8.2,
π	Lighting impulse test	PN EN 60041-2, p.8.3
4	Wet test for outdoor transformers	PN EN 60044-2, p.8.4
vc ·	Determination of errors	PN EN 60044-2, p. 12.3, 13.6.2,
9	Measurement of the radio interference voltage (RIV)	PN EN 60044-2/A1, p. 8.5
SPE	SPECIAL TESTS	
7	Chopped impulse test on the primary winding	PN 6N 60044-2, p. 10.1
oc	Measurement of capacitance and dielectric dissipation factor	PN EN 60044-2, p. 10.2
ο̈́	Mechanical test	PN EN 60044-2, p. 10.3
10	Transmitted overvoltage measurement	PN EN 60044-2/A2, p. 10.3

During mentioned above tests at Factory Laboratory of ABB sp. z o.o. in Przasnysz Levzno 59 Street, were performed determination of errors of transformer to prove positive results of consecutive tests. The complete tests were performed according to mentioned above standards. The tests were supervised by representatives of High Voltage Laboratory of Institute of Power Engineering in Warsaw in purpose to prove results of tests. The tests stands are under authority of Regional Verification Office in Warsaw (No. stand \$08/OUM1-5/01 XVI i \$08/OUM1-5/01

4. PERFORMED TESTS

4.0 Routine test and determination of errors before tests in 1En and after tests finishing.

Before delivery the transformer to IEn Laboratory and after type test and special test completed in ABB Factory Laboratory in Przasnysz were performed determination of errors measurement under supervision of representative of IEn. During test were checked:

- verification of terminals marking,
- \Box power-frequency withstand test on the primary winding 50 Hz, Uest = 230 kV, t = 60 s,
- partial discharge measurement for voltage transformers ψ <10pC (U₀) ϕ <5pC (L2: U_m / $\sqrt{3}$),
- D power-frequency withstand test on secondary windings 50 Hz, Urest = $3 \, \mathrm{kV}$, τ = $60 \, \mathrm{s}$,
- \Box power-frequency with stand test between sections 50 Hz, U as ≈ 4.5 kV, t $\equiv 60$ s,
- □ determination of errors.

The test results are presented in reports attached to hereby Report (Appendix 2):

- Tests before type test and special test (Measurements before type test and special tests)
 Report No. 2GKP011V1084703 19.01.2012,
- Tests after type test and special tests completed (Measurements after type test and special test completed) = 2GKP011V1084703 = 26.03.2012.

It were proved that all tests required in routine test gave positive results. It were proved that all metrological properties of transformer are comply accurate classes for all winding.

These tests results are base for later determination of errors for purpose of verification result of tests described below.



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4.1 Temperature-rise test

This test was performed in High Current Laboratory of Institute of Power Engineering in Warsaw.

Stage 1

The voltage value 1,2 Un = 76,2 kV was applied to the A terminal.

The secondary voltage windings were loaded as follows:1a-1n – 15 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V; 2a-2n – 15 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V; 3a-3n – 20 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V; 4a-4n – 25 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V.

The winding of residual voltage remained open.

The test was performed till reached steady state of the measured temperatures.

Stage 2

The voltage value 1,9 Un = 119,7 kV was applied to the A terminal.

The secondary voltage windings were loaded as follows: 1a-1n-15 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V; 2a-2n-15 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V; 3a-3n-20 VA at the voltage $100/\sqrt{3}$ V; 4a-4n-25 VA, $\cos \varphi = 1$, at the voltage $100/\sqrt{3}$ V.

The residual winding da-dn was loaded by -450 VA, $\cos \varphi = 1$, at the voltage 100/3 V.

The duration of the test was 8 h,

Stage 3

The voltage value Un = 63 kV was applied to the A terminal.

According to Manufacturers request secondary voltage windings (i.e. 1a-1n, 2a-2n, 3a-3n and 4a - 4n) were loaded by limit power 1000 VA at cosp = 1. The residual winding remained open.

The test was performed till reaching the steady state of the measured temperatures.

Rise of temperature in steady state not exceeding permissible value of 65 K + 10 K = 75 K (according to 5.4 of PN-EN 60044-2 and 4.2 of PN-EN 60044-3).

rest result - positive.

Detailed information about test arrangement and performed tests, tests results are present in separate Reports No. EWP/07/E/2012-3e of 27.02.2012. - (Appendix 4)



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4.2 Short-circuit withstand capability of secondary circuit

The test of short-circuit withstand capability of secondary circuit of voltage transformer was performed for combined transformers type PVA 123, serial No. 84500, manufactured by ABB. (Test Report EWN/70/F/11-1 – High Voltage Laboratory IEn) Voltage part of this combined transformer PVA 123 was identical construction to the voltage transformer PV 123. The test was performed in Distribution Equipment Laboratory of Institute of Power Engineering in Warsaw.

To the voltage transformer was applied rated voltage $110/\sqrt{3}$ kV during 1 second at short-circuited secondary winding. The test was performed twice – one with short-circuited secondary winding for measurement and second with short-circuited residual voltage winding.

 $U_{test} = 63.5 \text{ kV}, t = 1$

During test transformer behaviour was correct. After test not stated any failures or oil leakage.

Test result - positive.

After the test of short-circuit withstand capability of secondary circuit of transformer in Factory Laboratory of ABB sp. z o.o. in Przasnysz 59 Leszno 59 Street, under supervision of representative of IEn was performed determination of errors.

The test result of these measurement are present in Report No. 2GKP011V1084703 – 26,03,2012 – (Appendix No. 3 of hereby Report).

It was found that metrological properties of transformer are comply to assigned accurate classes of transformer windings and measured values are practically identically to measured values before short-time test. This prove positive result of short-time test.

4.3 Lightning impulse test

Test was done in test arrangement of surge generator type Haefely 5 MV, 375 kJ. Equivalent circuit diagram is shows on Figure 2. The test was performed on standardized lightning impulse 1,2/50µs. The purpose of test was checking internal insulation of transformer. The influence of atmospheric condition on test voltage value was not taken into consideration.

The Lightning impulse test was performed jointly with chopped impulse test on the primary winding (clause 3.8 of hereby Report).



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Test condition:

- Pull impulse test voltage U = 550 kV,
- Chocked impulse test voltage 1,15 \cdot 550 kV = 632,5 kV,
- Sequence of impulses:

positive polarity - 15 full impulses.

negarive polarity = 1 full impulse, 2 chocked impulses, 14 full impulses,

During test was recorded test voltage and current flowed through along of voltage transformer. o

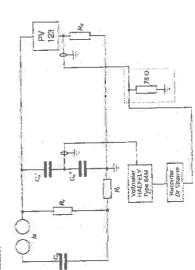


Fig. 2 Equivalent circuit diagram of test arrangement for lightning impulses: $C_8 = 0.125~\mu \mathrm{K}, C_0 = 1.2~\mathrm{nF}, \, R_1 = 175~\Omega, \, R_3 = 600~\Omega, \, R_d = 8.95~\Omega.$ Measurement uncertainty = 1,5 %

The oscillograms not shows failures of transformer insulation. Result of test - positive. Recorded oscillograms of all applied impulses are shown in Appendix No. 5 of hereby Report.



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4.4 Wet test for outdoor transformers

The test was performed in arrangement of test transformer type TuR 700kV, 0.5A. Equivalent circuit diagram is presented on Pigure 3.

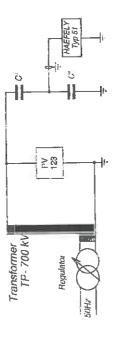


Fig. 3 Equivalent circuit diagram for power frequency voltage 50 Hz. C = 200 pF (C' in series with C")

Measurement uncertainty - 1,5 %

All external elements of transformers, which can influenced on test results were identical to the The test was performed on transformers model with disassembled winding (Figure 4). complete transformer.



Fig. 4 Wet test of voltage transformers type PV 123 at power frequency voltage 50 Hz.



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Because electric strength of inner insulation is not depend from atmospheric conditions and this property was tested during routine test at ABB's Factory Laboratory (Raports No. 2GKP011V1084703 – 19.01.2012 and No. No. 2GKP011V1084703 – 26.03.2012 of Factory Laboratory ABB sp. z o.o. Przasnysz Division),

In each cases the test voltage was U=230 kV was applied during 1 minute.

During wet test for outdoor transformers the transformer was werting by artificial rain at parameters:

- vertical component of precipitation $H_v = 1.6 \text{ mm/min}$
- horizontal component of precipitation H_b = 1,5 mm/min
- water electrical resistivity ρ = 99 Ω m

The test voltage was corrected according to density of air.

During test were not observed any flashover or failure of insulation.

Test result - positive.

4.5 Determination of errors

Measurements of errors for voltage transformers was performed in Factory Laboratory of ABB sp. z o.o. in Przasnysz 59 Leszno 59 Street, under supervision of representative of IEn.

The measurement was done two times:

- Tests before type test and special test (Measurements before type test and special tests) -Report No. 2GKP011V1084703 – 19.01.2012.
- Tests after type test and special tests completed (Measurements after type test and special test completed) - Report No. 2GKP011V1084703 – 26.03.2012.

Detailed information about tests results consists Appendix No. 2 of hereby Report.

Analyzing test results of measurements of errors for voltage transformer was found that:

- For measurement windings 1a-1n and 2a-2n class 0,2:
- for voltages 0,8Up, 1Un i 1,2Un voltage error $\Delta U(\%) < 0,2\%$ and phase displacement $S_n(\min) < 10$ min.
- For winding for protection 3a-3n class 0,2% and 3P:
- for voltages 0.8U_w 1U_n i 1.2U_n voltage error $\Delta U(\%) < 0.2\%$ and phase displacement $\delta_u(min) < 10$ min.



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for voltages 0,02U₀, 0,05U_n i 1,9U_n voltage error $\Delta U(\%) < 3\%$ and phase displacement $\delta_n(\min) < 120 \min$.

and phase displacement $\delta_u(min) < 120$ min. For winding for protection 4a-4n class 0.2% and 3P: for voltages 0.8U_n 1U_n i 1.2U_n voltage error $\Delta U(\%) < 0.2\%$

a

- and phase displacement $\delta_u(\min) < 10$ min. - for voltages $0.02 \mathrm{U}_u$, $0.05 \mathrm{U}_n$ i $1.9 \mathrm{U}_n$ voltage error $\Delta \mathrm{U}(\%) < 3\%$ and phase displacement $\delta_u(\min) < 120$ min.
 - ☐ For residual voltage winding da-dn class 3P:
- for voltages $0.02U_m$, $0.05U_n$, $1.9U_n$, $1.9U_n$, voltage error $\Delta U(\%) < 3\%$ and phase displacement $\delta_n(\min) < 1.20$ min.

For each of voltage windings values of error are contain in range compatible to appropriate class of accuracy.

4.6 Radio interference voltage measurement

Following to requirement of IEC/CISPR 18-2 the measurements was performed in testing arrangement as is show on Figure 5. The interference voltage was measured on resistance 300Ω at frequency 0,5 MHz. To determinate coefficient of correction +24 dB before measurement the instrument was calibrated by stabile signal generator. To measurement of interference voltage the instrument LMZ-5 was used. The level of background was checked for range of test voltages 0 - 150 kV. Interference voltages originated form testing arrangement, radio broadcasts etc., were below 5μV (14 dB).

According to PN EN 60044-1/A1 interference voltage at voltage Up=1.1-U_m/ $\sqrt{3}$ =78 kV has not to exceed the value RIV_{dop} = 2500µV.

The instrument had logarithmic scale: $RIV_{dop} = 2500 \mu V \rightarrow 68 \text{ dB } (0 \text{ dB} = 1 \mu V)$.

Before the test, the instrument transformer was supplied with voltage 1,5 $U_m/\sqrt{3}$, held for 30 sec. Next, within about 10 sec the voltage was decreased to value 1,1 $U_m/\sqrt{3}$, held for 30 sec.

The measurements were done at test voltages in range $0,3+1,1\cdot U_m/\sqrt{3}$. Test voltage was decreased step by step with value 0,1xUp since $Up=1,1\cdot U_m/\sqrt{3}$ up to value $Up=0,3\cdot U_m/\sqrt{3}$. Next, voltage was increased by this same values and finally deceased again.. For each of test voltage the measurement of radio interference voltage were performed and registered level in last series of decreasing voltage was drawn in function of test voltage U_{test} .



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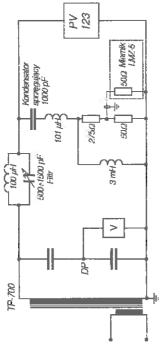
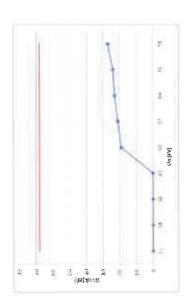


Fig. 5 Test arrangement for Radio interference voltage measurement

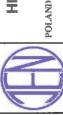
The results of measurements are present in Table and diagram below.

	_	_	_	_	_	_
21	0,3	١,	ı	,	t	٠,
23	0,4	1	1	1	1	٠
36	0,5	8	1	1	1	•
43	9,0	1	٠	1	1	
20	0,7	κ'n	ΑĎ	ې	19	6
Į,	8,0	-3	Ç	ç	21	11
Z	6,0	-1	ij	Ţ	23	13
17	1,0	_	0	0	24	16
78	1,1	m	m	m	27	22
<u> </u>	87	1	ţ	1	[gp]	[h]
Up [kV]	xUn/v3		[G B]		VIV	W YILLIK



Measured Radio Interference Voltage RIV = 22 μ V (27dB) is much less than permissible level RIV perm = $2500 \mu V$ (68dB).

Test result - positive.



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4.7 Chopped impulse test on the primary winding

Chopped Impulse Test was supplemented to Lightning Impulse test 1,2/50µs and was described in clause 4.3 of hereby Report. Recorded oscillograms not show of failure of insulation of voltage transformers. Test result - positive.

Oscillograms of all applied impulses are present in Appendix No. 4 of hereby Report.

4.8 Measurement of capacitance and dielectric dissipation factor

No. 2GKP011V1084703 - 19.01.2012 and No. No. 2GKP011V1084703 - 26.03.2012 of Factory The measurement was performed at at ABB's Factory Laboratory (Raports Laboratory ABB sp. z 0.0. Przasnysz Divisiou).

Condition of measurements:

 $U_{p} = 10 \text{ kV}$; $110/\sqrt{3} \text{ kV} = 63.5 \text{ kV}$; $123/\sqrt{3} \text{ kV} = 71 \text{ kV}$

Ambient temperature during measurement was 20,7°C and (22,8°C).

Test results are present in table below:

tgō [%]	2,0	(0,19)	0,2	(0,2)	0,2	(0,21)
C, [pF]	264	(265)	265	(266)	265	(266)
Up [kV]	Ü		63 5	25.20	7.1	

PN-EN 60044-2:2001 (EN 60044-2:1999) only contain note that value of dissipation factor The standard specifications for capacitance and dissipation factor for instrument transformers not provide criterion for these parameters. The Standard is usually less than 0,5%.



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4.9 Mechanical tests

Engineering in Warsaw. The test consist in applying to the transformer mechanical load -- static and The mechanical tests were performed in Distribution Equipment Laboratory of Institute of Power dynamic, in three direction in turn. Static load was 20% higher than standard requirement for II class of load. The test conditions were as follow:

$$F_R = 3600 \text{ N}, t = 60 \text{ s}$$

It was assumed that dynamic load is 1,4 times higher than static load.

During the tests behaving of voltage transformer was correct. After test not stated any damages or oil leakage.

Test result - positive.

Detailed information about test arrangement, performed tests and tests results are present in Report No. EUR/12/E/12-3E - 30,03,2012 - (Appendix 3)

4.10 Transmitted overvoltage measurement

During all measurements to the transformer were applied lightning impulses at value ten times less, $U_{lost}=1.6 \text{ x}$ /2 x $U_{m}/\sqrt{3} \equiv 160 \text{ kV}$ the values of transmitted overvoltages can not exceed 1,6 kV. that is U₁= 16 kV. Concerning linear of phenomenon, registered overvoltages should have values It were recorded maximal value of overvoltages which came in each secondary windings - both current and voltage. According to requirement of Standard for impulse 0,5/50 µs and value During the test to the HV terminal of transformer were applied impulse voltage. less than 160 V (peak-to-peak value).

Registration was don by digital oscilloscope of "Dr Strauss" with input impedance 50 \Omega and transmission band 200 MHz



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Results of test are present in table below.

Winding	Overvoltage value Un/2 x 10 [V]
la-In	503
2a-2n	772
3a-3n	910
4a-4n	928
da-dn	732

It was found that for each of secondary winding of transformer transmitted overvoltages not exceed value of 1600 V.

Test result - positive.

The oscillograms of all applied and registered impulses are present in Appendix No. 6 of hereby Report.

5. SUMMARY

- The voltage instruments transformer type PV 123 manufactured by ABB sp. z 0.0.
- and identified on base provided documents (as presented in Appendix No. 1) was performed. 04-713 Warszawa, ul. Żegańska I, with parameters described in clause 2 of hereby Report
- The voltage instruments transformer type PV 123 passed positively type test according to requirement of standard:
- PN-EN 60044-2:2001 + A1:2003 +A2:2004 "Przekładniki. Część 2: Przekładniki napieciowe indukcyjne"
- (EN-60044-2:1999 + A1:2000 + A2:2003 "Instrument transformers. Part 2: Inductiv voltage transformers"),
- and program described in Table 1, clause 3 of hereby Report.
- requirement mentioned above standards and program described in Table 1, clause 3 of hereby The voltage instruments transformer type PV 123 passed positively special tests according





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6. LIST OF APPENDIXES

Appendix No. 1

Documents provided by ABB Sp. z.o.o. used as base of identification of test object:

- Manufacturer Conformity Declaration
- ☐ Dimension drawing No. 2GKV614114/ (19.01.2012) ☐ Electric diagram of Voltage instrument transformer
 - Drawing of rated nameplate

Appendix No. 2

Reports of routine test and determination of errors of voltage transformer type IVV 123 performed in Factory Laboratory of ABB sp. z 0.0.

- ☐ Tests before type test and special test (Measurements hefore type test and special tests) Report No. 2GKP011V1084703 - 19.01.2012,
 - 1 Tests after type test and special tests completed (Measurements after type test and special test completed) 2AtRP011V1084703 26.03.2012.

Appendix No. 3

Report of performed texts in Distribution Equipment Laboratory

of Institute of Power Engineering in Warsaw.

□ Test Report No. EUR/12/E/12-3E

(Mechanical tests.)

Appendix No. 4

Report of performed tests in High Current Laboratory

of Institute of Power Engineering in Warsaw.

a EWP/07/F/2012/3c of 27.02,2012 (Temperature-rise tests)

Appendix No. 5

Lightning impulse test. Impulse 1,2/50 µs, full and chopped:

Oscillograms of test voltages and detection currents.

Appendix No. 6

Transmitted overvoltage measurement:

Oscillograms of measured transmitted to secondary windings overvoltages.

	Serial no: 2GKP011V1084703	1102	ZH 06	Sth [VA]	1000	1000	1000	1000	450
DV 123	: 2GKP0	2	7-4-						
ΙΛΒ	Serial no	150 coo	150 SUC#4-2	class	0,2	0,2	0,2/3P	0,2/3P	ЗР
ort	mer is)	90	L'ANSID						
Routine test report	of voltage transformer (before type tests)	(-	voliage ractor:	Sn [VA]	. 15	5	20	25	20
 		Insulation level:	123/230/550 KV	Usn [kV]	0,1:43	0,1:43	0,1:√3	0,1:√3	0,1:3
ABB Sp. z 0.0.	06-300 Przasnysz ul. Leszno 59	110-ds IVV	Í	Winding	1a - 1n	2a - 2n	3a - 3n	4a - 4n	da - dn
		A-N	;						_

List of performed tests:

1. Oit dialectric parameters check baiors transformer filling (oil after treatment);

tg 5 : IEC 60247, breakdown voltage : IEC 60158

2. Verification of terminal markings

3. Oil tightness test: oil overpressure: 0,8 bar / 24h -- no traces of oil leakage

4. Power-frequency withstand test on primary windings

Partial discharge measurement
 Power-frequency withstand test on eacondary windings

-R >= 100 MΩ -R >= 200 MΩ

Up = 275 kV, f = 50Hz - Up = 3 kV/80s, f = 5014z

7. Determination of emors

Measurement of secondary windings insulation resistance (1kV DC)
 Measurement of primary windings insulation resistance (2.5kV DC)
 Measurement of capacitance and dielectric dissipation factor - tg ö
 Measurement of windings resistance

Oll dielectric parameters check before transformer filling (oll after treatment)

- Measurement of oil tg 5 according to IEC 60247

tg δ = 0.07 %; electrical stress = 1kV/mm, f = 50Hz, oil temp. = 90°C ±1°C

· Measurement of oil breakdown voltage according to IEC 60156

Mean breakdown voltage = 75.87 kV, Reletive standard deviation = 5.17 %;

f = 50Hz, oil temp. = 24 °C, measurement with the stimer, type of electrodes used: partially spherical.

ENGRADOWII VOIIGHE INVI	70.8	78.5	79.3	71.2	76.3	79.1
- Andrew	1	2	r	4	2	စ

Partial discharge measure

Measurement according

ocedure A

(PD test voltages were reached while decreasing the voltage after the power-frequency withstand test on primary windings)

Stress voltage: 230 kV / 60 s

Frequency: 120 Hz

1,2 Um / 43 = 85,2 kV	0.7 pc.	
1,2 Um = 147.8 kV	0.7 pc	
Test voltage	Level of partial discharge	

Remarks: background noise level: 0.6 pC (measured after voltage switch off), measuring circuit was calibrated with 5pC (calibrating charge)

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Mens.	b. 18-1n: 15 VA	Manage	d= d= 46.148
	0,8 Un 1,0 Un 1,2 Un		6.8 Un 1.0 Un 1.2 Un
٦Ρ	-0.106 -0.100 -0.089	٥٧	0.022
S S	3.9 4.1 4.2	= 60	80,0
Meas.		Mesta.	1a-1n: 3.76 VA
	VA; 3a-3n; 20 V		2a-2n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA
	0,8 Un 1,0 Un 1,2 Un		0,8 Un 1,0 Un 1,2 Un
PΩ	-0.077 -0.072 -0.070	PΩ	0.007
3 02	4,0 4.1 4.2	700	5.9
Meas.		Meas.	28-2n: 15 VA
	1a-1n: 15 VA; 3a-3n: 20 VA; 4a-4n: 25 VA		16-11: 0 VA; 39-31: 0 VA; 48-41: 0 VA
	0,8 Un 1,0 Un 1,2 Un		0.8 Un 1.0 Un 12 Un
٥Δ	-0.097 -0.091 -0.090	ΩV	-0.013
= ∞	4.0 4.1 4.3	ω E	6.0
Meas.		Meas.	24-211: 3.75 VA
	1a-1n: 15 VA; 3a-3n: 20 VA; 4a-4n: 25 VA		
			0,8 Un 1,0 Un 1.2 Un
٩	-0.067 -0.062 -0.061	٦٧	0.011 0.016 0.018
3	4.1 4.2 4.3	3 40	5.9 8.0 6.1
Meas.	. 3a-3n: 20 VA	Mean	3a-3n: 20 VA
	1a-1n: 15 VA; 2a-2n: 15 VA; 4a-4n: 25 VA		
	0,05 Un 0,8 Un 1,0 Un 1,2 Un 1		0,02 Un 0,05 Un 0,8 Un 1.0 Un 1.2 Un 1.9 Un*
ΩV	-0.175 -0.063 -0.08B -0.087	ηV	-0.129 -0.027 -0.022 -0.021
E Q	-7.1 -0.7 4.5 4.6 4.7 4.0	л 9	62 63 64
Megs,		Meas.	34-3n: 6 VA
	0,05 Un 0,8 Un 1,0 Un		0,02 Un 0,05 Un 0,8 Un 1.0 Un 1.2 Un 1.9 Un*
٦٥	-0.168 -0.129 -0.049 -0.044 -0.043 -0.123	٥Δ	-0.085 D.017 D.022 D.024
•	- 1	2 =	-6.3 1.2 6.0 6.2 6.3 5.6
Meas		Meas.	4a-4n: 25 VA
	2n: 15 VA; 3a-3n: 20		
	0,05 Un 0,8 Un		0,02 Un 0,05 Un 0,8 Un 1,0 Un 1,2 Un 1,9 Un"
٩.	-0.171 -0.092 -0.088 -0.086 -0.	PΩ	-0.025 -0.023
_ 0	- 1	η g	6.4
Mons.	•	Meas.	4a-4n: 6.25 VA
\int	2n: 15 VA; 3a-3n: 20 V		1a-1n: 0 VA; 2a-2n: 0 VA; 3a-3n: 0 VA
	0,05 Un 0,8 Un 1,0 Un		0,02 Un 0,05 Un 0,8 Un 1,0 Un 1,2 Un 1,9 Un"
0 4	-0.121 -0.043 -0.038 -0.037 -0.	ΔU	0.026
-	- 11	200	-8.4 1.4 6.1 6.2 B.3 5.7
Meas.		Meas.	da-dn: 12.5 VA
	VA; Za-Zn: 15 VA; 3a-3n: 20		1a-1n: 0 VA; 2a-2n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA
1	0,06 Un 1,0 Un 1		Ö
٦ ا	0.416 0.469 0	٦	0.933 0.891 0.924 0.913
3	-0.1 /./ 13,3 15.2	n o	-5.2 2.3 8.7 9.5
•			

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* at 1,9 Un winding da-dn is loaded with 50 VA

Measurements uncertainty: $\Delta_{11} = \pm~0.044~\%,~\delta_{11} = \pm~2.2$ min

Measurement of capacitance and dielectric dissipation factor - tg 5

Temperature: 20.7 °C, Frequency: 50 Hz

Leakage current	[mA]	0.845	5.234	6.6
Capacitance	[b¢]	264	265	265
tg 8	82	0.2	0.2	0.2
Primary	voltage	10 kV	63 KV	71 KV

Measurement of windings' resistance:

5	R (20.5 °C)	Ret (75 °C)
N-A	20.70 kΩ	25.134 kg
1a - 1n	45.140 mΩ	54.808 m.D
2a - 2n	47 880 ms	58.135 m.Q
3a - 3n	49.660 m.c.	
4a - 4n	51.500 m.c.	62.531 m Q
da - dn	33.610 mg	40.809 m.Q

Rating plato:

PV 123 Type Voltage Transformer

IEC 60044-2 280 / 60 kg Weight / oil Standard Insulation level 123/230/550 kV Nytro Libra Oil type

40°C -- +40°C

fn Temp. range

50 Hz

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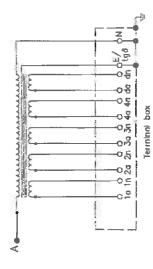
1,9Un/8h Voltage factor

110:√3 KV

100:3 450 20 35 100:43 100:43 100:43 100:43 0,2/3P 0,2/3P 1000 48-4n 25 1000 3a-3n 20 2a-21 1000 0,2 15 1000 0,2 1a-1n 5 VAsh > \$ ᄗ

Vertical Transportation

Electrical diagram plate:



Instrument transformer electrical diagram

ATTENTIONS

1. TERMINALS MARKED: N. E. IGD DURNG NORWAL CPERATION MAIST BE EARTHED. 2. AFTER CONNECTION THREE WINDING GLOCK IN OPEN DELLA CIRCUIT MUST BE EARTHED IN CALLY ONE POINT.



Przasnysz, 2012-01-19

The tests were witness

Sanuyeen no vo. 2 or 33nd

Ropresentative of HIGH VOLTAGE LABORATORY INSTYTUT ENERGETYKI 01-330 WARSAW, Mory 8

2GKP011V1084703 Page 4/4

2GKP011V1084703 Page 3 / 4

		_						
TYPE: PV 123 Serial no: 2GKP011V1084703	50 Hz	Sth [VA]	1000	1000	1000	1000	450	
PV 123	2							
TYPE: Serial no:	IEC 60044-2	class	0,2	0,2	0,2/3P	0,2/3P	윤	
_ £	1.9/8h							
Routine test report of voltage transformer after dielectric type tests	Voltage factor: 1.9	Sn [VA]	15	15	20	25	20	
	Insulation level: 123/230/550 kV	Usn [kV]	0,1:√3	0,1:√3	0,1:√3	0,1:√3	0,1:3	
ABB Sp. z o.o. 06-300 Przasnysz ul. Leszno 59	110:43 KV	Winding	1a - 1n	2a - 2n	3a - 3n	4a - 4n	da - dn	
	A-A							

List of performed tests;

- Power-frequency withstand test on primary windings
 Partial dischange measurement
 Power-frequency withstand test on secondary windings

- Determination of errors
 Measurement of secondary windings insulation resistance (1kV DC)
 Measurement of primary windings insulation resistance (2,5kV DC)
 Measurement of primary windings insulation resistance (2,5kV DC)
 Measurement of capacitance and dielectric dissipation factor— tg ō
 - B. Measurement of windings' resistance

Partial discharge measurement

- Measurement according to procedure A (PD test voltages were reached white decreasing the voltage after the power-frequency withstand test on primary windings)
- Stress voltage: 184 kV / 60 s
 - Frequency: 120 Hz

Test voltage	1,2 Um = 147.6 kV	1,2 Um / \(\frac{1}{3} = 86.2 kV
Level of partial discharge	0.9 pC	0.8 pc

Remarks: background noise level: 0.7 pC (measured after voltage switch off), measuring chault was calibrated with 5pC (calibrating charge)

Determination of errors ($\Delta U\%$), ($\delta u \min$), $\cos \varphi = 0.8$ lagging

Meas	Meas, 1a-in: 16 VA	-			Meas.	Meas. 14-1n; 16 VA	4	
	28-2n; 15 V/	V. 38-3m: 3	2e-2n: 15 VA; 3e-3n: 20 VA; 4e-4n: 25 VA			2a-2n: 0 VA	3a-3n: 0 V	28-2n: 0 VA; 38-3n: 0 VA; 48-4n: 0 VA
	0,8 Un 1,0 Un	1,0 Un	1,2 Un		-	0,8 Un	1,0 Un	1,2 Un
Π∇	-0.100	-0.095	-0.084		PΩ	-0.024	-0,019	-0.018
20	3.7	3.7	3.8		n Q	5,4	5,5	5.6
Meas.	Meas, 1a-1n: 3.75 VA	VA			Meas.	Meas. 1a-1n: 3.75 VA	VA	
	2a-2n: 15 V#	V; 38-3n; 2	2a-2n; 15 VA; 3a-3n; 20 VA; 4a-4n; 25 VA			2a-2n: 0 VA	3a-3n; 0 V	2a-2n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA
	0,8 Un	1,0 Un	1,0 Un 1,2 Un		H	0,8 Um 1,0 Un	1,0 Un	1,2 Un
PΩ	-0.070	-0.088	-0.084		NΔ	0.005	0.010	0.011
- n	3.8	3.8	3.9		n 0	5.5	5.6	5,7
Meas.	2a-2n: 16 VA	_		Ī	Meas.	2a-2n: 16 VA	l e	
	1a-1n: 15 VA	l; 3a-3n; 2	1a-1n: 15 VA; 3a-3n: 20 VA; 4a-4n: 25 VA		i	1a-1n: 0 VA	3a-3n: 0 V	la-1n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA
	0,8 Un	1,0 Un	1,2 Un			0,8 Um	1,0 Un	1.2 Um
NΔ	-0.091	-0.086	-0.084		٩Ω	-0.015	-0.010	-0.008
9	3,8	9.8	3,9		⊒ @	5.6	5.8	5,7
Mean	Meas. 2a-2n: 3.75 VA	VA			Meas.	Meas. 2a-2n: 3.75 VA	WA	
	1e-1⊓: 15 VA	3a-3n: 2	a-1n: 15 VA; 3a-3n: 20 VA; 4a-4n: 25 VA			ta-1n: 0 VA	3a-3n: 0 V	a-1n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA
	0,8 Un	1,0 Un	1,2 Un			0,8 Un	1,0 Un	1,2 Un
PΩ	-0.081	-0.057	-0.055		ηV	0.014	0.019	0.021
ω Ξ	80	3,8	4.0		n g	5.6	5.6	5.7

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Meas,	. 3a-3n: 20 VA	20 VA					Meas	Mass. 3s-3n: 20 VA	VA				
	1a-1n:	1a-1n: 15 VA; 2a-2n: 15 VA; 4a-4n: 25 VA	2n: 15 VA;	4a-4n: 2	5 VA			1a-1r: 0 \	/A; 2a-2n	: 0 VA; 4	la-1r: 0 VA; 2a-2n: 0 VA; 4a-4n; 0 VA		
	0,02 Un	0,02 Un 0,05 Un	0,8 Um		1,0 Un 1,2 Un 1,9 Un*	1,9 Un*		0,02 Un 0,05 Un 0,8 Un 1,0 Un 1,2 Un 1,9 Un*	.05 Un	0.8 Un	1.0 Un	1.2 Un	1.9 Un*
OΔ	-0.324	-0.240	-0.124	-0,120	-0.118	-0.182	٩Ν	-0.248	-0.165	-0.035	-0.031	-0.029	-0.113
- 0	-0.3	2.6	5.2	5.2	5.3	4.1	n 0	1.5	4.2	6.3	6.3	6.4	5.8
Meas.	. 3a-3n: 5 VA	5 VA					Meas.	. 3a-3n: 5 VA	 §				
	18-1n:	18-1n: 15 VA; 28-2n: 15 VA; 48-4n: 25 VA	2n: 15 VA;	4a-4n: 2	5 VA			18-11: 0\	/A; 28-2n	: 0 VA; 4	18-11:: 0 VA; 28-2n: 0 VA; 48-4n: 0 VA		
	0,02 Un	0,02 Un 0,05 Un	0,8 Um	1,0 Un	1,0 Un 1,2 Un 1,9 Un*	1,9 Un*		0,02 Un 0,06 Un	00 Un	0,8 Un	0.8 Un 1.0 Un	1.2 Un 1.8 Ur*	1.8 Ur*
NΩ	-0.284	-0.179	-0.048	-0.043	-0.042	-0.127	ΠV	-0.193	-0.110	0.023	0.027	0.028	-0.056
20	-0.8	2.0	42	4.3	4.4	3.7	20	0.9	3.7	5.8	5.8	5.9	5.3
Maas.	. 4a-4n: 25 VA	25 VA					Meas	Meas. 4a-4n: 25 VA	×				
	1a-1n:	la-1n: 15 VA; 2a-2n: 15 VA; 3a-3n: 20 VA	2n: 15 VA;	3a-3n; 2(AV C			1a-1n: 0 \	/A; 28-2n	: 0 VA; 3e	1a-1n: 0 VA; 2a-2n: 0 VA; 3a-3n: 0 VA		
	0,02 Un	0,02 Un 0,05 Un 0,8 Un 1,0 Un 1,2 Un 1,9 Un*	0,8 Un	1,0 Un	1,2 Un	1,9 Un*		0,02 Un 0.05 Un 0.8 Un 1.0 Un 1.2 Un 1.9 Un*	.05 Un	0.8 Un	1.0 Un	1.2 Un	1.9 Un*
₽	-0.286	-0.210	-0.083	-0.079	-0.076	-0.160	ΠV	-0.233	-0.150	-0.021	-0.017	-0.015	-0.098
- -0	0.4	2.2	4.5	6.4	4.6	3.8	70	1.1	3,8	CO.	5.8	8.0	5,3
Meas.		4a-4n: 6.25 VA					Meas.	. 44-4n: 6.26 VA	ZE VA				
	1a-1n:	1a-1n: 15 VA; 2a-2n: 15 VA; 3a-3n: 20 VA	2n: 15 VA;	3a-3n; 20	AV C			1a-1n: 0 \	/A; 28-2n	: 0 VA; 3	In-1r: 0 VA; 2a-2n: 0 VA; 3a-3n: 0 VA		
	0,02 Un	0,02 Un 0,05 Un	0,8 Un		1,0 Un 1,2 Un 1,9 Un*	1,9 Un*		0,02 Un 0,05 Un 0.8 Un 1.0 Un	.05 Un	0.8 Un	1.0 Un	1.2 Un 1.9 Un	1.9 Ur*
ηV	-0.236	-0.159	-0.032	-0.028	-0.028	-0.109	ηV	-0.180	-0.099	0.029	0.033		-0.049
20	D.5	2.2	4.4	4.4	4.5	3.8	ηQ	1.0	3.6	5.7	5,8	5.8	5,3
Meas.	. da-dn: 50 VA	50 VA					Meas.	. da-dn: 12.5 VA	5 VA				
	19-11	1a-1n: 15 VA; 2a-2n: 15 VA; 3a-3n: 20 VA; 4a-4n: 25 VA	2n: 15 VA;	3a-3n: 20	VA; 49-4	FI: 25 VA		-	/A; 2a-2n	: 0 VA; 3e	a-1n: 0 VA; 2a-2n: 0 VA; 3a-3n: 0 VA; 4a-4n: 0 VA	; 4a-4n: 0	8
	0,02 Un	n 0,05 Un		1,0 Un	1,9 Un			0,02 Un	0,06 Un		1.0 Un	1.9 Un	
PΩ	0.384	4 0.404		0.485	0.477		ΠV	0,683	0.721			0.791	
20	4.2		8.6	7.8	8.4		20	2.2	ur.	5.8	A 7	7.4	

* at 1,9 Un winding da-dn is loaded with 50 VA

Measurements uncertainty: $\Delta_u = \pm 0,044 \%$, $\delta_u = \pm 2,2$ min

Measurement of capacitance and dielectric diesipation factor - tg 5 Temperature: 22.8 °C, Frequency: 50 Hz

Leakage current	[mA]	0.881	5.242	5.914
Capacitance	[Jd]	265	266	266
tg 8	[%]	0.19	0.2	0.21
Primary	voltage	10 kV	63 KV	71 KV

Measurement of windings' resistance:

	R (22.7 °C)	Rct (75 °C)
A-N	20.30 kΩ	24.472 kΩ
1a - 1n	48,440 mΩ	55.985 m Q
2a - 2n	48.250 mΩ	58.167 m Ω
3a - 3n	50.100 mΩ	60.398 m Q
4a - 4n	52.000 mΩ	62,688 m Ω
da - dn	33.910 m _Ω	40.880 m Ω

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2GKP011V1084703 Page 4/4

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PV 123	50 Hz -40°C → +40°C		_ · ·	
Туре	fin Temp. range		da-dn 100:3 50 3P 450	
	IEC 60044-2 280 / 60 kg 1,9Un/8h	kV kV	100°\3 10°\3 10	
rmer	Standard Weight / oil Voltage factor	A-N 110:√3		
Transfc	3/230/550 kV Nytro Libra 84703 / 11	•	V VA CI. CI. VAran	
Voltage Transformer	Insulation level 123/230/550 kV Oil type Nytro Libra SN 84703 / 11			

Electrical diagram plate:

A CONSTRUCTOR TO STORM OF ELECTRICAL DIAGRAM OPENATION MUST BE EARTHED TO SAFE CONNECTION THREE WINDING GA-GN IN OPEN DELTA CIRCUIT MUST BE EARTHED IN ONLY ONE POINT

The tests were witnessed by:

Checked by:

Przasnysz, 2012-03-26

Representative of HIGH VOLTAGE LABORATORY INSTYTUT ENERGETYKE 01-330 WARSAW, Mory 8

2GKP011V1084703 Page 3 / 4



INSTITUTE OF POWER ENGINEERING

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Page 1/7

TEST REPORT No. EUR/12/E/12-3E

Voltage transformer type PV 123 with porcelain insulator TEST OBJECT: ABB Sp. z o.o. Division in Przasnysz, ul. Leszno 59, 06-300 Przasnysz MANUFACTURER:

TESTS ORDERED BY: Internal order No. EWN/48/E/12 dated 10.05.2012

Mechanical tests TYPE OF TESTS:

According to IEC 60044-2:1997+A1:2000+A2:2002 TESTS PROCEDURE:

30,03,2012 DATE OF TESTS:

TESTS RESULT:

Positive for $F_{R}=3600\ N$ and resulting dynamic load

Tests result refers only to the test object

THE TESTS WERE WITNESSED BY:

Test engineer

HEAD OF LABORATORY

Заличено по чл.2 от 33ЛД



INSTITUTE OF POWER ENGINEERING

Test report No. EUR/12/E/12-3E

Page

	DISTRIBUTION EQUIPMENT LABORATORY	EUR/12/F
Ö	Contents	
1.	Test object	
	1.1. Description	
	1.2. Technical data	
	1.3. Technical documentation	
	1.4. Preparation for tests	
2.	Scope of tests	
33	Test and measuring circuits	
4	Tests and theirs detailed results	
5,	Test results evaluation	
	Annexes: 1. Photographs taken during the tests	
	2. Documentations delivered by orderer	

Report contents:

numbered pages	7
tables	
photographs	3



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INSTITUTE OF POWER ENGINEERING DISTRIBUTION EQUIPMENT LABORATORY

Test report No. EUR/12/E/12-3E Page 3/7

1. TEST OBJECT

1.1 Description

in the network of nominal voltage 110 kV and frequency 50 Hz. The transformer consists of voltage transformer mounted in porcelain euclosure immersed with transformer oil. Voltage transformer type PV 123 is used for supplying of measuring and protection circuits

1.2 Technical data

The Manufacturer attributed the following construction data to the test object.

		7	•	•	۰
				-	-
4		2	្ន	è	ğ
0.0	þ	300	5	÷	5
1		Š	Ť		≝
Rated voltage	-	Dated Gramman	Ĭ	1	Raich Static 10a
TV4	4	3	Ž	7	3
12		100	ā	Ś	₹
\simeq	Ę	2	6	Ω	۲,

110/\f3 kV

3600 N 50 Hz

1.3 Technical documentation

For the purpose of tosts the orderer delivered the following technical documentation: - dimensional drawing voltage transformer PV 123, No. 2/GKV614114, 19.01.2012,

prepared by ABB Sp. z o.o. (Annex 2).

The laboratory proceeded the identification of test object on the base of above documentation and the nameplate

1.4 Preparation for tests

The test object was prepared for test by factory.

2. SCOPE OF TESTS

Test program, agreed with orderer, comprised the following tests according to requirements of IEC 60044-2:1997+A1:2000+A2:2002;

- mechanical tests acc. to item 9.3 of above standards for F_R = 3600 N and resulting dynamic load of terminal A.

3. TEST AND MEASURING CIRCUITS

For the tests the transformer was fixed to the rigid construction of the test stand.

Mechanical tests were performed applying the load consecutively to the transformer's terminal as shown on photographs 1 to 3 in Annex 2.



INSTITUTE OF POWER ENGINEERING DISTRIBUTION EQUIPMENT LABORATORY

EUR/12/E/12-3E Test report No.

4. TESTS AND THEIRS DETAILED RESULTS

Mechanical tests were performed 30.03.2012. Tests results present table 1. During the tests the photos were made (Annex 1 presents the photographs) phot. 1 to 3 - voltage transformer during mechanical tests.

Table 1, Results of static load withstand tests at $F=3620\,\mathrm{N}$ and dynamic *j

Observations		After tests no damage nor oil leak was stated.		After tests no damage nor oil leak was stated.		After tests no damage nor oil leak was stated.			Dynamic tests were performed by sudden loading the terminal by the weight 3620 N.
Test	c/s		dyn.")	_	dyn.*)		dyn.*)		sudden le
Load direction	e	longitudinal	Iongitudinal	transverse	transverse	vertical	vertical		re performed by
Terminal		¥,	A	A	٧	V	A		nic tests we
Test No.	ı	1	7	3	4	5	9	Remark	*) Dynar

5. TESTS RESULTS EVALUATION

According to criteria given in IEC 600/4-2:1997+A1:2000+A2:2002the results of tests of tested combined transformer is positive for:

F_R = 3600 N and resulting dynamic load



INSTITUTE OF POWER ENGINEERING DISTRIBUTION EQUIPMENT LABORATORY

Test report No. EUR/12/E/12-3E

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ANNEX 1

Photographs taken during the tests



Phot. 1. Longitudinal load of terminal A



Phot. 2. Transverse load of terminal A



INSTITUTE OF POWER ENGINEERING DISTRIBUTION EQUIPMENT LABORATORY

Test report No. EUR/12/E/12-3E Page 6/7

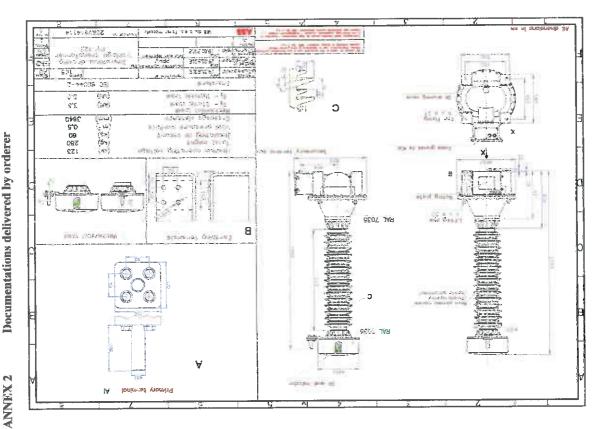


Phot. 3. Vertical load of terminal A



Documentations delivered by orderer

Test report No. EUR/12/E/12-3E Page 7/7





INSTYTUT ENERGETYKI INSTITUTE OF POWER ENGINEERING

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e-mail: ewp@ien.com.pl
http://www.ien.com.plpileeup

TEST REPORT NO. EWP/07/E/2012-3e

TEST OBJECT:	Voltage instrument transformer type PV 123
MANUFACTURER:	ABB Sp. z o.o. Power Products 59 Leszno Str. 06-300 Przasnysz, Poland
TESTS ORDERED BY:	Institute of Power Engineering High Voltage Department Internal order No. EWN/11/E/12 dated 16.02.2012
TYPE OF TESTS:	Temperature-rise test
TEST PROCEDURE:	IEC 60044-2: 1997, IBC 60044-2: 1997 /A2: 2002, IEC 62271-1: 2007
TEST OBJECT DELIVERED: 10.02.2012	10.02.2012
DATE OF TESTS:	22,02,2012 + 23,02,2012
TESTS RESULTS:	Positive

Tests result refers only to the test object.

The Test Report cansist tests from and beyond the scope of accreditation (details in sub-cl. 4)
Publishing or reproducing of this report in other version then extend and complete without written
permission of laboratory is forbidden

1 Appendix

THE TESTS WERE WITNESSED BY: TEST ENGINEER: Mariusz SUL M.Sc. Eng.
Lidia GRUZA M.Sc. Eng

Warsaw, 27.02.2012





INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No. EWP/07/E/2012-3e

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Technical data declare Technical documental Scope of the tests Tests and their results Summary Opinions and interpre Photographic docume Drawings	Technical data declars Technical documental Scope of the tests Tests and their results Summary Opinions and interpre Photographic docume	1. Description of the test object

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INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No. FWP/07/E/2012-3c

Test object	Voltage instrument transformer
Type, Senal number	PV 123, 2GKP011V1084703
Manufacturer	ABB Sp. z o.o. Power Products
Year	2011
Insulator	Porcelain insulator
Oil type	Nytro Libra
Minimum creepage distance	3640 mm
Insulating oil weight	60 kg
Total weight	280 kg
Dimensions	According to drawing no. 2GKV614114

prepared for testing by the Manufacturer.

Maximum operating voltage 123 kV Rated frequency 50 Hz Voltage factor and time 1,9Un/8h	<u></u>	2. Technical data declared by the Manufacturer	cturer
nd time	aximı	um operating voltage	123 kV
	ated fi	requency	50 Hz
	oltage	e factor and time	1,9Uh/8h

Type of secondary winding	la-ln	2a-2n 3a-3n 4a-4n	3a-3n	3a-3n 4a-4n	da-dn
Rated secondary voltage	100:43	100:43	100:43 100:43	100:43	100:3
Rated output	15 VA	15 VA	20 VA	2.5 VA	50 VA
Accuracy class	0,2	0,2	0,2/3P	0,2/3P	ЗР
Therntal limiting output	1000 VA	1000 VA 1000 VA 1000 VA 1000 VA	1000 VA	0 VA 1000 VA 1000 VA 450 VA	450 VA

INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No. EWP/07/E/2012-3e

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Drawing no. 2GK V614114/ - Dimensional drawing voltage transformer PV 123, ABB Sp. z o.o. Power Products, approved 19.01.2012

Routine test report of voltage transformer (before type test); type PV 123, Series No. 2GHKP011V1084703, ABB Sp. z o.o., Przasnysz, 19.01.2012 7

3. Construction of voltage transformer PV 123 - NF 2GKP011V1084703

4. Scope of the tests

Test programme agreed with Orderer comprised of tests:

Kind of test	Tests according the Standard	Location of the test
the state of the s	THE MARKET OF THE PARK THE COURSE OF THE PARK TH	7
	IEC 60044-2:1997 sub-cl. 5.4, 8.1, 13.6.1	CARO
l'emperante-rise tests	IEC 62271-1:2007, Table No. 3, sub-cl. 4	L'AA'L

EWP The test was performed in Institute of Power Engineering, by High - Current Laboratory.



INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No.

EWP/07/E/2012-3e

Tests and their results

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quired value was applied to the primary voltage winding. The secondary voltage windings and the Voltage transformer was installed at the test stand, as it was during normal operation. Electric diagram of terminal box of tested voltage transformer is given in Fig. 1. The rated voltage with a reresidual voltage winding were loaded with the suitable power, according to the test programme given below, which was agreed with the Orderer. The arrangement of the thermocouples is given in Figure No. 2. The temperature-rises of windings ings were made every 1-hour and registered the deflection of oil level indicator. The resistances of were measured by the resistance rise method. During the test, the measurements of loaded windall windings were measured before the tests and after of each stage of tests.

The abstract of the protocol of temperature-rise test is given in Table No. 1. The summary of test results is given in Table 2.

The temperature-rise of windings were calculated from the formula:

$$T = \frac{R}{R_0 \alpha} = \frac{R_1 - R_0}{R_0 \cdot 0,0004}$$

Stage No. 1: Test at the rated load

Test was performed according to the IEC 60044-2 sub-cl. 8.1, 5.4 a) and 13.6.1). The voltage value 1,2 Un = 76,2 kV was applied to the A terminal The secondary voltage windings were loaded as follows: $\ln \Rightarrow 15 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$; $2a-2n \Rightarrow 15 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$; $3a-3n \Rightarrow 20 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$; $4a-4n \Rightarrow 25 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$. The winding of residual voltage remained open.

The test was performed till reached steady state of the measured temperatures.

Stage No. 2: Test of 8 h

Test was done immediately after the Stage No. 1 according to the IEC 60044-2 sub-cl. 5.4 c, 8.1, and 13.6.1. The voltage value 1,9 Un = 119,7 kV was applied to the A terminal The secondary voltage windings were loaded as follows: $1a-1n \Rightarrow 15 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$, $2a-2n \Rightarrow 15 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$, $3a-3n \Rightarrow 20 \text{ VA}$ at the voltage $100/\sqrt{3} \text{ V}$; $4a-4n \Rightarrow 25 \text{ VA}$, $\cos \varphi = 1$, at the voltage $100/\sqrt{3} \text{ V}$.

The residual winding da-dn was loaded by \Rightarrow 450 VA, $\cos \varphi = 1$, at the voltage 100/3 V.

The duration of the test was 8 h.

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Stage No. 3: Test with thermal limit power

Test was done immediately after Stage No. 2 according to the IEC 60044-2 sub-cl. 5.4 a), 8.1, and 13.6.1. The voltage value Un = 63 kV was applied to the A terminal. According to Manufacturers request secondary voltage windings (i.e. 1a-In, 2a-2n, 3a-3n and 4a -4n) were loaded by limit power 1000 VA at cosp = 1. The residual winding remained open.

The test was performed till reaching the steady state of the measured temperatures.

Measuring instruments

The resistance was measured by means of meter type 2291 manufactured by TETTEX Instruments $\pm 0.6^{\circ} \text{C}^{1}$. The ambient temperature was measured using four mercurial thermometers immersed into tank filled with oil. These thermometers were placed in the distance of 1 meter from the tested The temperatures were measured by means of type K thermocouples (NiCr - NiAl) with accuracy transformer at the height of 1 meter above floor- the accuracy of measurement ± 0.03 °C $^{\rm I}$ with accuracy ± 0,01 mΩ1

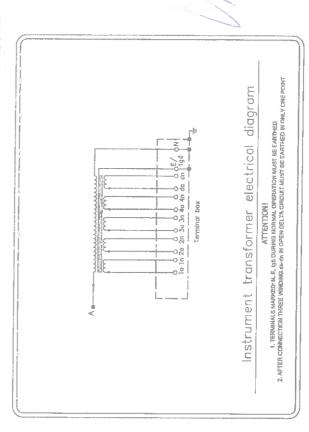


Fig. 1. Electrical diagram of terminal box of tested voltage instrument transformer

6/12 Page

¹ The expanded uncertainty assigned corresponds to a coveringe probability of 95 % and the coverage factor k = 2.

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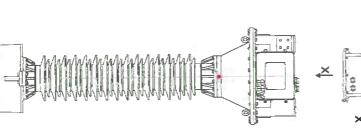
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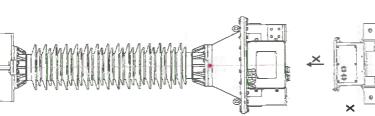
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Test Report No. EWP/07/E/2012-3e





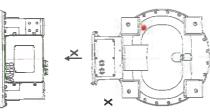


Fig. 2. Arrangement of thermocouples during temperature-rise test:

1-oil; 2-under the flange of tank lid; 3-lower tank (placed inside over earthing terminal)

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Temperature ruse test results of voltage instrument transformer PV 123, serial no 2CKP011/108

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INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No. EWP/07/E/2012-3e

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Table No. 2, Temperature-rises [K] given during the tests Voltage instrument transformer PV 123 serial no. 2GKP011V1084703	₽Ф	after Stage No. 3	31,66	30,08	30,70	31,40	35.08	55,44	Δθ after Stage	No.3	9,33	8,33	7,10	2007,
Table No. 2. Temperature-rises [K] given during the tests is instrument transformer PV 123 serial no. 2GKP011VIC	Φ Φ	after Stage No. 2	18,11	18,33	18,84	19,21	21,02	17,04	At after Stage	No. 2	6,42	6,13	5,19	2) acc. to IEC 62271-1:2007,
Table No. 2, Tempe e instrument transf	ΦΦ	after Stage No. 1	4,86	4,54	4,41	4,35	4,25	2,80	Δ 0 after Stage	No. 1	1,10	1,23	0,84	.1997,
Voltag		Winding	la- lu	2a-2n	3a-3n	4a-4n	da-dn	A-N	Thermocouple	Location	Ö	Under the flange of tank lid	Enclosure of lower tank	¹⁾ acc. to IEC 60044-2:1997,
			,	i					The	No.	-	7	co	D acc

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INSTITUTE OF POWER ENGINEERING HIGH CURRENT LABORATORY

Test Report No. EWP/07/E/2012-3e

6. Summary

In tested voltage instrument transformer type PV 123 with porcelain insulator, as results of temperature rise test: - in steady state, at the rated load of secondary voltage windings (without residual winding) , at $\cos \Phi = 1$ and supply voltage $1,2U_n$ (Stage No. 1), permitted temperature-rise limits were not exceeded.

The tested voltage transformer met requirements of IEC 60044-2: 1997, IEC 60044-2:1997/A2:2002 and IEC 62271-1: 2007 standards.

- results of test 8 h at supply voltage 1,9 U_n and rated load of voltage windings at $\cos \varphi = 1$ and load of residual winding with thermal limit power (Stage No. 2), shows that permitted temperature-rise limits were not exceeded.

The tested voltage transformer met requirements of IEC 60044-2: 1997, IEC 60044-2:1997/A2:2002 and IEC 62271-1: 2007 standards.

 $\cos \phi = 1$ and supply voltage U_n , and at the same time loading of all voltage windings (without residual windings) with thermal limit power, shows that permitted temperature-rise limits were not - results of test with thermal limit power (Stage No. 3) at the rated load of voltage windings at exceeded.

The tested voltage transformer met requirements of IEC IEC 60044-2: 1997, IEC 60044-2:1997/A2::2002 and IEC 62271-1: 2007 standards.

7. Opinions and interpretations

None

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Test Report No. EWP/07/E/2012-3e

8. Photographic documentation



Photograph No. 1. Voltage transformer on the test stand during temperature-rise test.

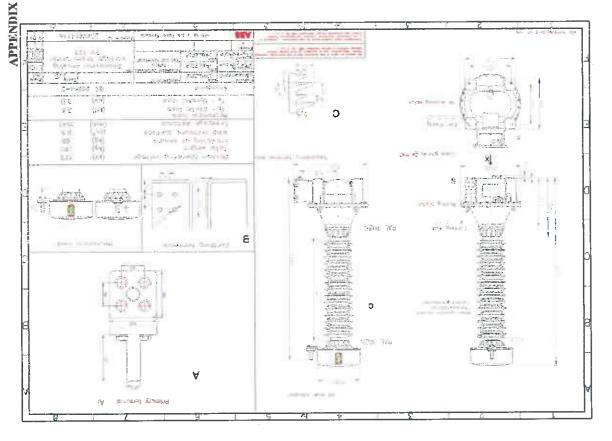


Photograph No. 2. Tenninal box of tested voltage transformer during temperature-rise test.

Test Report No. EWP/07/E/2012-3e

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HIGH VOLTAGE LABORATORY

POLAND v. ..40 WARSZAWA, ul. Mary 8 fax: (+4822) 836-80-48, mail: ewn@ien.com.pl

Lightning impulse test of the voltage transformer project: ewn11e12-u1

test date 30-03-2012

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IGH VOLTAGE LABORATORY

POLAND 01-336 WARSZAWA, ul. Mory 8 fax (+4822) 836-80-48, mail: eum@ien.com.pl

	page 2						
the voltage transformer		LI: 1A - FW(100,0%)	Ll: 1A - FW(100.0%)	LI: 1A - FW(100.0%)	LI: 1A - FW(100.0%)	Ll: 1A - FW(100.0%)	Ll: 1A - FW(100.0%)
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<u> </u>	PV123	kvA kv		vector group BIL frequency	550 50 Hz
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lghtning-impulse					
Up [kV]	T1[µs]	T2[µs]	Tc[µs]	remark	
-276.8	1.19	53.2		LI: 1A - RW(50.0%)	(9)
-554.6	1.19	53.4		LI: 1A - FW(100.0%)	(%)
-320.5	1.19		3.37	LI: 1A - CRW(57.5%)	2%)
-634.7	1.2		3,44	LI: 1A - CFW(115.0%)	(%0°)
-634.7	1.21		3.46	LI: 1A - CFW(115.0%)	.0%)
-551.5	1.19	53.4		LI: 1A - FW(100.0%)	(%)
-551.9	1.19	53.4		LI: 1A - FW(100.0%)	(%)
-552.8	1,19	53.4		LI: 1A - FW(100.0%)	(%)
-551.2	1.19	53.4		Ll: 1A - FW(100.0%)	(%)
-551.5	1.19	53.4		LI: 1A - FW(100.0%)	(%)
-551.1	1.2	53.4		LI: 1A - FW(100.0%)	(%)
-551.3	1.2	53.5		LI: 1A - FW(100.0%)	(%)
-551.5	1,19	53.5		LI: 1A - FW(100.0%)	(%)
-551.2	1.19	53.5		LI: 1A - FW(100.0%)	(%)
-551.4	1.19	53.5		LI: 1A - FW(100.0%)	(%)
-551.5	1.19	53.5		LI: 1A - FW(100.0%)	%
-551.2	1.2	53.5		LI: 1A - FW(100.0%)	(%
-55	5	53.5		LI: 1A - FW(100.0%)	(%
-550.9	1.19	53.5		LI: 1A - FW(100.0%)	(%
277.7	1.19	53.4		LI: 1A - RW(50.0%)	(9)
552.1	1.19	53.7		LI: 1A - FW(100.0%)	(%)
552	1.2	53.7		LI: 1A - FW(100.0%)	(%)
552.2	1.19	53.7		LI: 1A - FW(100.0%)	(%)
551.9	1.19	53.6		U: 1A - FW(100.0%)	(%)
551.9	1.2	53.7		U: 1A - FW(100.0%)	(%)
551.6	1.2	53.7		LI: 1A - FW(100.0%)	(%
551.5	1.19	53.7		LI: 1A - FW(100.0%)	(%)
551.8	1.19	53.7		LI: 1A - FW(100.0%)	(%
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HIGH VOLTAGE LABORATORY

Lightning impulse test of the voltage transformer

project: ewn11o12-u1

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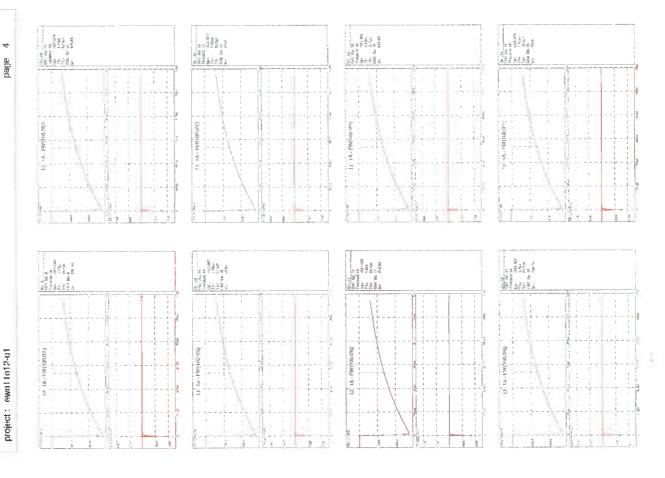
POLAND 01-330 WARDZAWA, UL Mery B fax: (+4822) 836-80-48, mail: evin@lon.com.pl



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Lightning impulse test of the voltage transformer project: ewn11612-u1



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Lightning impulse test of the voltage transformer

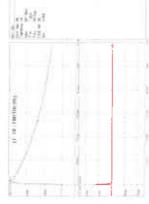
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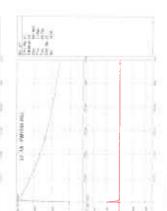
POLAND 01-330 WARSZAWA, UL Mory 8 fax: (*4822) 836-80-48, mail: ewn@ien.com.pi

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Lightning impulse test of the voltage transformer project: ewn11e12-u1



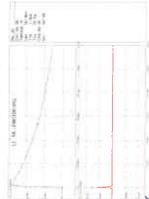


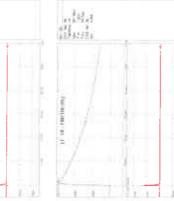


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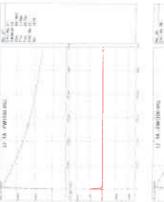
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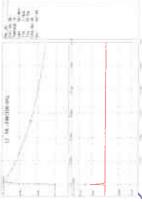




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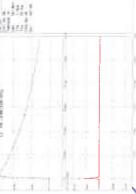


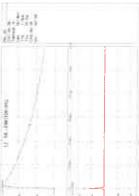


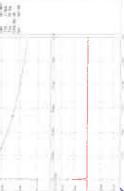
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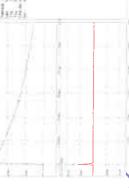
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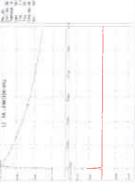
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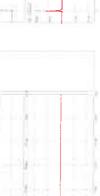














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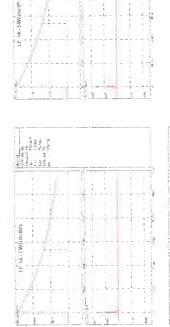


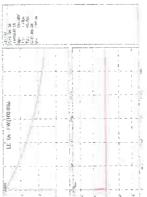
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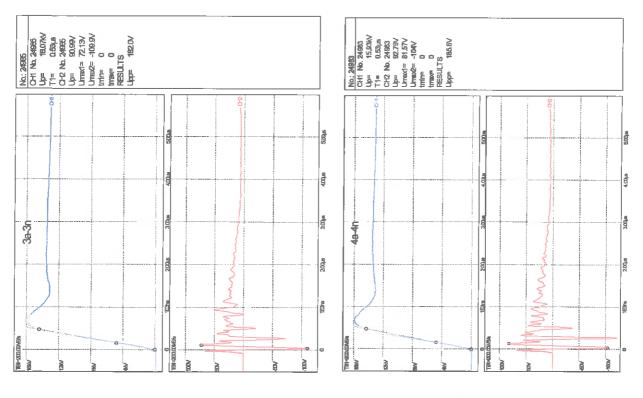
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Lightning impulse test of the voltage transformer project: ewn1912-u1







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Upp 15288V

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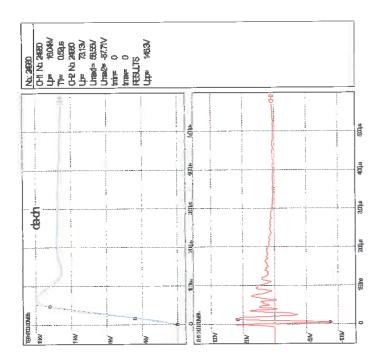
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POLSKIE CENTRUM AKREDYTACJI

POLISH CENTRE FOR ACCREDITATION



Sygnatariusz EA MLA EA MLA Signatory

CERTYFIKAT AKREDYTACJI JEDNOSTKI CERTYFIKUJĄCEJ WYROBY ACCREDITATION CERTIFICATE FOR PRODUCT CERTIFICATION BODY

Nr AC 117

Potwierdza się, że: / This is to confirm that:

INSTYTUT ENERGETYKI
INSTYTUT BADAWCZY
ZESPÓŁ ds. CERTYFIKACJI
ul. Mory 8, 01-330 Warszawa

spełnia wymagania normy PN-EN ISO/IEC 17065:2013-03 meets requirements of the PN-EN ISO/IEC 17065:2013-03 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AC 117
Accredited activity is defined in the Scope of Accreditation No AC 177

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w kontrakcie Nr AC 117

This accreditation remains in force provided the Body observes the requirements of Accreditation Body defined in the Contract No AC 117

Certyfikat akredytacji ważny do dnia 03.02.2017 r.
The certificate of accreditation is valid until 03.02.2017

Akredytacji udzielono dnia 04.02.2005 r. Accreditation was granted on 04.02.2005



p.o. DYREKTORA
POLSKIEGO CENTRI IM AKREDYTACJI

Заличено по чл.2 от ЗЗЛД



LUCYNA OLBORSKA

Warszawa, 24 kwietnia 2015 roku





POLSKIE CENTRUM AKREDYTACJI

POLISH CENTRE FOR ACCREDITATION



Sygnatariusz EA MLA **EA MLA Signatory**

CERTYFIKAT AKREDYTACJI

LABORATORIUM BADAWCZEGO

ACCREDITATION CERTIFICATE OF TESTING LABORATORY

Nr AB 323

Potwierdza się, że: / This is to confirm that:

INSTYTUT ENERGETYKI LABORATORIUM WIELKOPRADOWE

ul. Mory 8, 01-330 Warszawa

spełnia wymagania normy PN-EN ISO/IEC 17025:2005 meets requirements of the PN-EN ISO/IEC 17025:2005 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AB 323 Accredited activity is defined in the Scope of Accreditation No AB 323

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w kontrakcie Nr AB 323

This accreditation remains in force provided the Laboratory observes the requirements of Accreditation Body defined in the Contract No AB 323

Certyfikat akredytacji ważny do dnia 27.12.2019 r. The certificate of accreditation is valid until 27 12 2019

Akredytacji udzielono dnia 28.12.2000 r. Accreditation was granted on 28 12.2000



DYREKTOR POLSKIEGO CENTRUM AKREDYTACJI

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LUCYNA OLBORSKA

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EVIDENCE OF APPROVAL FOR SUBCONTRACTORS

OF CERTIFICATION DEPARTMENT OF INSTITUTE OF POWER ENGINEERING IN THE RANGE OF LABORATORY TESTING

No. LBU - 001/2015

(Issue 01)

It is confirmed that

Measuring and testing sites No. 16, 17, 18 and 19 located in the ABB Sp. z o.o., Branch Office in Przasnysz Power Products High Voltage 59 Leszno Str., 06-300 Przasnysz, Poland

meets the criteria for the technical requirements specified in point 5 of PN-EN ISO / IEC 17025:2005 (EN ISO/IEC 17025:2005) and obtained recognition of Certification Department of IEn in the scope of performing laboratory tests and measurements for company own use and for Certification Department of IEn.

Certification Department of IEn confirms the validity of test and measurements procedures applied for the measurement and research stations at ABB Sp. z o.o. Branch Office in Przasnysz Power Products High Voltage laboratories for testing according to the following standards:

IEC 61869-1 ed 1.0 (2007); IEC 61869-2 ed 1.0 (2012); IEC 61869-3 ed 1.0 (2011); IEC 61869-4: ed 1.0 (2013); IEC 60156 ed 2.0 (1995)

Recognized test methods are given in Appendix No. 1

This evidence of approval is valid from 23.02.2015 until 23.02.2016

Department of IEn

Заличено по чл.2 от ЗЗЛД

myr mz. Giazyna wieczorek

Head of Certification



Warsaw, 23.02.2015



APPENDIX No. 1 TO EVIDENCE OF APPROVAL FOR SUBCONTRACTORS OF CERTIFICATION DEPARTMENT OF INSTITUTE OF POWER ENGINEERING No. LBU - 001/2015

(Issue 01)

Recognized test and mesaurements methods in the range:

- 1. Site No. 16. Verification of accuracy of inductive voltage transformers. Measurement of capacitance and dielectric dissipation factor. [points 7.2.6, 7.3.5, 7.4.3 of standard IEC 61869-3 ed 1.0 (2011)]
- 2. Site No. 17. Verification of accuracy of current transformers and tests on inter-turn insulation of current transformers. [points 7.2.6.201, 7.3.5.201, 7.3.5.202, 7.3.5.204, 7.3.5.206, 7.3.204 of standard IEC 61869-2 ed 1.0 (2012)]
- 3. Site No. 18. Breakdown voltage measurement of the insulating oil at power frequency. [IEC 60156 ed 2.0 (1995)]
- 4. Site No. 19. Power-frequency voltage withstand tests on primary terminals and partial discharge measurement in Faraday cage. [points 7.3.1 i 7.3.2 of standards: IEC 61869-2 ed 1.0 (2012); IEC 61869-3 ed 1.0 (2011)]



ИНСТИТУТ ПО ЕНЕРГЕТИКА

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СВИДЕТЕЛСТВО ЗА ОДОБРЕНИЕ ЗА ПОДИЗПЪЛНИТЕЛИ

НА ОТДЕЛ СЕРТИФИЦИРАНЕ НА ИНСТИТУТ ПО ЕНЕРГЕТИКА Β ΔΝΑΠΑ3ΟΗΑ ΗΑ ΛΑБΟΡΑΤΟΡΗΝ Ν3ΠΝΤΑΗΝЯ

> Nº LBU-001/2015 (издание 01)

Потвърждаваме, че

Площадки за измерване и изпитания № 16, 17, 18 и 19 намиращи се в ABB Sp. Z о.о., клон в Пшашниш Продукти Високо Напрежение ул. Лешно 59, 06-300 Пшашниш, Полша

отговаря на критериите за техническите изисквания, посочени в точка 5 на PN-EN ISO/IEC 17025:2005 (EN ISO/IEC 17025:2005) и получава признаване от Отдел Сертифициране на IEn в обхвата на извършване на лабораторни изпитвания и измервания за собствени нужди на компанията и за Отдел Сертифициране на IEn.

Отдел Сертифициране на IEn потвърждава валидността на процедурите за изпитване и измерване, които се прилагат за измервателните и изследователски станции на ABB Sp. z o.o. клон в Пшашниш, лаборатории за изпитване на Продукти Високо Напрежение, в съответствие със следните стандарти:

IEC 61869-1 изд. 1.0 (2007); IEC 61869-2 изд. 1.0 (2012 г.); IEC 61869-3 изд. 1.0 (2011); IEC 61869-4: изд. 1.0 (2013 г.); IEC 60156 изд. 2.0 (1995)

Признатите методи за изпитване са дадени в Приложение № 1

Това свидетелство за одобрение е валидно от 23.02.2015 до 02.23.2016

Ръководител Отдел Сертифициране на IEn

инж. Гразина Вичорек

Варшава, 23.02.2015 г.



ПРИЛОЖЕНИЕ №1 към СВИДЕТЕЛСТВО ЗА ОДОБРЕНИЕ

ЗА ПОДИЗПЪЛНИТЕЛИ
НА ОТДЕЛ СЕРТИФИЦИРАНЕ
НА ИНСТИТУТ ПО ЕНЕРГЕТИКА
№ LBU-001/2015
(издание 01)

Признатите методи за изп<u>итване и измервания в диапазона:</u>

- 1. Площадка №16. Проверка на точността на индуктивни напреженови трансформатори. Измерване на капацитет и фактор на диелектрично разсейване. (точки 7.2.6, 7.3.5, 7.4.3 на стандарт IEC 61869-3 изд. 1.0 (2011))
- 2. Площадка №17. Проверка на точността на токови трансформатори и тестове на вътрешно-намотъчната изолация на токови трансформатори. (точки 7.2.6.201, 7.3.5.201, 7.3.5.202, 7.3.5.204, 7.3.5.206, 7.3.204 на стандарт IEC 61869-2 изд. 1.0 (2012))
- 3. Площадка №18. Измерване на пробивното напрежение на изолационното масло при промишлена честотата. (IEC 60156 изд. 2.0 (1995))
- 4. Площадка №19. Изпитание на издръжливост на напрежение с промишлена честота на първични клеми и измерване на частичните разряди във Фарадеев кафез. (точки 7.3.1 и 7.3.2 на стандарти: IEC 61869-2 изд. 1.0 (2012); IEC 61869-3 изд. 1.0 (2011))

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Technical report

Simulation Support Team

Case submitted by	Marcin Tamowski
Business Unit	PPHV
Type of analysis (used tool)	ABAQUS (seismic analysis)
Description of analysis	Seismic analysis different variants of current, voltage and combined transformers (PA123a / PA145a, PV123, PVA123a / PVA123a / PVA145a) according to guidelines described in IEC standard. Consideration of seismic, wind, and dead loads.

Executive summary

This report covers investigation related to selsmic analysis of HV instrument transformers (PV123, PA123a /PA145a, PVA123a PVA145a) subjected to various load scenarios. Simulation covered the following load conditions: dead load, wind load, terminal force load, seismic load (AF5 - 0.5 g). Analysis showed that all designs are satisfying required safety criteria.



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1 INTRODUCTION

8.1), PV123 (see 8.2), PVA145a/PVA123a (8.3) type transformers. Simulation was done using The goal of the analysis was to evaluate seismic performance of PA123a IPA145a (see guidelines of IEC TR 62271-300 standard. For more information please see [1]. Computations concerned evaluation of stress field distribution and maximum bending moment between flange and insulator. Present report describes used simulation technique, analysis steps, loads and boundary conditions variations and summarizes obtained results.

SIMULATION SOFTWARE

All simulations were performed using Abaqus/CAE package. Abaqus includes FEM (finite clement method) solver, pre- and post processor and enables performing many types of multiphysics simulations: mechanical, thermal, acoustic, piezoelectric, seismic, and others.

boundary conditions, mosh. User is also available to set up simulation parameters such as propocassing memory. It is always possible to change all simulation settings and properties, Parts and assemblies can be created in Abaqus, or they can be imported from CAD systems using nafive file formats. Abaqus functionality enables to define materials, interactions, loads, because they're all parameterized.

generate reports, diagnose model (warnings, errors). For more information about ABAQUS is able to import simulation results in Abaqus format. In postprocessor user can view all predefined field outputs, show or hide part instances, create cross-sections, make animations, automatically Simulation results can be visualized in Abaqus postprocessor or in external software, which

SIMULATION SETUP ๙

Analysis has been made using Finite Element Method.

Simulation procedure 3.1

According to [1] analysis included three main simulation steps:

Wind load.

Static load:

- Terminal load.
- Gravitational load.
- Natural frequency extraction.
 - Dynamic analysis.

Simulation steps 3.2

Simulation consisted of three main simulation steps.

3.2.1 Natural frequency extraction

extraction procedure performs eigenvalue extraction to calculate the natural frequencies and the In the first simulation step natural frequency extraction was performed. The frequency corresponding mode shapes of a system.

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The eigenvalue problem for the natural frequencies of an undamped finite element model can be described by equation (3-1):

$$(-\omega^2 M^{MN} + K^{MN}) \phi^N = 0$$
 (3-1)

where: MMN - mass matrix (kg); KMN - stiffness matrix (Pa), which includes initial stiffness effects if the base state (gravitational load); ϕ – eigenvector (the mode of vibration); M, N – degrees of freedom (-). Based on specification [1] one can assume that most critical frequency modes are in range of 0-35 Hz.

3.2.2 Response spectrum analysis

The response spectrum method is a convenient way of describing shock motion in terms of the maximum response of a single degree of freedom (1-DOF) oscillator of arbitrary natural period and damping ratio. Each data point of the response spectrum curve represents the peak response from a time history analysis of the earthquake applied to 1-DOF oscillator system. The ordinate defines the natural pertod at which the oscillator is tuned. Repeating the procedure for a great many frequencies defines a continuous curve for an assumed level of damping.

A spectral response analysis estimates the maximum displacement of the structure during a 'design' shock load without recourse of direct integration. Finite element implementation of the response spectrum calculate the response of each mode independent, and then combine the scaled response one of a number of established combination rules, to give an estimate of peak response. Spectrum plot used in simulation is presented in Figure 1

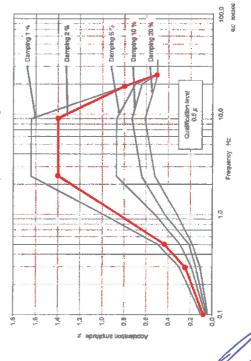


Figure 1. Design response spectrum – 2% damping (red curve)

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3.3 Loads and boundary conditions

3.3.1 Loads

The following static load scenarios have been considered

- Gravitational load, g=9.81 m/s²
- Terminal operating load, acc. to [3]. According to Table 14, page 90 terminal force are adequate to rated voltage and current level. Applied force values were the following:
- a. PA123a /PA145a: Longitudinal force-1250 N, Transversal force 1000 N, Vertical force - 1250 N.
- PV123: Longitudinal force-1750 N, Transversal force 1250 N, Vertical force
 - PVA123a/PVA145a: Longitudinal force-1750 N, Transversal force 1250 Vertical force - 1500 N.
- Wind load, 10m/s load. Wind load has been represented as directional pressure evaluated according to drag force equation: က်

$$F_D = \frac{1}{2} \rho u^2 C_D A \tag{3-1}$$

where: F_D – drag force [N], ρ – mass density of the fluid [kg/m³], u – flow velocity [m/s], Areference area [m 3], $C_D - drag$ coefficient [-].

Evaluated pressure level for all designs was ca. p=71 Pa.

Seismic load have been predefined according design response spectrum described in the standard [1] - ground acceleration reference AF5. Main input parameters were the following:

- XZ base motion with vertical load equal to 50% of horizontal direction
- YZ base motion with vertical load equal to 50% of horizontal direction.
 - Damping ratio -2% ([1], page 23, chapter 7.3.2 point b).

As the final outcome from the analysis static loads were combined with the most conservative seismic load,

3.3.2 Boundary conditions

Simulation assumes that the apparatus will be mounted on ground. An example of boundary conditions is presented in

During analysis model has been fixed at the bottom face of used test frame. General view of static loads and boundary conditions is presented in Figure 2. Area highlighted by red has been constrained (Y-rotation released). Base of the bottom tank has been supported in Y direction (as it is placed on the ground). Described boundary conditions have been used for all analyzed

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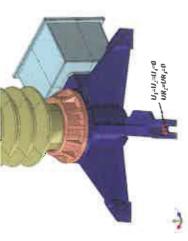


Figure 2. Boundary conditions - general view

3.4 Acceptance criteria

According to [1] the following acceptance criteria shall be met:

- Strosses observed at metallic parts should not exceed yield point of material. The maximum bending moment of the insulator should not exceed ultimate value. For more information please refer to [4] (Table 1, page 23).

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3.5 Current transformer - PA 123a/PA 145a

This chapter gathers details related to FE model of current transformer PA 123a/PA 145a.

3.5.1 Model simplifications

For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation process. Details of the geometry and center of mass can be found in Figure 3. Red point indicates center of mass of the transformer.

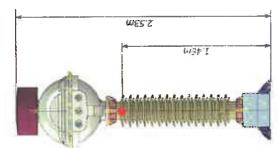


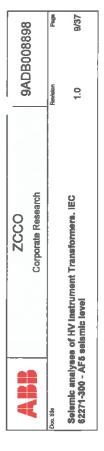
Figure 3. Simplified representation of the PA 123a/PA 145a transformer

Concrete between flange and ceramic insulator has been introduced using connector element with predefined rotational stiffness. Because of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mesh.

3.6 Material and mass Information

Component naming is presented in Figure 4.

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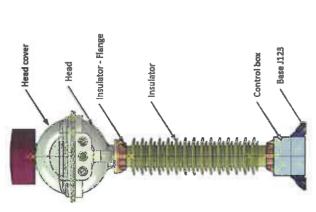


Figure 4. Assembly - component naming

Material and mass information is listed in Table 1

Table 1. Mass and material data

Strength [MPa]	160		220	160	160		160	
s strength	80	140	180	8	8		80	
rodulus [MPa]	00089	100000	00069	00069	00069		00069	
Mass [kg]	18,5	7.1	3.5	22.5	20	150	5,5	120
Material name	EN-AC 43200 (grade F)	Porcelain	EN-AC 43200 (grade T6)	EN-AC 43200 (grade F)	EN-AC 43200 (grade F)	r	EN-AC 43200 (grade F)	
Component	Base J123	Insulator	Insulator - Flange	Head	Head cover	Coll	Control box	Ō
Drawing number	2GKA310015	2GKA310404	_	2GKA414718	2GKK314089		2GKK311093R	

The maximum allowable bending moment for ceramic insulator is equal to M_B=13.3 kNm.

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3.7 Finite element (FE) model

General view of FE model is presented in Figure 5.

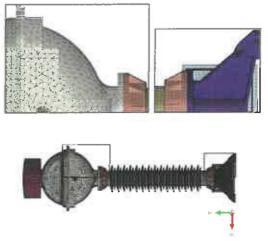


Figure 5. FE model - general view

Mesh statistics were the following:

- Total number of nodes: 533430
- Total number of elements: 242866
- o 210555 quadratic tetrahedral elements of type C3D10 o 31050 quadratic hexahedral elements of type C3D20R o 1243 quadratic quadrilateral elements of type S8R o 18 quadratic triangular elements of type STR165

Description of the coordinate system.

- X 1st horizontal axis.
 Z 2rd horizontal axis.
- Y vertical axis.

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3.8 Voltage transformer - PV 123

This chapter gathers details related to FE model of voltage transformer PV 123.

3.8.1 Model simplifications

For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation process. Details of the geometry and center of mass can be found in Figure 6. Red point indicates center of mass of the transformer.

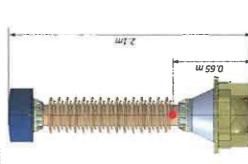


Figure 6. Simplified representation of the PV 123 transformer

Concrete between flange and ceramic insulator has been introduced using connector element with predefined rotational stiffness.

Because of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mosh.

3.9 Material and mass information

Component naming is presented in Figure 7.

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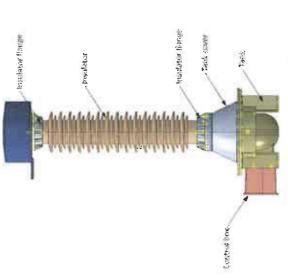


Figure 7. Assembly -- component naming

Material and mass information is listed in Table 2.

Tablo 2. Mass and material data

Component Material Mass
Bottom tank EN-AC 43200 25 (grade F)
Core Steel 22.5
Tank cover EN-AC 43200 15.5 (grade F)
Insulator Porcelain 71
Insulator EN-AC 43200 3.5 [lange (grade T5)
Coil = 30
Control box (grade F) 5.5
Oil 60

The maximum allowable bending moment for ceramic insulator is equal to Mn=13.3 kNm.

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3.10 Finite element (FE) model

General view of FE model is presented in Figure 8.

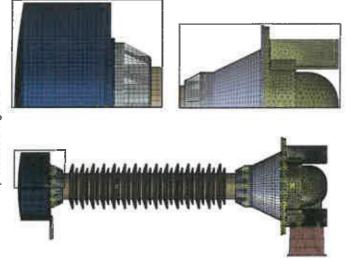
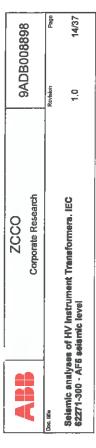


Figure 8. FE model - general view

Mesh statistics were the following:

- Total number of nodes: 608507
- Total number of elements: 236033
- 4606 quadratic quadrilateral elements of type S8R 58 quadratic triangular elements of type STRI65 ٥
- 58965 quadratic hexahedral elements of type C3D20R 8577 linear hexahedral elements of type C3D8R
 - 163827 quadratic tetrahedral elements of type C3D10
- cription of the coordinate system.
- (1st horizontal axis.
 - Z 2nd horizontal axis.
 - Y vertical axis.

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3.11 Combined transformer - PVA123a /PVA145a

of combined transformer model to FE This chapter gathers details related PVA123a /PVA145a

3.11.1 Model simplifications

process. Details of the geometry and center of mass can be found in Figure 9. Red point indicates For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation center of mass of the transformer

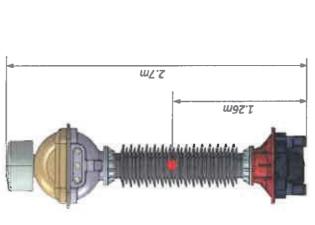


Figure 9. Simplified representation of the PVA123a /PVA145a transformer

Concrete between flange and ceramic insulator has been introduced using connector element with predefined rotational stiffness.

Because of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mesh.

3.12 Material and mass information

Component naming is presented in Figure 7.



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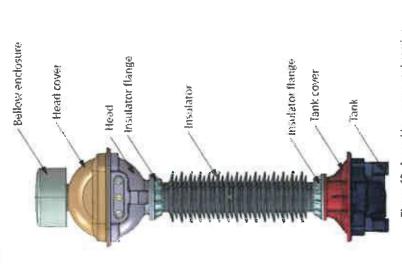


Figure 10. Assembly – component naming Material and mass information is listed in Table 3.

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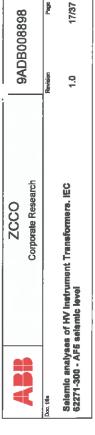
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Table 3. Mass and material data

Drawing number	Component	Matorial	Mass	Young's modulus [MPa]	Yiold strength [MPa]	Ultimate strength [MPa]
2GKK314076	Tank	EN-AC 43200 (grade F)	25	69000	80	160
2GKK314084	Core	Steel	33.8	206000	300	370
2GKK314075	Tank cover	EN-AC 43200 (grade F)	18	00069	80	160
	Insulator	Porcelain	131	100000	140	
ZGNN314070	Insulator flange	EN-AC 43200 (grade T6)	5	69000	180	220
2GKK314080	Head	EN-AC 43200 (grade F)	23.5	00069	80	160
2GKK314089	Head cover PVA-PA123a /PA145a-145	EN-AC 43200 (grade F)	23	69000	80	160
2GKK310902	Bellow	Stainless steel	Ŋ	190000	200	200
2GKK310014P	Below enclosure	EN-AC 43200 (grade F)	7	69000	80	160
	Voltage coil	•	30			1
	Current coil	98	150	4		10
2GKK310802	Epoxy insulator	ı	2.5	b.	-	,
2GKK311093R	Control box	EN-AC 43200 (grade F)	5,5	69000	80	160
la la	IIO		150	-	20	W.

The maximum allowable bending moment for ceramic insulator is equal to M₅=13.3 kNm.



3.13 Finite element (FE) model

General view of FE model is presented in Figure 11.

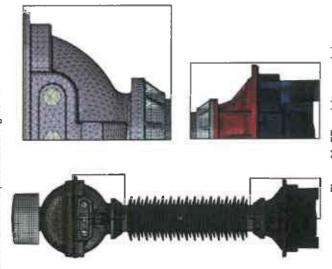


Figure 11. FE model - general view

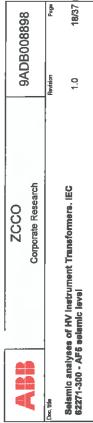
Mesh statistics were the following:

- Total number of nodes: 1009580
- Total number of elements: 463007
- 58507 quadratic hexahedral elements of type C3D20R
 - 300489 quadratic tetrahedral elements of type C3D10
- 2519 linear quadrilateral elements of type S4R 97 linear triangular elements of type S3
- 9900 linear hexahedral elements of type C3D8R 528 quadratic wedge elements of type C3D15
- 90967 quadratic tetrahedral elements of type C3D10M

Description of the coordinate system.

- X 1st horizontal axis.
 - Z 2nd horizontal axis.
 Y vertical axis.

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SIMULATION RESULTS

This chapter gathers simulation results evaluated in the analysis. Obtained outcome Incudes static and the most conservative (design) seismic load.

4.1 PA123a/PA145a

4.1.1 Natural frequency extraction

Effective modal mass plot is presented Figure 12. Bubble size indicated amount of mass which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between $6.9-8.2~\mathrm{Hz}$.

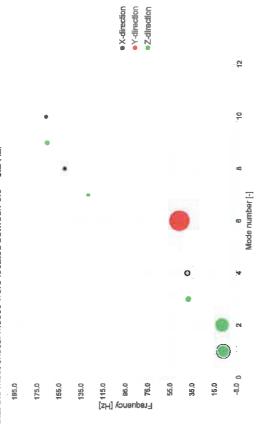


Figure 12. Natural frequency extraction – effective modal mass Effective modes and associated with the shapes are presented in Figure 13,

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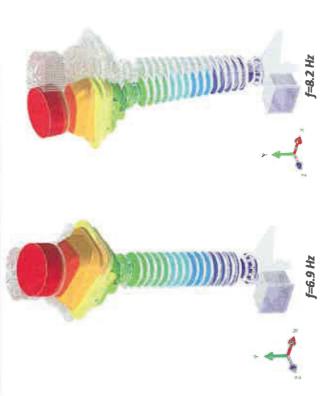


Figure 13. Natural frequency extraction - mode shapes

Summary of modal mass participation is listed in Table 4.

Table 4. Modal mass participation - summary

Mode no	Frequency [Hz]	X-direction	Y-direction	Z-direction
1	6.9	40%	%0	35%
2	8.2	34%	%0	40%
m	38.9	2%	%0	%9
4	39.7	%9	%0	7%
22	46.9	%0	%0	%0
9	98.7	%0	%68	%0
7	129.2	%0	%0	7%
00	150.3	4%	%0	%0
6	166.6	%0	%0	4%
10	167.4	5%	%0	%0

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4.1.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 14 and Figure 15. Stress scale has been limited to 80 MPa as the maximum allowable stress level.

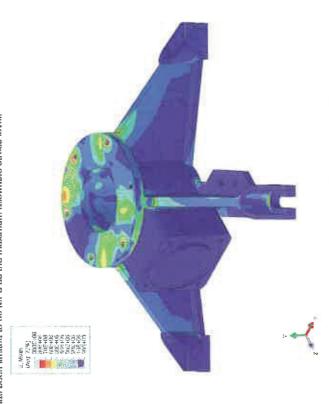


Figure 14. Von-Mises stress [Pa] distribution - tank (view 01)

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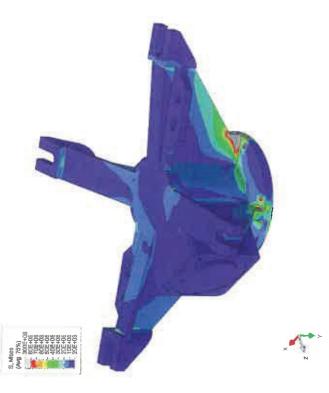


Figure 15. Von-Mises stress [Pa] distribution – tenk (view 02) Displacement field is presented in Figure 16.



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Figure 16. Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=4848 Nm.
- M_z=7476 Nm.

Insulator has satisfied the maximum bending moment condition. One can observer that stresses evaluated at the base are slightly above yield point of material. Therefore small yielding may occur. One must have in mind that analysis did not cover possible casting imperfections. Design has been also verified according to AF3 seismic level (0.3 g Zero Period Acceleration). Stress distribution for such load scenario is presented from Figure 17 to Figure 18. Obtained stress level was significantly below yield point of material.

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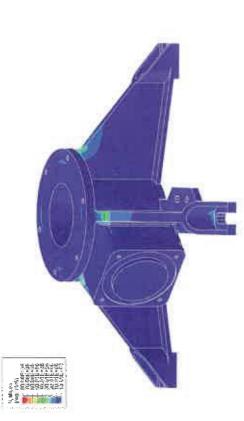


Figure 17. Von-Mises stress [Pa] distribution (AF3) - tank (view 01)

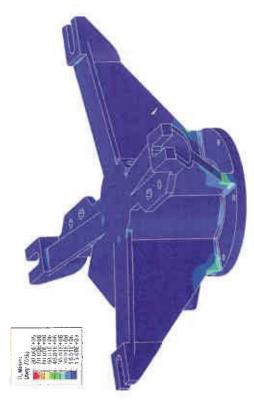


Figure 18. Von-Mises stress [Pa] distribution (AF3) - tank (view 02)

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4.2 PV 123

4.2.1 Natural frequency extraction

Effective modal mass plot is presented Figure 19. Bubble size indicated amount of mass which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between 24.7–25.3 Hz.

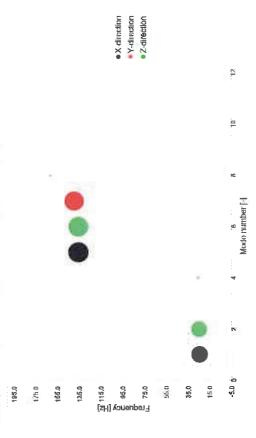
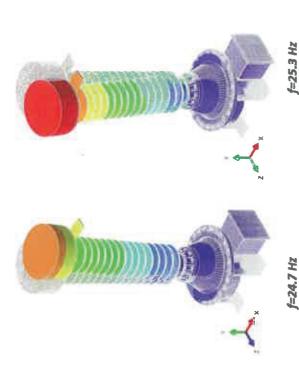


Figure 19. Natural frequency extruction – effective modal mass Effective modes and associated with the shapes are presented in Figure 20.

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f=24.7 Hz

Figure 20. Natural frequency extraction - mode shapes

Summary of modal mass participation is listed in Table 5.

Table 5. Modal mass participation - summary

no [Hz] direction direction direction direction 1 24.7 24% 0% 0% 2 25.2 0% 0% 24% 3 25.4 0% 0% 24% 4 26.5 0% 0% 0% 5 135.5 37% 0% 0% 6 139.3 0% 0% 36% 7 161.3 0% 34% 0% 9 175.8 0% 0% 0% 10 176.2 0% 0% 0%	Mode	Frequency	×	Υ.	-2
24.7 24% 0% 25.2 0% 0% 25.4 0% 0% 26.5 0% 0% 135.5 37% 0% 1439.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	no.	[Hz]	direction	direction	direction
25.2 0% 0% 25.4 0% 0% 26.5 0% 0% 135.5 37% 0% 139.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	1	24.7	24%	%0	%0
25.4 0% 0% 26.5 0% 0% 135.5 37% 0% 139.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	2	25.2	%0	%0	24%
26.5 0% 0% 135.5 37% 0% 139.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	m	25.4	%0	%0	%0
135.5 37% 0% 139.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	4	26.5	%0	%0	%0
139.3 0% 0% 161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	5	135.5	37%	%0	%0
161.3 0% 34% 162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	9	139.3	%0	%0	36%
162.4 0% 0% 175.8 0% 0% 176.2 0% 0%	7	161.3	%0	34%	%0
175.8 0% 0% 176.2 0% 0%	00	162.4	%0	0%	%0
176.2 0% 0%	6	175.8	%0	%0	%
	10	176.2	%0	%0	%0



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4.2.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 21 and Figure 22. As described in chapter 3.8.1 location of center of mass is close to the ground level, therefore expected bending moment and so the stress was low. One can see that the maximum stress level reached ca. 30 MPa and it was located at vicinity of coupling constraint. Stress level satisfies required safety condition.

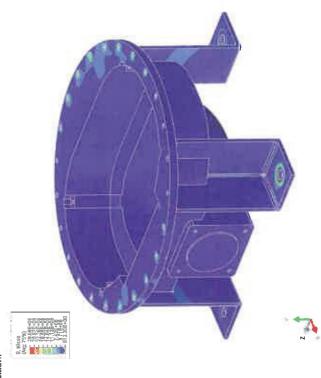


Figure 21. Von-Mises stress [Pa] distribution - tank (view 01)



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Figure 22. Von-Mises stress [Pa] distribution - tank (view 02) Displacement field is presented in Figure 23.

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Figure 23. Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=2079 Nm.
 M_z=2263 Nm.

Insulator has satisfied the maximum bending moment condition.

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4.3 PVA123a /PVA145a

4.3.1 Natural frequency extraction

Effective modal mass plot is presented Figure 24. Bubble size indicated amount of mass which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between 3.8–4.1 Hz.

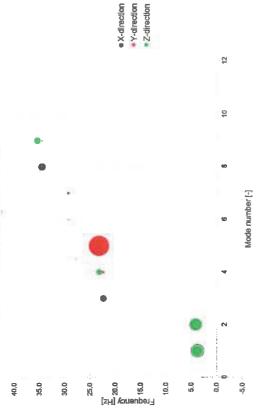
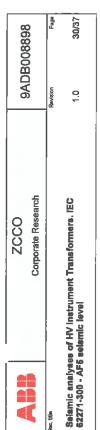
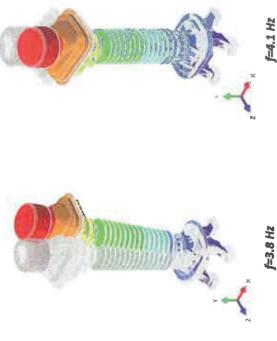


Figure 24. Natural frequency extraction – effective modal mass Effective modes and associated with the shapes are presented in Figure 25.



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Figure 25. Natural frequency extraction - mode shapes

Summary of modal mass participation is listed in Table 6. **Table 6.** Modal mass participation – summary

direction direction 35% 0% 32% 0% 32% 0% 7% 0% 0% 95% 0% 0% 1% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	Mode	Frequency	×	γ.	-Z
3.8 35% 0% 4.1 32% 0% 22.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	no.	[Hz]	direction	direction	direction
4.1 32% 0% 22.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	1	3.8	32%	%0	32%
22.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	2	4.1	32%	%0	35%
23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	23	22.4	7%	%0	%0
26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	4	23.2	%0	7%	%8
29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	5	26.5	%0	95%	%0
29.3 1% 0% 34.5 10% 0% 35.5 0% 0% 36.2 0% 0%	9	29.2	%0	%0	1%
34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	7	29.3	1%	%0	%0
35.5 0% 0% 36.2 0% 0%	80	34.6	10%	%0	%0
36.2 0% 0%	6	35.5	%0	%0	88
	10	36.2	%0	%0	3%

4.3.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 26 and Figure 27. One can see that the maximum stress level reached ca. 70 MPa. Stress level satisfies required safety condition.

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Figure 26. Von-Mises stress [Paj distribution - tank (view 01)

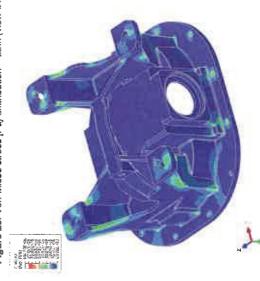


Figure 27. Von-Mises stress [Pa] distribution – tank (view 02) Displacement field is presented in Figure 23.

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Figure 28. Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=6864 Nm.
 M_x=7752 Nm.

Insulator has satisfied the maximum bending moment condition.

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CONCLUSIONS LO

The goal of the analysis was to investigate family of HV Instrument Transformers using guidelines described in IEC 62271-300. Based on performed analysis main conclusions are the following:

- seismic levels: AF5 (0.5 g) and AF3 (0.3 g). For AF5 level stresses were above yield strength of material. These concentrations can be caused by sharp edges which are that possible material imperfection were not considered in the simulation. For AF3 load scenario stresses were below yield strength of material. Bushing has satisfied Current transformer PA 123a/PA 145a. This design has been investigated for two usually eliminated in real casting process. On the other hand one must have in mind required safety factor for both load scenarios.
- design is very close to the ground level. Therefore obtained level of stress and so bending moment was relatively low. Design satisfies required safety factors for AF5 Voltage transformer - PV 123. Seismic level – AF5. Center of mass for this particular
- Combined transformer PVA 123a/PVA 145a. Seismic level AF5. Obtained stress level was below yield strength of material. Bending moment was also below ultimate value. Whole design should be considered as safe.
- Damping factor used in the analysis was equal to 2%.
- Transformer oil has been modeled as uniformly distributed additional mass.

Disclaimer

The analysis documented herein has been prepared in accordance with reasonable standards of scientific endeavor and the best knowledge of the author(s). The simulation results may depend on a variety of factors, including quality of input data applied model simplifications and chosen numerical methods.

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7 CHANGE HISTORY

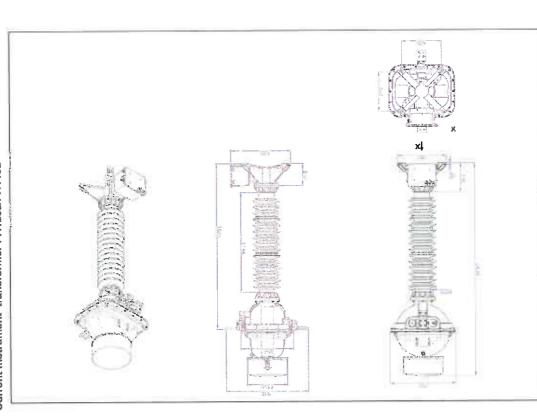
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Author(s)	Juszkiewicz Grzegorz
Revision	Rev. 1
Date	2015-05-22

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8 APPENDICES

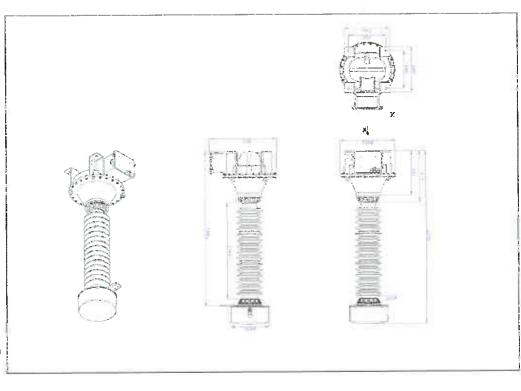
8.1 Current Instrument transformer PA123a/PA145a



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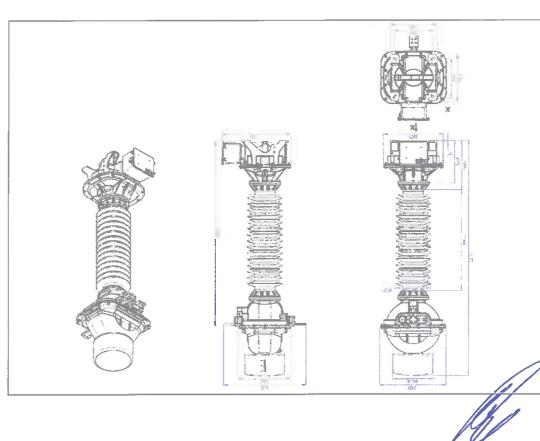
8.2 Voltage Instrument transformer PV123



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8.3 Combined Instrument transformer PVA123a /PVA145a



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Approved by:	Final /	Final Approval Date:	2015-08-17	

Electronic document

Technical report

Simulation Support Team

Case submitted by	Marcin Tamowski
Business Unit	РРНУ
Type of analysis (used tool)	ABAQUS (seismic analysis)
Description of analysis	Seismic analysis different variants of current, voltage and combined transformers (PA123a/PA145a, PV123, PVA123a/PVA 145a) according to guidelines described in IEEE 693 standard. Consideration of seismic and dead loads.

Executive summary

This report covers investigation related to seismic analysis of HV instrument transformers (PV123, PA123a /PA145a, PVA123a JPVA145a) subjected to various load scenarios. Simulation covered the following load conditions: dead load, terminal force load, seismic load (Moderate - 0.25g; High - 0.5g). Analysis showed that designs: PA123a/PA145a and PVA123a /PVA145a can withstand moderate seismic level, while PV123 can withstand high seismic load scenario.

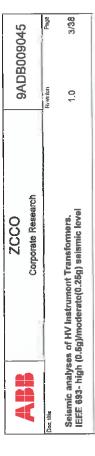


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1 INTRODUCTION

The goal of the analysis was to evaluate seismic performance of PA123aPA145a (see 8.1), PV123 (see 8.2), PVA145a/PVA123a (see 8.3) type transformers. Simulation was done using guidelines of IEEE 693 standard. For more information please see [1].

Computations concerned evaluation of stress field distribution and maximum bending moment between flange and insulator. Present report describes used simulation technique, analysis steps, loads and boundary conditions variations and summarizes obtained results.

2 SIMULATION SOFTWARE

All simulations were performed using Abaqus/CAE package. Abaqus includes FEM (finite clement method) solver, pre- and post processor and enables performing many types of multiphysics simulations: mechanical, themal, acoustic, piezoelectric, seismic, and others.

Parts and assemblies can be created in Abaqus, or they can be imported from CAD systems using native file formats. Abaqus functionality enables to define materials, interactions, loads, boundary conditions, mesh. User is also available to set up simulation parameters such as pre-processing memory. It is always possible to change all simulation settings and properties, because they're all parameterized.

Simulation results can be visualized in Abaqus postprocessor or in external software, which is able to import simulation results in Abaqus format. In postprocessor user can view all predefined field outputs, show or hide part instances, create cross-sections, make animations, automatically generate reports, diagnose model (warnings, errors). For more information about ABAQUS please see [2].

3 SIMULATION SETUP

Analysis has been made using Finite Element Method.

3.1 Simulation procedure

According to [1] analysis included three main simulation steps:

- Static load:
- Terminal load
- Gravitational load.
- Natural frequency extraction.
 - Dynamic analysis.

3.2 Simulation steps

Simulation consisted of three main simulation steps.

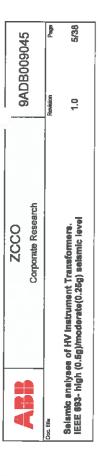
3.2.1 Natural frequency extraction

In the first simulation step natural frequency extraction was performed. The frequency extraction procedure performs eigenvalue extraction to calculate the natural frequencies and the corresponding mode shapes of a system.

The eigenvalue problem for the natural frequencies of an undamped finite element model can be described by equation (3-1):

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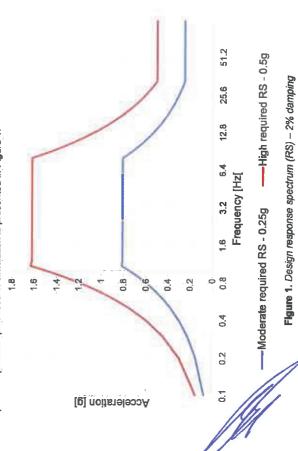


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if the base state (gravitational load); ø – eigenvector (the mode of vibration); M, N – degrees of where: M** - mass matrix (kg); K** - stiffness matrix (Pa), which includes initial stiffness effects freedom (-). Based on specification [1] one can assume that most critical frequency modes are in range of 0-35 Hz.

3.2.2 Response spectrum analysis

The response spectrum method is a convenient way of describing shock motion in terms of the maximum response of a single degree of freedom (1-DOF) oscillator of arbitrary natural period and damping ratio. Each data point of the response spectrum curve represents the peak response from a time history analysis of the earthquake applied to 1-DOF oscillator system. The ordinate defines the natural period at which the oscillator is tuned. Repeating the procedure for a great many frequencies defines a continuous curve for an assumed level of damping. A spectral response analysis estimates the maximum displacement of the structure during design' shock load without recourse of direct integration. Finite element implementation of the response spectrum calculate the response of each mode independent, and then combine the scaled response one of a number of established combination rules, to give an estimate of peak response. Spectrum plot used in simulation is presented in Figure 1.



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3.3 Loads and boundary conditions

3.3.1 Loads

The following static load scenarios have been considered

- Gravitational load, g=9.81 m/s².
- Terminal operating load. These load conditions were specified according to [3] (Table 7 Static withstand test loads). For considered voltage-current range static withstand force (Load class II) should be equal to 3000 N. With respect to 'NOTE 1 The sum of the loads acting in routinely operating conditions should not exceed 50% of the specified withstand test load, maximum operating force is equal to 1500 N.

Seismic load have been predefined according design response spectrum described in the standard [1] - ground acceleration reference - Moderate/High Required Response Spectrum. Main input parameters were the following:

- XYZ base motion with vertical load (Y) equal to 80% of horizontal direction.
 - Damping ratio 2%.

As the final outcome from the analysis static loads were combined with the seismic load.

3.3.2 Boundary conditions

Simulation assumes that the apparatus will be mounted on ground. During analysis model has been fixed at the bottom face of used test frame. General view of static loads and boundary conditions is presented in Figure 2. Area highlighted by red has been constrained (Y-rotation released). Base of the bottom tank has been supported in Y direction (as it is placed on the ground). Described boundary conditions have been used for all analyzed models.

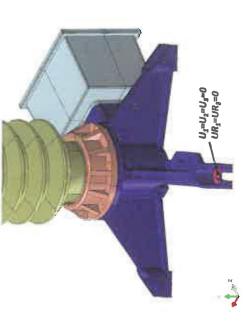


Figure 2. Boundary conditions – general view

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3.4 Acceptance criteria

With respect to the standard [1] the following acceptance criteria were used

- Scismic load should be combined with dead load and possible normal operating loads.
 - The maximum allowable bending moment shall not exceed 6.65 kNm (50% of ultimate load/stress)
- Aluminum components shall not exceed 73 MPa (minimum ultimate tensile strength divided by 2.2 safety factor).

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3.5 Current transformer - PA 123a/PA 145a

This chapter gathers details related to FE model of current transformer PA 123a/PA 145a.

3.5.1 Model simplifications

For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation process. Details of the geometry and center of mass can be found in Figure 3. Red point indicates center of mass of the transformer.

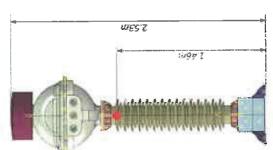


Figure 3. Simplified representation of the PA 123a/PA 145a transformer

Concrete between fange and ceramic insulator has been introduced using connector element with predefined rotational stiffness.

Bacause of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mesh.

3.6 Material and mass information

Component naming is presented in Figure 4.

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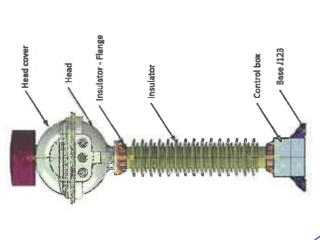


Figure 4. Assembly - component naming

Material and mass information is listed in Table 1

Table 1. Mass and material data

old Ultimate strength [MPa]	160	0	30 220	0 160	160			160
g's Yield ilus strength a] [MPa]		140	00 180	08 00			L	_
young's modulus	5 69000	100000	90000	9 69000	00069	0	9	
Mass [kg]	16.5	17 ה	3.5	22.5	200 20	150	5.5	
Material name	EN-AC 43200 (grade F)	Porcelain	EN-AC 43200 (grade T6)	EN-AC 43200 (grade F)	EN-AC 43200 (grade F)		EN-AC 43200	(grade F)
Component	Base J123	Insulator	Insulator - Flange	Head	Head cover	Coll	Control box	
Drawing number	2GKA310015	2GKA310404		2GKA414718	2GKK314089		2GKK311093R	

The ultimate bending moment for ceramic insulator is equal to Ms=13.3 kNm.

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3.7 Finite element (FE) model

General view of FE model is presented in Figure 5.

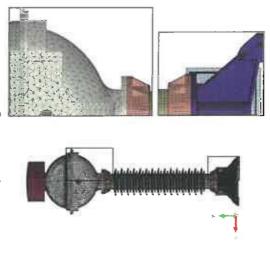


Figure 5. FE model - general view

Mesh statistics were the following:

- Total number of nodes: 533430
- Total number of elements: 242866
- 210555 quadratic tetrahedral elements of type C3D10
- 31050 quadratic hexahedral elements of type C3D20R 1243 quadratic quadrilateral elements of type S8R 18 quadratic triangular elements of type STRI65

Description of the coordinate system.

- X 1^{et} horizontal axis.
 Z 2rd horizontal axis.
 Y vertical axis.

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3.8 Voltage transformer - PV 123

This chapter gathers details related to FE model of voltage transformer PV 123.

3.8.1 Model simplifications

For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation process. Details of the geometry and center of mass can be found in Figure 6. Red point indicates center of mass of the transformer.

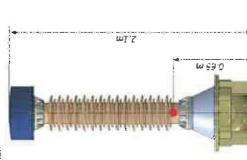


Figure 6. Simplified representation of the PV 123 transformer

Concrete between flange and ceramic insulator has been introduced using connector element with prodefined rotational stiffness.

Because of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mosh.

3.9 Material and mass information

Component naming is presented in Figure 7.

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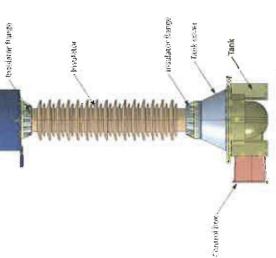


Figure 7. Assembly - component naming

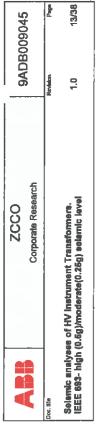
Material and mass information is listed in Table 2.

Table 2. Mass and material data

Ultimato strenght [MPa]	160	370	160		220		160	
Yield stronght [MPa]	80	300	80	140	180		90	
Young's modulus [MPa]	00069	206000	00069	100000	00069		00069	
Mass	25	22.5	15.5	71	3.5	30	5.5	60
Material	EN-AC 43200 (grade F)	Steel	EN-AC 43200 (grade F)	Porcelain	EN-AC 43200 (grade T6)		EN-AC 43200 (grade F)	
Component	Bottom tank	Core	Tank cover	Insulator	Insulator flange	Coil	Control box	liO
Drawing	2GKK310150P	2GKK310147P	2GKV314005	2GKA310404			2GKK311093R	

The ultimate bending moment for caramic insulator is equal to Ma=13.3 kNm.

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3.10 Finite element (FE) model

General view of FE model is presented in Figure 8.

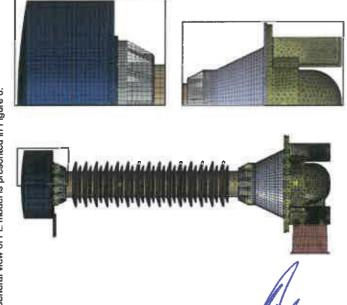


Figure 8. FE model - general view

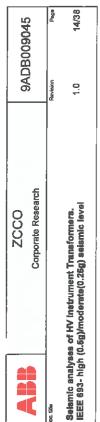
Mesh statistics were the following:

- Total number of nodes: 608507
- Total number of elements: 236033
- 4606 quadratic quadrilateral elements of type S8R 0
 - 58 quadratic triangular elements of type STRI65
- 58965 quadratic hexahedral elements of type C3D20R 0
 - 163827 quadratic tetrahedral elements of type C3D10 8577 linear hexahedral elements of type C3D8R

Description of the coordinate system.

- X 1st horizontal axis.
 - Z 2^{rrd} horizontal axis. Y vertical axis.

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3.11 Combined transformer -- PVA123a /PVA145a

of combined transformer model chapter gathers details related to FE PVA123a /PVA145a.

3.11.1 Model simplifications

For simulation requirements some areas of the model were simplified. Small geometrical features like casting rounding, chamfers were removed in order to improve mesh generation process. Details of the geometry and center of mass can be found in Figure 9. Red point indicates center of mass of the transformer.

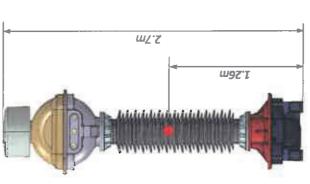


Figure 9. Simplified representation of the PVA123a /PVA145a transformer

Concrete between flange and ceramic insulator has been introduced using connector element with predefined rotational stiffness. Because of the simulation method (dynamics based on modal analysis) components were connected together using bonded connection or conformal mesh.

3.12 Material and mass Information

Component naming is presented in Figure 10

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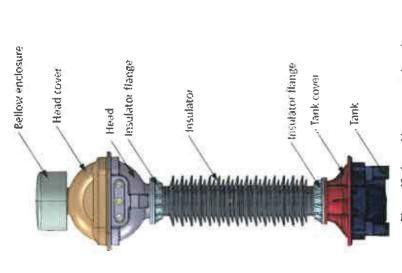


Figure 10. Assembly - component naming Material and mass information is listed in Table 3.

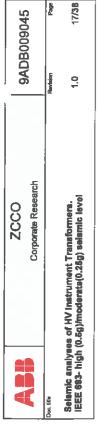
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Table 3. Mass and material data

Drawing number	Component	Material	Mass	Young's modulus [MPa]	Yield strength [MPa]	Ultimate strength [MPa]
2GKK314076	Tank	EN-AC 43200 (grade F)	25	69000	80	160
2GKK314084	Core	leetS	33.8	208000	300	370
2GKK314075	Tank cover	EN-AC 43200 (grade F)	18	00069	80	160
STEAR PROPERTY	Insulator	Porcelain	131	100000	140	
Cakha Istoria	Insulator flange	EN-AC 43200 (grade T6)	5	69000	180	220
2GKK314080	Head	EN-AC 43200 (grade F)	23.5	00069	80	160
2GKK314089	Head cover PVA-PA123A /PA145A-145	EN-AC 43200 (grade F)	23	00069	80	160
2GKK310902	Bellow	Stainless steel	ស	190000	200	200
2GKK310014 ³	Below endosure	EN AC 43200 (grade F)	7	00069	80	160
25	μα авиμολ		30	50	E 50	į.
2.9	Current coil		150	-	- 12	,
2GKK310802	Epoxy Insulator	,	2.5		*	,
2GKK311093R	Control box	EN-AC 43200 (grade F)	ري ئ	00069	80	160
D	Oil		150	,	55	, 1

The ultimate bending moment for ceramic insulator is equal to Me=13.3 kNm.

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3.13 Finite element (FE) model

General view of FE model is presented in Figure 11.

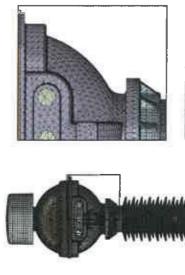




Figure 11. FE model - general view

Mesh statistics were the following:

- Total number of nodes: 1009580
- Total number of elements: 463007
- 0 0
- 58507 quadratic hexahedral elements of type C3D20R 300489 quadratic tetrahedral elements of type C3D10 2519 linear quadrilateral elements of type S4R
 - 0
 - 97 linear triangular elements of type S3
- 9900 linear hexahedral elements of type C3D8R
- 90967 quadratic tetrahedral elements of type C3D10M 528 quadratic wedge elements of type C3D15

Description of the coordinate system.

- X 1st horizontal axis.
 - $Z 2^{nd}$ horizontal axis. Y vertical axis.
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SIMULATION RESULTS

This chapter gathers simulation results evaluated in the analysis. Obtained outcome incudes static and the seismic load.

4.1 PA123a /PA145a

4.1.1 Natural frequency extraction

which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between $6.9-8.2\,\mathrm{Hz}$. Effective modal mass plot is presented Figure 12. Bubble size indicated amount of mass

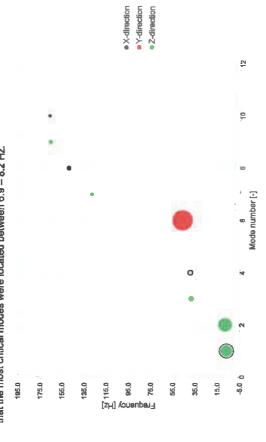


Figure 12. Natural frequency extraction - effective modal mass Effective modes and associated with the shapes are presented in Figure 13.

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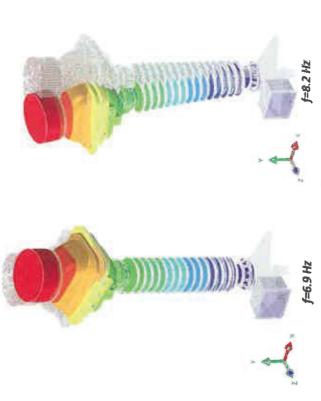


Figure 13. Natural frequency extraction - mode shapes

Summary of modal mass participation is listed in Table 4.

Table 4. Modal mass participation - summary

				_	_		_			
Z-direction	35%	40%	6%	7%	0%	0%	2%	0%	4%	%0
Y-direction	%0	9%0	%0	%0	%0	89%	%0	%0	%0	%0
X-direction	40%	34%	2%	%9	%0	%0	%0	4%	%0	2%
Frequency [Hz]	6.9	8.2	38.9	39.7	46.9	98.7	129.2	150.3	166.6	167.4
Mode no	1	2	e	4	2	9	7	60	6	10

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4.1.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 14 and Figure 15. Stress scale has been limited to 73 MPa as the maximum allowable stress lovel.

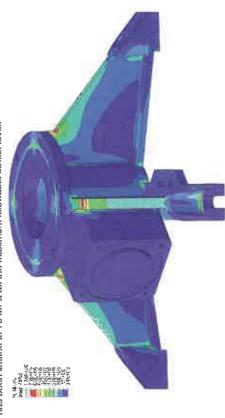


Figure 14. Von-Mises stress (Paj distribution - tank (view 01)

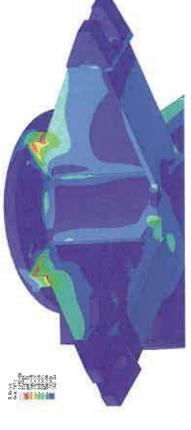


Figure 15. Von-Mises stress [Pa] distribution - tank (view 02) Displacement field is presented in Figure 16.

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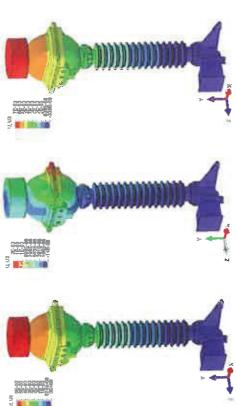


Figure 16. Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=7961 Nm.
 - M_z=7992 Nm.

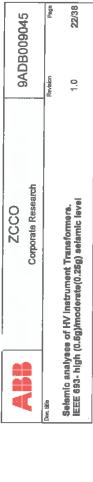
Insulator has not satisfied the maximum bending moment condition. One can observe that stresses evaluated at the base are slightly above allowable value. Therefore small yielding may occur. One must have in mind that analysis did not cover possible casting imperfections.

Design has been verified according to Moderate selsmic level (0.25 g Zero Period Acceleration). Stress distribution for such load scenario is presented from Figure 17 to Figure 18. Obtained stress level was below allowable level.

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=4816 Nm.
 - M_z=4821 Nm.

Insulator has satisfied allowable bending moment condition.



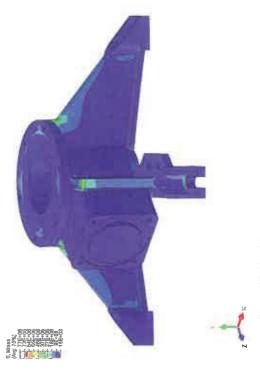


Figure 17. Von-Mises stress [Pa] distribution (AF3) - tank (view 01)



Figure 18. Von-Mises stress [Paj distribution (AF3) - tank (view 02)

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4.2 PV 123

4.2.1 Natural frequency extraction

Effective modal mass plot is presented Figure 19. Bubble size indicated amount of mass which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between 24.7--25.3 Hz.

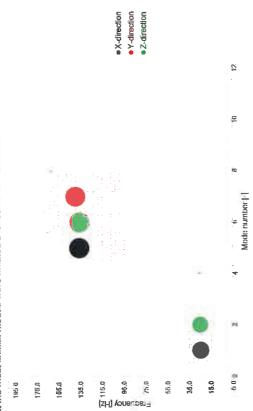
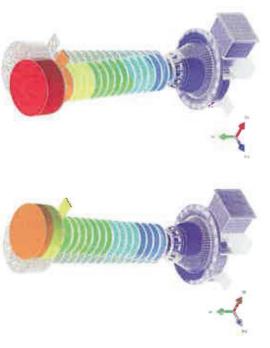


Figure 19. Natural frequency extraction – effective modal mass Effective modes and associated with the shapes are presented in Figure 20.

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f=24.7 Hz

f=25.3 Hz

Figure 20. Natural frequency extraction -- mode shapes

Summary of modal mass participation is listed in Table 5.

Table 5. Modal mass participation - summary

		-		_	_	_	-	-	_		_
2	direction	%0	24%	%0	%0	%0	36%	%0	%0	%0	%0
'	direction	0%	%0	%0	%0	%0	%0	34%	%0	%0	%0
×	direction	24%	%0	%0	%0	37%	%0	%0	%0	%0	%0
Frequency	[Hz]	24.7	25.2	25.4	26.5	135.5	139.3	161.3	162.4	175.8	176.2
Mode	no.	7	2	m	4	2	9	7	90	6	10

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4.2.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 21 and Figure 22. As described in chapter 3.8.1 location of center of mass is close to the ground level, therefore expected bending moment and so the strass was low. One can see that the maximum stress level reached ca. 24 MPa and it was located at vicinity of coupling constraint. Stress level satisfies required safety condition.



Figure 21. Von-Mises stress [Pa] distribution - tank (view 01)

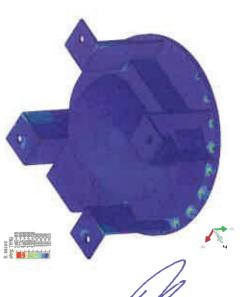


Figure 22. Von-Mises stress [Pa] distribution - tank (view 02)

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Displacement field is presented in Figure 23.



Figure 23. Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=2224 Nm.
 M_z=2228 Nm.

Insulator has satisfied the maximum bending moment condition.

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4.3 PVA123a /PVA145a

4.3.1 Natural frequency extraction

Effective modal mass plot is presented Figure 24. Bubble size indicated amount of mass which participates in motion at specific frequency range. Based no presented plot one can see that the most critical modes were located between 3.8–4.1 Hz.

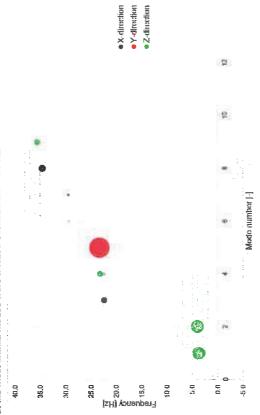


Figure 24. Natural frequency extraction – effective modal mass Effective modes and associated with the shapes are presented in Figure 25.

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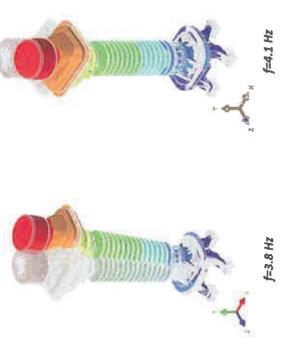


Figure 25. Natural frequency extraction – mode shapes Summary of modal mass participation is listed in Table 6.

Table 6. Modal mass participation – summary

no. [Hz] direction direction direction direction direction direction direction direction 1 3.8 35% 0% 32% 2 4.1 32% 0% 35% 3 22.4 7% 0% 0% 4 23.2 0% 2% 8% 5 26.5 0% 95% 0% 6 29.2 0% 0% 1% 7 29.3 1% 0% 0% 8 34.6 10% 0% 8% 9 35.5 0% 0% 8% 10 36.2 0% 0% 3%	Mode	Frequency	×	γ.	-7
3.8 35% 0% 4.1 32% 0% 22.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	.00	[Hz]	direction	direction	direction
4.1 32% 0% 22.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	17	80° FF	32%	%0	32%
23.4 7% 0% 23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	2	4.1	32%	0%	35%
23.2 0% 2% 26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	ന	22.4		%0	%D
26.5 0% 95% 29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	4	23.2	%0	7%	%8
29.2 0% 0% 29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	5	26.5	%0	95%	%0
29.3 1% 0% 34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	9	29.2	%0	%0	1%
34.6 10% 0% 35.5 0% 0% 36.2 0% 0%	7	29.3	1%	%0	%0
35.5 0% 0% 36.2 0% 0%	æ	34.6	10%	%0	%0
36.2 0% 0%	G	35.5	%0	0%	%8
	10	36.2	%0	%0	3%

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4.3.2 Dynamic analysis

Stress distribution for tank component is presented in Figure 26 and Figure 27. One can see that the maximum stress was above 73 MPa allowable limit.

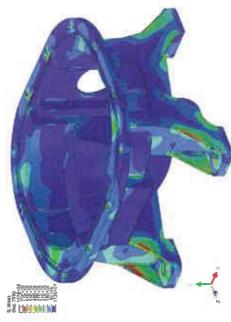


Figure 26. Von-Mises stress [Pa] distribution - tank (view 01)

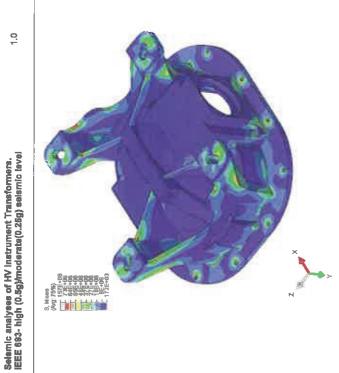


Figure 27. Von-Mises stress [Paj distribution – tank (view 02) Displacement field is presented in Figure 28.



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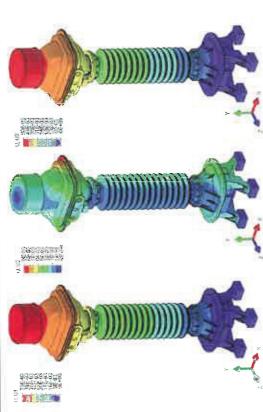


Figure 28.Displacement [m] field - distribution

The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- Mx=10451 Nm.
 Mx=8515 Nm.

Insulator has not satisfied the maximum bending moment condition. Stress distribution for moderate seismic level is presented in Figure 29 and Figure 30.

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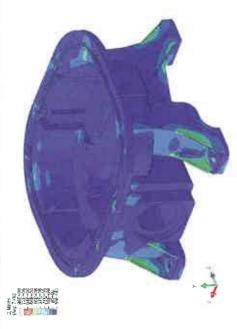


Figure 29. Von-Mises strass [Pa] distribution - tank (view 01)



Figure 30. Von-Mises stress [Pa] distribution -- tank (view 02)

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The maximum bending moment evaluated at the interface between flange and insulator was equal to:

- M_x=6335 Nm.
 M_z=4080 Nm.

The maximum bending moment satisfies allowable value.

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5 CONCLUSIONS

The goal of the analysis was to investigate family of HV Instrument Transformers using guidelines described in IEEE 693 standard. Summary of satisfied criteria is presented in Table 7. Column 'IEEE 693' lists allowable seismic level for selected design. Columns (2, 3) list seismic level where obtained stresses/bending moment were below yield strength/ultimate bending moment.

Table 7. Summary of acceptance criteria

Design name	(1) IEEE 693	(2) Yield strength	(3) Ultimate bending load
PA123a /PA145a	MODERATE	HIGH	HIGH
PV 123	MGH	HIGH	HIGH
PVA123a/PVA145a	MODERATE	HIGH	нівн

With respect to IEEE 693 criteria main conclusions are the following:

- PA123a/PA145a withstands Moderate seismic qualification level.
- PV 123 withstands High seismic qualification level. PVA123a/PVA145a withstand Moderate seismic qualification level.

Disclaimer

The analysis documented herein has been prepared in accordance with reasonable standards of scientific endeavor and the best knowledge of the author(s).

The simulation results may depend on a variety of factors, including quality of input data, applied model simplifications and chosen numerical methods.





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6 BIBLIOGRAPHY

- ITEEE 693 IEEE Recommended Practice for Seismic Design and Substations, The Institute of Electrical and Electronics Engineers, Inc. NY 10016-5997, USA
 - ABAQUIS, ABAQUS 6.13 Documentation, DS Simulia, USA, www.simulia.com <u>s</u> <u>s</u>
- IEC 61869-1 Instrument transformers Part 1: General requirements, International standard, Edition 1.0 2007-10

7 CHANGE HISTORY

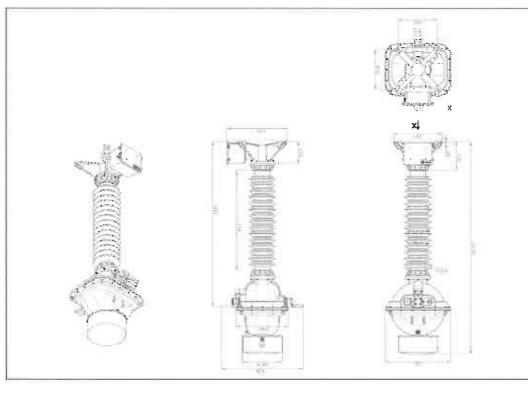
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8 APPENDICES

8.1 Current transformer PA123a /PA145a



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8.2 Voltage transformer PV123

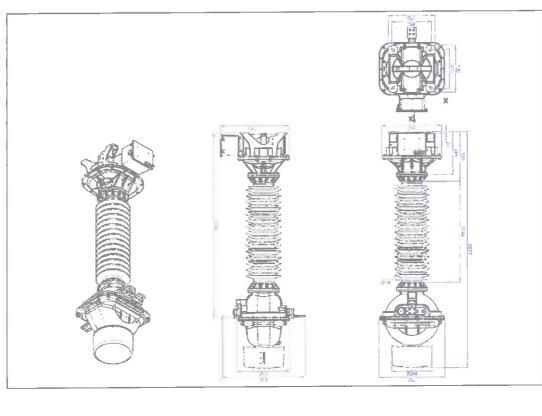
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8.3 Combined transformer PVA123a /PVA145a



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Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Reguly ** (EU) No. 453/2010

Nytro 10 XN

SAFETY DATA SHEET

No previous validation 2015-09-11 2015-09-11 Date of Issue/ Date of revision Date of previous issue Date of printing Version

SECTION 1 Identification of the substance/mixture and of the company/undertaking

1.1 Product Identifier

Insulating oil Nytro 10 XN Liquid. Product description MARPOL Annex 1 Product name Product type

1.2 Identified uses

Reason Formulation and (re)packing of substances and mixtures - industrial This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the Use as lubricant in open and closed systems - Professional Use in formulations in lubricants- Industrial Manufacture of substance - Industrial Distribution of substance - Industrial Functional Fluids - Industrial Functional Fluids - Professional Uses advised against Identified uses

1.3 Details of the supplier of the safety data sheet

Supplier/Manufacturer

Head office:

P.O. Box 10700 SE-121 29 Stockholm Nynas AB

SWEDEN

+46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) MMM, NYNAS.COM

ProductHSE@nynas.com

e-mail address of person responsible for this SDS National contact

Nynas sp. z o.o. ul. Kolberga 48D PL-44 100 Gliwice POLAND +48 32 232 74 10

National advisory body/Poison Centre 1.4 Emergency telephone number

+44 (0) 1235 239 670 Telephone number

24 hour service Hours of operation

. No previous validation 2015-09-77 Date of previous Issue Date of Issue/Date of revision

Conforms to Regulation " ") No. 1907/2006 (REACH), Annex II Nytro 10 XN

SECTION 2. Hazards identification

2.1 Classification of the substance or mixture

Product definition

Classification according to Regulation (EC) No. 1272/2008 ICLP/GHSI

Aquatic Chronic 3, H412

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended. See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms



Danger

H304 - May be fatal if swallowed and enters airways. H412 - Harmful to aquatic life with long lasting effects.

P273 - Avoid release to the environment

Precautionary statements

Prevention Response

Hazard statements

Signal word

P301 - IF SWALLOWED:

P310 - Immediately call a POISON CENTER or physician. P331 - Do NOT Induce vomiting.

Not applicable.

P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Not applicable

Annex XVII - Restrictions on the manufacture, placing on

Disposal Storage

the market and use of

certain dangerous

2.3 Other hazards

substances, mixtures and

Not applicable. Substance meets the criteria for PBT according to

Regulation (EC) No. 1907/2006, Annex XIII

Not applicable Substance meets the criteria

for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII

SECTION 3. Composition/Information on ingredients

3.2 Mixtures

			Classification	
Productfingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Distillate (petroleum), hydrotreated light pabhthenic	REACH #: 01-2119480375-34	66<	Asp. Tox. 1, H304	Ξ
2,6-di-tert-butyl-p-cresol	EC: 265-156-6 CAS: 64742-53-6 Index: 649-466-00-2 REACH #:	6.03	Aquetic Acute 1, H400	Ξ

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SECTION 3 Composition/information on ingredients

01-2119555270-46 EC: 204-881-4 CAS: 128-37-0

Aquatic Chronic 1, H410

See Section 16 for the full text of the III statements declared above. Annex I Nota L applies to the base oil(s) in this product. Nota L - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346

concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been There are no additional ingredients present which, within the current knowledge of the supplier and in the assigned a workplace exposure limit and hence require reporting in this section.

- Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII [1] Substance classified with a health or environmental hazard [2] Substance with a workplace exposure limit [3] Substance meets the criteria for PBT according to Regulatio (4) Substance meets the criteria for PBT according to Regulatio [5] Substance of equivalent concern.

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist. Eye contact

oxygen by trained personnel. Get medical attention if adverse health effects porsist breathing is irregular or if respiratory arrest occurs, provide artificial respiration or If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if or are severe. Maintain an open airway.

Wash with soap and water. Remove confaminated clothing and shoes. Handle with care and dispose of in a safe manner. Sook medical attention if skin initation, swelling or redness develops and persists.

Skin contact

Ingestion

Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop

lungs and cause damage. If verniting occurs, the head should be kept low so that Always assume that aspiration has occurred. Do not induce vomiting. Can enter vomit does not enter the lungs. Seek professional medical attention or send the casually to a hospital. Do not wait for symptoms to develop. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open allway. oosen tight clothing such as a collar, tie, belt or waistband. may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

No action shall be taken involving any parsonal risk or without suitable training. It

Protection of first-aiders

ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined Before attempting to rescue casualties, isolate area from all potential sources of

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Inhalation of oil mist or vapours at elevated temperatures may cause respiratory Eye contact may cause redness and transient pain. No known significant effects or critical hazards. May be fatal if swallowed and enters airways. Skin contact Eye contact nhalation Ingestion

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SECTION 4 First and measures

4.3 Indication of any immediate medical attention and special treatment needed

may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. No action shall be taken involving any personal risk or without suitable training. It Notes to physician

ignition including disconnecting electrical supply. Ensure adequate ventilation and Before attempting to rescue casualties, isolate area from all potential sources of cheak that a safe, broathable atmosphere is present before entry into confined

Specific treatments

Always assume that aspiration has occurred.

SECTION 5. Firefighting measures

5.1 Extinguishing media

Use dry chemical, (10)2, water spray (fog) or foam. Suitable extinguishing media

Unsuitable extinguishing media

Do not use direct water jets on the burning product, they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture

In a fire or if heated, a pressure increase will occur and the container may burst. contaminated with this material must be contained and prevented from being This substance will float and can be reignifed on surface water. Fire water discharged to any waterway, sewer or drain.

Incomplete combustion is likely to give rise to a complex mixture of airborne solid

and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

5.3 Advice for firefighters

decomposition products

Hazardous thermal

Special precautions for firefighters

equipment for fire-fighters

Special protective

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No ection shall be taken involving any personal risk or without suitable training.

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure

SECTION 6. Accidental release measures

6.1 Personal prazautions, protective equipment and emergency procedures

For non-emergency personnel

spillage. Alert emergency personnel. Except in case of small spillages, the feasibility Avoid broathing varxur or mist. Keep non-involved personnel away from the area of competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In of any actions should always he assessed and advised, if possible, by a trained, case of large spillages, alert occupants in downwind areas.

product, especially in the open air when vapours will be usually quickly disparsed, are dynamic situations, which will presumably limit the exposure to dangarous Eliminate all ignition sources if safe to do so. Spillages of limited amounts of

Note: recommended measures are based on the most likely spillage scanarios for direction and speed) may significantly influence the choice of appropriate actions. this material; however, local conditions (wind, air temperature, wave/current For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken

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SECTION 6: Accidental release measures

Small spillages: normal antistatic working clothes are usually adequate. For emergency responders

should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note: gloves made of PVA are not water-resistant, and are Large spillages: full body suit of chemically resistant and thermal resistant material not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or Respiratory protection: A half or full-face respirator with filter(s) for organic vapours situation cannot be completely assessed, or if an oxygen deficiency is possible, only be used according to the extent of spill and predictable amount of exposure. If the (and when applicable for H2S) a Self Contained Breathing Apparatus (SCBA) can SCBA's should be used

6.2 Environmental precautions

rivers or other bodies of water. If necessary dike the product with dry earth, sand or quantities. Inform the relevant authorities if the product has caused environmental Water polluting material. May be harmful to the environment if released in large pollution (sewers, waterways, soil or air). Prevent product from entering sewers, similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations.

In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific

If possible, large spillages in open waters should be contained with floating barriers spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved or other mechanical means. If this is not possible, control the spreading of the by local authorities.

6.3 Methods and material for containment and cleaning up

Large spill

Stop leak if without risk. Absorb spilled product with suitable non-combustible

materials.

materials to suitable containers for recovery or safe disposal. Note; see Section 1 for emergency contact information and Section 13 for waste disposal. See Section 8 for Information on appropriate personal protective equipment. Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces ensure adequate ventilation. Transfer collected product and other contaminated

6.4 Reference to other

Section 8 for information on appropriate personal protective equipment. See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal prote
See Section 13 for additional waste treatment information.

SECTION 7. Handling and storage

away from heat/sparks/open flames/hot surfaces. - No smoking. Use and store only Obtain special instructions before use. Hazard of slipping on spilt product. Keep consulted for any available use-specific information provided in the Exposure Scenario(s) **General information**

The information in this section contains generic advice and guidance. The list of identified Uses in Section 1 should be

outdoors or in a well-ventilated area.

Avoid release to the environment.

7.1 Precautions for safe handling

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Protective measures

SECTION 7. Handling and storage

Do not ingest. Do not breathe dustfume/gas/mist/vapours/spray. Avoid contact with eyes, skin and clothing.

Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product

Avoid release to the environment.

Nota : Sea Section 8 for information on appropriate personal protective equipment. See section 13 for waste disposal information.

Ensure that proper housekeeping measures are in place. Contaminated materials

should not be allowed to accumulate in the workplaces and should never be kept

inside the pockets. Eating, drinking and smoking should be prohibited in areas handling. Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.

where this material is handled, stored and processed. Wash hands thoroughly after

7.2 Conditions for safe

storage, including any

incompatibilities

occupational hygiene

Advice on general

design, equipment and operating procedures must comply with the relevant regional. Storage area layout, tank design, equipment and operating procedures must comply national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal with the relevant European, national or local legislation. Storage area layout, tank structure of storage tanks must be done only by properly equipped and qualified

Store separately from oxidising agents.

personnel as defined by national, local or company regulations.

containers or container linings depending on the material specification and intended stainless steel. Not sultable: Some synthetic materials may be unsuitable for Recommended materials for containers, or container linings use mild steel, use. Compatibility should be checked with the manufacturer.

unlabelled containers. Containers that have been opened must be carefully resealed flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these Keep only in the original container or in a sultable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in and kept upright to prevent leakage. Empty containers may contain harmful nazards, Store locked up. Protect from sunlight.

7.3 Specific end use(s)

Recommendations

Industrial sector specific

Not available. Not available.

SECTION 8. Exposure controls/personal protection

The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Exposure Ilmit values [Air contaminant] Product/Ingredient name Oll mist

TWA: 5 mg/m3 8 hours. Form: Inhalable fraction 2014 poz. 817) (Poland, 5/2014).

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SECTION 8: Exposure controls/personal protection

Recommended monitoring procedures

atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory If this product contains ingredients with exposure limits, personal, workplace protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the

5.4 mg/m³ Workers Local	
-------------------------	--

No PNECs available

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model PNEC Summary

Appropriate engineering 8.2 Exposure controls

Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating

Individual protection measures

before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation Wash hands, forearms and face thoroughly after handling chemical products, ocation. Wash contaminated dothing before reuse. Hygiene measures

Recommended: Safety glasses with side shields.

Eye/face protection Skin protection

Hand protection **Body** protection

4 - 8 hours (breakthrough time); nitrile rubber

Wear protective clothing if there is a risk of skin contact. Change contaminated slothes at the end of working shift.

selected based on the task heing performed and the risks involved and should be Respirator selection must be based on known or anticipated exposure levels, the Appropriate footwear and any additional skin protection measures should be approved by a specialist before handling this product Other skin protection Respiratory protection

hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirater complying with an approved standard if a Emissions from ventilation or work process equipment should be checked to risk assessment indicates this is necessary.

Environmental exposure

ensure they comply with the requirements of environmental pretextion logislation. In some cases, fume scrubbers, filtars or enginewing modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9. Physical and chemical properties

Information on basic physical and chemical properties

Appearance

Odourless/Light petroleum. Light yellow Liquid Physical state Colour Odour

Not applicable Not applicable 0.09 Odour threshold H

initial boiling point and boiling Molting point/freezing point

>250°C

Closed cup: >140°C [Pensky-Martens.] Flash point

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SECTION 9 Physical and chemical properties

Not available

Evaporation rate

Kinematic (40°C): 0.076 cm²/s (7.6 cSt) Insoluble in water. 160 Pa @ 100 °C 0.88 g/cm³ [15°C] Not available. Not available. Not available, Not available Not available >270°C >280°C × 3% DMSO extractable compounds Partition coefficient: n-octanol/ Upper/lower flammability or Decomposition temperature Auto-ignition temperature Flammability (solid, gas) for base oil substance(s) Explosive properties Oxidising properties according to IP346 Vapour pressure explosive limits Solubility(ies) Viscosity Demsity water

SECTION 10: Stability and reactivity

No specific test data related to reactivity available for this product or its ingredients. Under normal conditions of storage and use, hazardous reactions will not occur. Stable under normal conditions. 10.3 Possibility of hazardous 10.2 Chemical stribility 10.1 Reactivity reactions

Oxidising agent. 10.4 Conditions to avoid

Keep away from extreme heat and oxidizing agents. 10.5 Incompatible materials

and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds. Incomplete combustion is likely to give rise to a complex mixture of air borne solid decomposition products 10 6 Hazardous

SECTION 11 Toxicological information

Information on toxicological effects

Acute toxicity

Product/Ingredient name	Result	Species	Dose	Exposure Remarks	Remarks
Distillate (petroleum), hydrotreated light	LC50 Inhalation Dusts and mists	Rat - Male, Female	Rat - Male, >5.53 mg/l	4 hours	EMBSI 1988a (similar material)
napnurenic	LD50 Demal	Rabbit	>5000 mg/kg		API 1982 (similar
	LD50 Oral	Rat	>-5000 mg/kg	9	API 1986a (similar
2,6-di-tert-butyl-p-cresol	LD50 Dermal	Kat	>5000 mg/kg	ì	Supplier's
	LD50 Oral	Rat	>5000 mg/kg	19	Supplier's information

Conclusion/Summary

No known significant effects or critical hazards.

mitation/Corrosion

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SECTION 11 Toxicological information

Product/ingradiant name	Result	Species Score	Score	Observation Remarks	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Skin - Non-irritant to akin.	Rabbit	0 to 0,8	24 to 72 hours	24 to 72 UBTL 1984e hours (similar material)
	Eyes - Non-irritating to the	Rabbit	0.17 to 0.33	24 to 72	UBTL 1984i
2,6-di-tert-butyl-p-cresol	Eyes - Redness of the	Rabbit	0.5	Sinor -	Supplier's
	Eyes - Iris lesion	Rabbit	0	ı	Supplier's
	Eyes - Oedema of the conjunctivae	Rabbit	0.1	ı	

No known significant effects or critical hazards. No known significant effects or critical hazards. No known significant effects or critical hazards.

Respiratory Sensitisation

Eyes

Productingradient	Route of	Species	Result	Remarks
патре	exposure			
Distillate (petroleum), hydrofreated light naphthenic	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)

No known significant effects or critical hazards. No known significant effects or critical hazards.

Respiratory

Skin

No known significant effects or critical hazards. dusion/Summary

Product/ingredient	Result	Species	Dose	Exposure	xposure Remarks	
name						
Distillate (petroleum),	Negative - Dermal	Mouse -	0.22 to 0.25	78 weeks:	0.22 to 0.25 78 weeks; Doak, 1983, McKee,	
hydrotreated light		Female	Im.	Various	1989 (similar material)	
naphthenic					,	

The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.

Conclusion/Summary Reproductive toxicity

Conclusion/Summary

No known significant effects or critical hazards.

Teratogenicity

Product/Ingredient name	Result	Species	Dose	Exposure	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Negative - Dermal	Rat	0 to 2000 mg/kg mg/ kg/day		(similar material)

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SECTION 11. Toxicological information

No known significant effects or critical hazards.

Aspiration hazard

Condusion/Summary

Result
ASPIRATION HAZARD - Category 1 Distillate (petroleum), hydrotreated light naphthenic Not available. Product/Ingredient name

Information on the likely routes of exposure Potential acute health effects

Eye contact

Inhalation

Eye contact may cause redness and transient pain.

Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.

No known significant effects or critical hazards.

May be fatal if swallowed and enters airways.

Potential chronic health effects

Skin contact

Ingestion

Product/Ingredient name	Result	Species	Dose	Exposure
2,6-Di-tert-butyl-p-cresol	Chronic NOAEL Oral	Rat	25 mg/kg	28 days; 7 days per week
General	No known significant effects or critical hazards.	or critical hazards.		
Carcinogenicity	The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.	ct is based on an so ded as a carcinoge	everely hydrotreate n.	d distillate. The
Mutagenicity	No known significant effects or critical hazards.	or critical hazards.		
Teratogenicity	No known significant effects or critical hazards.	or critical hazards.		
Developmental effects	No known significant effects or critical hazards.	or critical hazards.		
Fertility effects	No known significant effects or critical hazards.	or critical hazards.		

Other information

Not available.

Specific hazard

SECTION 12. Ecological information

12.1 Toxicity

Product/ingredient name	Regult	Species	Evaluation
			EAposure
Distillate (petroleum), hydrotreated light naphthenic	Acute LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chranic NOEL 10 mg/l	c invertebrates.	21 days
2,6-Di-tert-butyl-p-cresol	Acute EC50 0.61 mg/l	Daphnia - Magna	48 hours
	Acute IC50 > 0.4 mg/l	Algae - Desmodesmus	72 hours
		Subspicatus	
	Chronic NOEC 0.318 mg/l	Daphnia - Magna	21 days
			Ц

Harmful to aquatic life with long lasting effects. Conclusion/Summary

12.2 Persistence and degradability

Productingredient name	Aquatic half-life	Photolysis	Blodegradability	
Distillate (petroleum),	,		Inherent	
hydrotreated light naphthenic				
2,6-Di-tert-butyl-p-cresol	•		Not readily	

Inherently biodegradable. Conclusion/Summary

12.3 Bioaccumulative potential

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SECTION 12. Ecological information

Product/ingredient name	LogPow	BCF	Potential
Distillate (petroleum),	2 to 6	<500	ksw
2,6-Di-tert-butyl-p-cresol	5,1	>500	high

Conclusion/Summary

The product has a potential to bioaccumulate

12.4 Mobility in soil

Mobility

High mobility in soil predicted, based on log Kow > 3.0.

12.5 Results of PBT and vPvB assessment

Not applicable.

Not applicable

Insoluble in water. Spills may form a film on water runfaces causing physical damage to organisms. Oxygen transfer could also be impaired. 12.6 Other adverse effects

SECTION 13: Disposal considerations

The information in this section contains generic advices and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s)

13.1 Waste treatment methods

Methods of disposal

safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or Where possible (e.g. in the absence of relevant contemnation), recycling of used incinerated, subject to national/local authorizations, relevant contamination limits, substance is toasible and recommended. This substance can be burned or prescribe composition limits and methods for recovery or disposal.

Hazardous waste

Yes.

European wasto ratalogue (EWC)

mineral based non-chlorinated insulating and heat transmission oils Waste designation Waste code 13 03 0/*

Packading

Methods of disposul

The generation of waste should be avoided or minimised wherever possible. Washe packeging should be recycled. Incheration or landfill should only be considered when recycling is not feasible.

SECTION 14 Transport information

International transport regulations

				1000
	ADR/RID	ADN	IMO/IMDG Classification	ICAC/IATA Classification
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	t			
14.3 Transport hazard class(es)	-			
14.4 Packing group	54	ξ	[id	92

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II

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SECTION 14: Transport information

Comment of the Party of the Par				
14.5	No.	No.	No.	No.
Environmental				
hazards				in the
Additional		ţ		14
infornation				

Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the ovent of an accident or spillage. 14.6 Special procautions for

Silo

MARPOL 73/78 and the IBC according to Annex I of 14.7 Transport in bulk

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

Not applicable. None of the components are listed. Annex XVII - Restrictions on

the manufacture, placing on the market and use of

castain dangerous

substances, mixtures and

articles

Office EU regulations

This product is not exertrelled under the Seveso Directive. Saveso Dijucriive

ntemational lists

National Inventory

All components are listed or exempted. All components are listed or exempted. All components are listed or exempted Australia Canada China All components are listed or exempted.

Japan

All components are listed or exempted All components are listed or exempted. New Zealand Malaysta

All components are listed or exempted. All components are listed or exempted Republic of Korea Philippines

All exemponents are listed or exempted All eximponents are listed or exempted. United Startes Taiwan

Complete 15.2 Chemical Safety

Assessment

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SECTION 16. Other information

Revision comments

ert = 1 Indicates information that has changed from previously issued version.

ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway

ADR = The European Agreement concerning the International Carriage of

Dangerous Goods by Road ATE = Acute Toxicity Estimate

1272/2008

CLP = Classification, Labelling and Packaging Regulation (Regulation (EC) No.

CMR = Carcinogen, Mutagen or Reproductive toxicant

CSA = Chemical Safety Assessment

CO₂ = carbon dioxide

EC50 = Half maximal effective concentration DNEL = Derived No Effect Level

EUH statement = CLP-specific Hazard statement

ATA = International Air Transport Association C50 = Half maximal inhibitory concentration

MDG = International Maritime Dangerous Goods

LC50 = Median lethal concentration

LD50 = Median lethal dose

PNEC = Predicted No Effect Concentration
PBT = Persistent, Bioaccumulative and Toxic
RID = The Regulations concerning the International Carriage of Dangerous Goods

REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals by Rail

Regulation [Regulation (EC) No. 1907/2006]

SCBA = Self-Contained Breathing Apparatus SVHC = Substances of Very High Concern

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	cation	Justification
Asp. Tox. 1, H304 Aquatic Chronic 3, H412		Calculation method Calculation method
Poland		
Full text of abbreviated H	H304 May be fatal if s	May be fatal if swallowed and enters airways.
statements	H400 Very toxic to aquatic life.	uatic life.
	H410 Very toxic to aq	Very toxic to aquatic life with long lasting effects.
		Harmful to aquatic life with long lasting effects.
Full text of classifications	Aquatic Acute 1, H400	Aquatic Acute 1, H400 ACUTE AQUATIC HAZARD - Category 1
[CLP/GHS]	Aquatic Chronic 1, H410	Aquatic Chronic 1, H410 LONG-TERM AQUATIC HAZARD - Category 1
•	Aquatic Chronic 3, H412 Asp. Tox. 1, H304	Aquatic Chronic 3, H412 LONG-TERM AQUATIC HAZARD - Category 3 Asp. Tox. 1, H304 ASPIRATION HAZARD - Category 1
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Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

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Final determination of sultability of any material is the sola responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that hese are the only hazards that exist.

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Annex to the extended Safety Data Sheet (eSDS)



Industrial

identification of the substance or mixture

Nytro 10 XN Product definition Product name

Section 1 - Title

List of use descriptors

scenario

Use in formulations in lubricants-industrial (2,6-di-tert-butyl-p-cresol) Short title of the exposure Identified use name: Use in formulations in lubricants- Industrial Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a,

Substance supplied to that use in form of: As such PROC08b, PROC09

Sector of end use: SU03, SU10

Subsequent service life relevant for that use: No. Environmental Release Catagory: ERC02 Market sector by type of chemical product PC17, PC24, PC25

Environmental contributing

Health Contributing scenarios

Covers the use of formulated lubricants within closed or contained systems including incidental exposures during material transfers, operation of machinery/engines and similar articles, equipment maintenance and disposal of wastes. Not applicable, Not applicable, Not applicable Industrial Generic exposure scenario covered by the exposure Processes and activities Additional information Industry Association Number of the ES scenario

Section 2 - Exposure controls

Product characteristics	pijos
	Melting/Freezing Point (°C): 69.8
Concentration of substance in mixture or article	≤100%
Amounts used	Annual site tonnage 110 t/a
Frequency and duration of use	Continuous release(d/a): 300
Environment factors not influenced by risk management	Local freshwater dilution factor 10 Receiving surface water flow is 18000 m³/d. Local marine water dilution factor 100
Other given operational conditions affecting environmental exposure	Not applicable.
Technical conditions and measures at process level (source) to prevent release	% Release fraction to wastewater from process (initial release prior to RMM) 0.2 % Release fraction to air from process (initial release prior to RMM) 0.01 % Release fraction to soil from process (initial release prior to RMM) 0
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	On-site wastewater treatment required. Ensure all waste water is collected and treated via a waste water treatment plant. Floors should be impervious, resistant to liquids and easy to clean.
Organisational measures to prevent/fimit release from site	Ensure operatives are trained to minimise exposures.

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. No previous validation

: 2015-09-11 Date of previous issue

Date of issue/Date of ravision

(ES Revision date)

Use in formulations in lubricants- Industrial (2,6-di-tert-butyl-Nytro 10 XN

Section 2 - Exposure controls

related to municipal sewage Conditions and measures treatment plant

related to external treatment Conditions and measures

Conditions and measures related to external recovery of waste for disposal

Size of industrial sewage treatment plant (m3/d): 2000, Removal Efficiency (total)94

No spexial measures are required. General information, See section 13 for waste disposal information

Seo section 13 for waste disposal information

Contributing scenario controlling worker exposure for 0:

Melting/Freezing Point (°C): 69.8 Product characteristics

×100% Concentration of substance in mixture or articles

solid Physical state

Exposure duration per day: 8 h (full shift). Exposure duration per year: 230 d Solid, medium dustiness Frequency and duration of

Respiratory (m³/d): 10 Human factors not influenced by risk management

The product should be handled at room temperature. conditions affecting workers Other given operational exposure

No special measures required (source) to prevent release measures at process level Technical conditions and

Handle only in a places with local exhaust ventilation (or other adequete ventiletion). Technical conditions and measures to control dispersion from source towards the worker

Ensure operatives are trained to minimise exposures Organisational measures to

prevent/limit releases,

Porsonal protection

Wear protective clothing. See Section 8 of the safety data sheet (personal protective equipment). Conditions and measures related to personal protection and hygiene dispension and expusure

Section 3 - Exposure estimation and reference to its source

Risk characterisation ratio (PEC/PNEC). <1 Exposure estimation and reference to its source - Environment: 2. Used EUSES model.(v2.1) Not available Exposure assessment Exposure estimation (environment): Website:

Exposure estimation and reference to its source - Workers: 1:

Used ECETOC TRA model (May 2010 release). (04/2010) Risk characterisation ratio DNELs <1 Exposure assessment Exposure estimation (human):

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

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culdance to DU to evaluate whether he works inside the boundaries set by the ES

Not available. Not available.

Environment

Health

Not applicable Environmen Health

Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection. See Section 8 for information on appropriate personal protective equipment.

Nytro 10 XN

Annex to the extended Safety Data Sheet (eSDS)



Professional

Identification of the substance or mixture

Nytro 10 XN Product definition Product name

Section 1 - Title

Use as lubricant in open and closed systems- Professional (2,6-di-tert-butyl-p-cresol)

Short title of the exposure scenario

List of use descriptors

dentified use name: Use as lubricant in open and closed systems - Professional Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13 Substance supplied to that use in form of: As such

Sector of end use: SU22

Subsequent service life relevant for that use: No.

Environmental Release Category: ERC08a, ERC08d, ERC09a, ERC09b Market sector by type of chemical product: PC17, PC24

Environmental contributing scenarios

Health Contributing scenarios

Not applicable Not applicable Not applicable Generic exposure scenario Industry Association Number of the ES

Covers the use of formulated lubricants in closed and open systems including transfer operations, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil. Professional covered by the exposure Processes and activities Additional information

scenario

Section 2 - Exposure controls

Product characteristics

Concentration of substance in mixture or article

Amounts used

Frequency and duration of Environment factors not

environmental exposure Other given operational conditions affecting Influenced by risk

emissions and releases to soil Technical on-site conditions and measures to reduce or (source) to prevent release measures at process level Technical conditions and limit discharges, air

On-site wastewater treatment required.

Organisational measures to preventilimit release from site

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Local freshwater dilution factor 10 Receiving surface water flow is 18000 m³/d. Local marine water dijution factor 100 Continuous release(d/a): 300 Melting/freezing point 69.8 ≤0.16 t/a (Closed system) ≤0.03 t/a open systems Annual site tonnage Not applicable 22%

% Release fraction to wastewater from process (initial release prior to RMM) 0.2 % Release fraction to air from process (initial release prior to RMM) 0.01 % Release fraction to soil from process (initial release prior to RMM) 1

Ensure all waste water is collected and treated via a waste water treatment plant.

Ensure operatives are trained to minimise exposures

17/39 Floors should be impervious, resistant to liquids and easy to clean. (ES Revision date)

Use as lubricant in open and closed systems- Professional (2, 6-di-tert-butyl-p-cresol) Nytro 10 XN

Section 2 - Exposure controls

Size of industrial sewage treatment plant (m3/d): 2000, Removal Efficiency (total) related to municipal sewage Conditions and measures

No special measures are required. See section 13 for waste disposal information. related to external treatment Conditions and measures of waste for disposal treatment plant

See section 13 for waste disposal information related to external recovery Conditions and measures

of waste

Handle only in a place with local exhaust ventilation (or other adequate ventilation). The product should be handled at room temperature. Exposure duration per day: 8 h (full shift). Exposure duration per year: 230 days Melting/Freezing Point (°C): 69.8 Vo special measures required. Lubricants (Closed system) Solid, medium dustiness Contributing scenario controlling worker exposure for 0; Respiratory m3/d: 10 solid 22% Human factors not influenced Concentration of substance conditions affecting workers (source) to prevent release Frequency and duration of measures at process level Fechnical conditions and Fechnical conditions and Other given operational measures to control dispersion from source Product characteristics in mixture or article by risk management cowards the worker Physical state exposure

Ensure operatives are trained to minimise exposures. Organisational measures to prevent/limit refeases

dispersion and exposure

Conditions and measures related to personal protection and hygiene

Wear protective clothing. See Section 8 of the safety data sheet (personal protective aduipment). Personal protection

Section 3 - Exposure estimation and reference to its source

Used ECETOC TRA model (May 2010 release). Risk characterisation ratio (PEC/PNEC): <1 Risk characterisation ratio DNELs <1 Exposure estimation and reference to its source - Environment: 2: Used EUSES model. (v2.1) Exposure estimation and reference to its source - Workers: 1: Not available Exposure assessment Exposure assessment Exposure estimation Exposure estimation (environment); (human): Nebsite:

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

(ES Revision date) Date of issue/Date of revision

Use as lubricant in open and closed systems- Professional (2, 6-di-tert-butyl-p-cresol)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment Not available.

Health Not available.

Environment Not available.
Health Wear protective gloves/protective clothing/eye protection/face protection.
Vear respiratory protection.
Site Saction 8 for information on appropriate personal protective equipment.

Nytro 10 XN

Annex to the extended Safety Data Sheet (eSDS)



Industrial
Identification of the substance or mixture
Product definition
Mixture
Product name
Nytro 10 XN

9	tosure Distribution of substance- Industrial (Other Lubricant Base Oils, IP346<3%, H304)	Identified use name: Distribution of substance - Industrial Process Category: PROC01, PROC02, PROC03, PROC04, PROC08h, PROC08h, PROC09, PROC015 Substance supplied to that use in form of: Substance Sector of end use: SU03 Subsequent service life relevant for that use: No. Environmental Release Category: ERC04, ERC06, ERC06b, ERC06c, ERC06d, ERC06d, ERC06c, ERC06d,	ributing Distribution of substance	scenarios Distribution of substance	
Section 1 - Title	Short title of the exposure scenario	List of use descriptors	Environmental contributing scenarios	Health Contributing scenarios	

 Number of the ES
 9.3.1b

 Industry Association
 Concave

 2b12
 2b12

 Connection of the control of th

Section 2 - Exposure controls

Risk from environmental exposura is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment Common practices vary across sites thus conservative process release estimates Release fraction to wastrewater from process (initial release prior to RMM) 1.0E-7 Release traction to soil from process (initial release prior to RMM) 0.00001 Release fraction to air from process (initial release prior to RMM) 1.0E-4 Substance is complex UVCB., Prodominantly hydrophobic Fraction of Regional tonnage used locally 1 Fraction of EU tonnage used in region 0.1 Local marino water dilution factor 100 Maximum daily site tennage 1.7E+4 Local freshwater dilution factor 10 Emission Days (days/year) 100 Regional use tonnage 8.5E+5 Continuous release emissions and releases to soil Technical on-site conditions and measures to reduce or Frequency and duration of (source) to prevent release measures at process level Technical conditions and Environment factors not environmental exposure Other given operational Product characteristics conditions affecting irfluenced by risk Arnounts used

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Treat air emission to provide a typical removal efficiency of 90

Risk managoment

moasures - Air

Distribution of substance-

istrial (Other Lubricant Base Oils, IP346<3%, H304)

Section 2 - Exposure controls

Nytro 10 XN

Risk management

measures - Water

Organisational measures to prevent/limit release from site related to municipal sewage Conditions and measures treatment plant

related to external treatment related to external recovery Conditions and measures Conditions and measures of waste for disposal

of waste

Treat on-site wastewater (prior to receiving water discharge) to provide the required

if discharging to domestic sewage treatment plant, provide the required onsite removal efficiency of 64.4

Do not apply industrial sludge to natural soils. Sludge should be incinerated, wastewater removal efficiency of 0

Estimated substance removal from wastewater via on-site sewage treatment94.7 contained or reclaimed.

Maximum allowable site tonnage (Mass) based on release following total wastewater Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7 treatment removal1.1E+5

Assumed on-site sewage treatment plant flow 2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Distribution of substance

Concentration of substance Product characteristics

Frequency and duration of Physical state

in mixture or article

Liquid, vapour pressure < 0.5 kPa at STP

Covers percentage substance in the product up to 100% (unless stated differently).

Covers daily exposures up to 8 hours (unless stated differently)

Operation is carried out at elevated temperature (> 20°C above ambient temperature). Assumes a good basic standard of occupational hygiene is

conditions affecting workers

Other given operational

Aspiration means the entry of a liquid substance directly into the traches and lower Aspiration hazard if swallowed

Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. respiratory tract

This property relates to the potential for low viscosity material to spread quickly into Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties the deep lung and cause severe pulmonary tissue damage.

SWALLOWED: Immediately call a POISON CENTER or physician. not induce vomiting as there is high risk of aspiration.

Contributing scenarios - Operational conditions and risk management measures

Health

No other specific measures identified General exposures (closed systems)

General exposures (open systems)

No other specific measures identified Process sampling No other specific measures identified. Laboratory activities

No other specific measures Identified.

No other specific measures identified. Bulk transfers closed systems

Bulk transfers open systems No other specific measures identified.

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Nytro 10 XN

Distribution of substance-Industrial (Other Lubricant Base Oils, IP348<2%, H304)

Section 2 - Exposure controls

Drum and small package filling No other specific measures identified.

Equipment cleaning and maintenance Drain down and flush system prior to equipment break-in or maintenance.

Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

Personal protection

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Not applicable. Website; Exposure estimation and reference to its source - Environment 2: Distribution of substance

Not available Exposure assessment

The Hydrocarbon Block Method has been used to calculate environmental exposure Exposure estimation

with the Petronisk model

Exposure estimation and reference to its source - Workers: 1: Distribution of substance

Not available

Exposure assessment

Exposure estimation

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved Guidance is based on assumed operating conditions which may not be applicable to SpERC factsheet. Scaled local assessments for EU refineries have been performed using onsite/offsite technologies, either alone or in combination, Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

The CLP hazard statement H304: May be fatal if swaltowed and enters airways (the potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vornited following ingestion. DPD risk phrase R65: Harmful: may cause Jung damage if swallowed) relates to

A DNEL (derived no effect levels) cannot be derived.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ However, implementation of risk management measures (RMMs) and operational avoid contact or incidents with the substance.

level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

likelihood of an event occuring due to the substance hazard is negligible, and the risk

There are no routine anticipated exposures by ingestion related to any supported is considered to be controlled to a level of no concern.

uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk. For any substance, classifies as H304 (R65), these measures should be

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Nyto 10 XN

Oils, IP346<3%, H304) Distribution of substance- Industrial (Other Lubricant Baso

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

communicated via the sufety data sheet by use of the following phrase: Do not ingest. if swallowed then seek immediate medical assistance.

Nytro 10 XN

Annex to the extended Safety Data Sheet (eSDS)



Industrial

Identification of the substance or mixture Nytro 10 XN Product definition Product name

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Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, Formulation & (re)packing of substances and mixtures - Industrial (Other Lubricant identified use name: Formulation and (re)packing of substances and mixtures Article catogory related to subsequent service life: Not applicable Environmental Release Category: ERC02, ESVOC SpERC 2.2.v1 Formulation and (re)packing of substances and mixtures Market sector by type of chemical product: Not applicable. PROCOBL PROC69, PROC14, PROC15 Substance supplied to that use in form of: Substance Subsequent service life relevant for that use: No. Sector of end use: SU10 Base Oils, IP346<3%] Environmental contributing Short title of the exposure List of use descriptors scenarios Scenario

Formulation and (re)packing of substances and mixtures Health Contributing scenarios

Concawo 2012 20 Generic exposure scenario Industry Association Number of the ES

Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities Industrial Processor and activities covered by the exposure Additional information

Section 2 - Exposure controls

Releases fraction to air from process (initial release prior to RMM)2.5E-3 Substance is complex UVCB. Predominantly hydrophobic Fraction of Regional tonnage used locally 1 Fraction of EU tonnage used in region 0.1 Local marine water dilution factor 100 Maximum daily site tonnage 1.0E+5 Local freshwater dilution factor 10 Emission Days (days/year)300 Regional use tonnage 8.5E+5 Annual site tonnage 3.0E+4 Continuous refease Frequency and duration of Environment factors not Other given operational Product characteristics influenced by risk Amounts used

Common practices vary across sites thus conservative process release estimates Release fraction to wastewater from process (initial release prior to RMM)5.0E-6 Riskease fraction to soil from process (initial release prior to RMM) 0.0001 Risk from environmental exposure is driven by freshwater sediment. Technical on site conditions and measures to reduce or (source) to provent release measures at process level Fechnical conditions and environmental exposure limit discharges, air conditions affecting

Provent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage freatment plant, no onsite wastewater freatment required. emissions and releases to soil

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Nytro 10 XN

Formulation & (re)pac of substances and mixtures-industrial (Other Lubricant Base Oils, IP346<3%)

Section 2 - Exposure controls

Risk management

measures - Air

Risk management measures - Water Organisational measures to prevent/limit release from site Conditions and measures

Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic related to municipal sewage Conditions and measures treatment plant

related to external treatment related to external recovery Conditions and measures of waste for disposal of waste

Treat on-site wastewater (prior to receiving water discharge) to provide the required

Treat air emission to provide a typical removal efficiency of

If discharging to domestic sewage treatment plant, provide the required onsite nemoval efficiency of69.5

Do not apply industrial sludge to natural soils. Sludge should be incinerated, wastewater removal efficiency of 0

Not applicable as there is no release to wastewater. contained or reclaimed.

Maximum allowable site tonnage (Ms.e.) based on release following total wastewater freatment plant) RMMs94.7

beatment removal5.7E+5

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or netional regulations. External recovery and recycling of waste should compty with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Formulation and (re)packing of substances and mixtures Liquid, vapour pressure < 0.5 kPa at STP Product characteristics

Liquid Concentration of substance in mixture or article

Covers percentage substance in the product up to 100% (unless stated differently).

Frequency and duration of

Covers daily exposures up to 8 hours (unless stated differently)

conditions affecting workers Other given operational

temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient

Aspiration means the entry of a liquid substance directly into the trachea and lower Aspiration hazard if swallowed. implemented

This property relates to the potential for low viscosity material to spread quickly into Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. the deep lung and cause severe pulmonary tissus damage. respiratory tract

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vorniting as there is high risk of aspiration

IF SWALLOWED: Immediately call a POISON CENTER or physician.

Contributing scenarios - Operational conditions and risk management measures

No other specific measures identified. General exposures (closed systems)

No other specific measures identified. General exposures (open systems)

Batch processes at elevated temperatures No other specific measures identified.

No other specific measures identified. Use in contained batch processes

No other specific measures identified. Process sampling

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Nytro 10 XN

Formulation & (re)packing of substances and mixtures-industrial (Other Lubricant Base Oils, IP346<3%)

Section 2 - Exposure controls

No other specific measures identified. Bulk transfers Dedicated facility Laboratory activities

No other specific measures Identified

No other specific measures identified. Mixing operations (open systems)

Fransfer from/pouring from containers Manual Non-dedicated facility

No other specific measures identified.

Drum/batch transfers Dedicated facility No other specific measures identified. Production of preparation or articles by tabletting, compression, extrusion or pelletisation

No other specific measures identified,

No other specific measures identified. Drum and small package filling

Equipment deaning and maintenance Drain down and flush system prior to equipment break-in or maintsnance.

Store substance within a closed system.

Conditions and measures related to personal protection and hygiene Personal protection

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Not applicable.

Exposure estimation and reference to its source - Environment: 2: Formulation and (re)packing of substances and Not available Exposure assessment mixtures

(environment):

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Exposure estimation

reference to its source - Workers: 1: Formulation and (re)packing of substances and mixtures Not available Exposure estimation and Exposure assessment

(human);

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. Exposure estimation

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved combination. Further details on scaling and control technologies are provided in SpERC factsheet. Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Sria-Spacific. Guidance is based on assumed operating conditions which may not be applicable to using onsite/offsite technologies, either alone or in combination. Required removal all sites; thus, acaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in Production" worksheet.

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Nytro 10 XN

Formulation & (re)packing of substances and mixtures-Industrial (Other Lubricant Base Oils, IP346<3%)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

-lealth

The CLP hazard statement H304: May be fatal if swallowed and enters alreadys (the DPD risk phrase R65: Harmful; may cause lung damage if swallowed) relates to potential for aspiration , a non-quantifiable hazand determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ A DNEL (derived no effect levels) cannot be derived

However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health avoid contact or incidents with the substance. hazard presented by the substance.

likelihood of an ewent occurring due to the substance hazard is negligible, and the risk exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the is considered to be controlled to a level of no concern.

communicated via the safety data sheet by use of the following phrase. Do not ingest. physico-chemical properties of the substance. The risk can therefore be controlled by uses of the substance. The risk arising from aspiration hazard is solely related to the There are no routine anticipated exposures by ingestion related to any supported For any substance, classifies as H304 (R65), those measures should be implementing risk management measures tailored to this specific risk If swallowed then seek immediate medical assistance.

Nytro 10 XN

Annex to the extended Safoty Data Sheet (eSDS)

Industrial

Manufacturer of substance Industrial (Other Lubricant Base Oils, IP346<3%, H304) Process Category: PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, Article category related to subsequent service life: Not applicable Subsequent service life relevant for that use: No. Environmental Release Category: ERC04, ESVOC SpERC 1.1.v1 Market sector by type of chemical product: Not applicable identified use name: Manufacture of substance - Industrial Substance supplied to that use in form of: Substance Sector of end use: SU03, SU08, SU09 Manufacture of substance Manufacture of substance dentification of the substance or mixture Nytro 10 XN Hexalth Contributing scenarios Environmental contributing Short title of the exposure Section 1 - Title List of use descriptors Product definition Product name scenarios

Section 2 - Exposure controls

Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintanance and loading (including mainte vessel/barge, road/rail car and bulk

container) Industrial

Additional information

Сопсаме 2012

Generic exposure scenario

Industry Association

Number of the ES

Processes and activities covered by the exposure

Release fraction to wastowater from process (initial release prior to RMM) 1.0e-5 Release fraction to an from process (initial release prior to RMM) 1.0e-4 Substanta is complex UVCB.. Predominantly hydrophobic Fraction of Regional tonnage used locally 1 Fraction of EU tonnage used in region0.1 Local marine water dilution factor 100 Maximum daily site tormage 2.0E+6 Local freshwater dilution factor 10 Emission Days (days/year)300 Regional use tonnage 8.5E+5 Annual site tonnage 6 0E+5 Continuous release limit discharges, air emissions and releases to soil Technical on site conditions (source) to prevent release and measures to reduce or Frequency and duration of measures at process level lechnical conditions and Environment factors not environmental exposure Product characteristics Other given operational conditions affecting influenced by risk Amounts used

Common practices vary across sites thus conservative process release estimates Release fraction to soil from process (initial release prior to RMM) 0.000 Risk from environmental exposure is driven by freshwater sediment.

Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment

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'ustrial (Other Lubricant Base Oils, IP346<3%, H304) Manufacturer of substance

Nytro 10 XN

Section 2 - Exposure controls

Risk management measures - Air

Risk management measures - Water Organisational measures to prevent/limit release from site Conditions and measures

related to municipal sewage

treatment plant

related to external treatment Conditions and measures

related to external recovery Conditions and measures of waste for disposal of waste

Treat air emission to provide a typical removal efficiency of 90

Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 84.8

If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0

Estimated substance removal from wastewater via on-site sewage treatment94.7 Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Maximum allowable site tonnage (Ms...) based on release following total wastewater Fotal efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7

treatment removal5.7E+6

Assumed on-site sewage treatment plant flow 10000

During manufacturing, no waste of the substance is generated.

During manufacturing, no waste of the substance is generated

Contributing scenario controlling worker exposure for 0: Manufacture of substance

Concentration of substance Product characteristics

in mixture or article

Physical state

Covers percentage substance in the product up to 100% (unless stated differently). Liquid, vapour pressure < 0.5 kPa at STP

Liquid With potential for aerosol generation

Covers daily exposures up to 8 hours (unless stated differently)

temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient

conditions affecting workers

exposure

Other given operational

Frequency and duration of

Aspiration hazard if swallowed. implemented

Aspiration means the entry of a liquid substance directly into the trachea and lower Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death respiratory tract,

This property relates to the potential for low viscosity material to spread quickly into Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. the deep lung and cause severe pulmonary tissue damage.

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do not induce vorniting as there is high risk of aspiration

Health

Contributing scenarios - Operational conditions and risk management measures

No other specific measures identified General exposures (closed systems)

No other specific measures identified General exposures (open systems)

No other specific measures identified Process sampling

No other specific measures identified.

Laboratory activities

No other specific measures identified. Bulk transfers (Closed system)

Bulk transfers open systems

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Nytro 10 XN

Manufacturer of substance- Industrial (Other Lubricant Base Oils, IP348<3%, H304)

Section 2 - Exposure controls

No other specific measures identified.

Drain down and flush system prior to equipment break-in or maintenance. Equipment cleaning and maintenance

Bulk product storage Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment). Personal protection

Section 3 - Exposure estimation and reference to its source

Not applicable, Website: Exposure estimation and reference to its source - Environment: 2: Manufacture of substance

Not available Exposure assessment The Hydrocarbon Block Method has been used to calculate environmental exposure Exposure estimation

Exposure estimation and reference to its source - Workers: 1: Manufacture of substance

Not available

with the Petrorisk model.

Exposure assessment (human): The ECETOC TRA tool has been used to estimate workplace exposures unless Exposure estimation

otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved assessments for EU refineries have been performed using site-specific data and are Guidance is based on assumed operating conditions which may not be applicable to SpERC factsheet, (http://cefic.org/en/reach-for-industries-libraries.html) Scaled local The CLP hazard statement H304: May be fatal if swallowed and enters airways (the using onsite/offsite technologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in attached in PETRORISK file - "Site-Specific Production" worksheet.

potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to vomited following ingestion.

A DNEL (derived no effect levels) cannot be derived.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ avoid contact or incidents with the substance.

level of risk such that the Implementation of the chosen RMMs will ensure that the However, implementation of risk management measures (RMMs) and operational Exposures should be controlled to at least the levels that represent an acceptable conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance,

ikelihood of an event occuring due to the substance hazard is negligible, and the risk There are no routine anticipated exposures by ingestion related to any supported is considered to be controlled to a level of no concern.

physico-chemical properties of the substance. The risk can therefore be controlled by uses of the substance. The risk arising from aspiration hazard is solely related to the

implementing risk management measures tailored to this specific risk.
For any substance, classifies as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest.

Date of issue/Date of revision

29/39

^(ES Revision date)

Manufacturer of substance-Industrial (Other Lubricant Base Oils, IP346<3%, H304)

Nytro 10 XN

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set

by the ES

Predicted exposures are not expected to exceed the DN(M)EL when the risk If swallowed then seck immediate medical assistance.

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels

management measures/operational conditions outlined in section 2 are implemented.

Available hazard data do not entible the derivation of a DNEL for dermal initiant effects. Available hizzard data do not support the need for a DNEL to be established for other health effects. Risk management moasures are based on qualitative risk characterisation.

Nytro 10 XN

Annex to the extended Safety Data Sheet (eSDS)



Industrial Identification of the substance or mixture Nytro 10 XN

Product definition

Product name

Section 1 - Title

List of use descriptors

Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304) Short title of the exposure

Identified use name: Functional Fluids - Industrial PROC08b, PROC02, PROC04.

Substance supplied to that use in form of: Substance

Sector of end use: SU03

Subsequent service life relevant for that use: No.

Environmental Release Category: ERC07, Market sector by type of chemical product: Not applicable.

Article category related to subsequent service life: Not applicable.

Functional Fluids Environmental contributing Functional Fluids Health Contributing scenarios

scenarios

Use as functional fluids e.g. rable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material Concave ndustrial transfers 2012 13.9 Generic exposure scenario covered by the exposure Processes and activities Additional information Industry Association Number of the ES

Section 2 - Exposure controls

Substance is complex UVCB. Predominantly hydrophobic Fraction of Regional tonnage used locally1 Fraction of EU tonnage used in region 0.1 Local marine water dilution factor 100 Maximum daily site tonnage5.0E+2 Local freshwater dilution factor 10 Regional use tennage 1.2E+3 Emission Days (days/year)20 Annual site tonnage 1.0E+1 Continuous release Frequency and duration of Environment factors not Product characteristics influenced by risk Amounts used

Technical on site conditions and measures to reduce or (source) to prevent release measures at process lovel Textuical conditions and environmental exposure Other given operational conditions affecting

management

Common practices vary across sites thus conservative process release estimates Release fraction to wastewater from process (initial release prior to RMM)1.0E-6 Release fraction to air from process (initial release prior to RMM)5.0E-4 Release fraction to soil from process (initial release prior to RMM)0.001

emissions and releases to soil

measures - Air

If discharging to domestic sewage treatment plant, no onsite wastewater treatment Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or rocover from onsite wastewater, Risk management

Freat air emission to provide a typical removal efficiency of

^(ES Revision date)

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ustrial (Other Lubricant Base Oils, IP346<3%, H304) Jses in Functional fluids -

Nytro 10 XN

Section 2 - Exposure controls

Risk management

measures - Water

Organisational measures to prevent/limit release from site related to municipal sewage treatment plant Conditions and measures

Conditions and measures related to external treatment of waste for disposal

related to external recovery Conditions and measures of waste

Treat on-site wastewater (prior to receiving water discharge) to provide the required

If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of removal efficiency of64.4

Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed. Estimated substance removal from wastewater via on-site sewage treatment94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7

Maximum allowable site tonnage (Man) based on release following total wastewater treatment removal3,3E+3

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Covers percentage substance in the product up to 100% (unless stated differently). Contributing scenario controlling worker exposure for 0: Functional Fluids Concentration of substance Product characteristics

in mixture or article

Physical state

Liquid, vapour pressure < 0.5 kPa at STP

Liquid With potential for aerosol generation Frequency and duration of

Covers daily exposures up to 8 hours (unless stated differently)

lamperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient molemented

conditions affecting workers

exposure

Other given operational

Aspiration hazard if swallowed

Aspiration means the entry of a liquid substance directly into the traches and lower respiratory tract. Aspiration of hydrocarbon substances can result in in severe acute effects such as

This property relates to the potential for low viscosity material to spread quickly into chemical pneumonitis, varying degree of pulmonary injury or death the deep lung and cause severe pulmonary tissue damage.

Environment

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. not induce vomiting as there is high risk of asplration. 8

SWALLOWED: Immediately call a POISON CENTER or physician.

Contributing scenarios - Operational conditions and risk management measures

Health

Bulk transfers - Closed system

No other specific measures Identified.

Drum/batch transfers - Dedicated facility No other specific measures identified. Filling of articles/equipment - closed systems

No other specific measures identified.

Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified.

General exposures (closed systems)

No other specific measures identified

Restrict area of openings to equipment. Provide extract ventilation to emission General exposures (open systems) - Elevated temperature points when contact with warm (>50°C) lubricant is likely.

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Nytro 10 XN

Uses in Functional fluids - Industrial (Other Lubricant Base Oils, iP348<3%, H304)

Section 2 - Exposure controls

No other specific measures identified. Remanufacture of reject articles

Equipment cleaning and maintenance

Drain down system prior to equipment break-in or maintenance.

Store substance within a closed system.

Conditions and measures related to personal protection and hygiene Personal protection

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Not applicable.

Exposure estimation and reference to its source - Environment: 2; Functional Fluids

Not available Exposure assessment

Exposure estimation

(environment):

The Hydrocarbon Block Method has been used to calculate environmental exposure

Exposure estimation and reference to its source - Workers: 1: Functional Fluids

with the Petrorisk model

Not available Exposure assessment

(human):

The ECETOC TRA tool has been used to estimate workplace exposures unless Exposure estimation

otherwise indicated

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

management measures. Required removal efficiency for wastewater can be achieved Guidance is based on assumed operating conditions which may not be applicable to assessments for EU refineries have been performed using site-specific data and are SpERC factsheet. (http://cefic.org/en/reach-for-industries-libraries.html) Scaled local using onsite/offsite technologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the potential for aspiration, a non-quantitlable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is DPD risk phrase R65; Harmful: may cause lung damage if swallowed) relates to attached in PETRORISK file - "Site-Specific Production" worksheet. vomited following ingestion.

A DNEL (derived no effect levels) cannot be derived.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ However, implementation of risk management measures (RMMs) and operational avoid contact or incidents with the substance.

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable conditions (OCs) need to be proportional to the degree of concern for the health is considered to be controlled to a level of no concern. hazard presented by the substance.

uses of the substance. The risk anising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk. There are no routine anticipated exposures by ingestion related to any supported

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Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304)

Nytro 10 XN

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For any substance, classifies as F1304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then sock immediate medical assistance.

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.

Where other risk management measures/operational conditions are adopted, then usors should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal infaunt offects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterisation.

Nytro 10 XN

Annex to the extended Safety Data Shoot (eSDS)



Professional

Identification of the substance or mixture Product definition Product name Nytro 10 XN	ce or mixture Mixturn Nytro 10 XN
Section 1 - Title	
Short title of the exposure scenario	Uses in Functional fluids - Professional (Other Lubricant Base Oils, IP346<3%, I3304)
List of use descriptors	Identified use name: Functional Fluids - Professional Process Category: PROC01, PROC03, PROC03, PROC08a, PROC09, PROC20 Substance supplied to that use in form of: Substance Sector of end use: SU22 Subsequent sovice life relevant for that use: No. Subsequent sovice life relevant for that use: No. Environmental Release Category: ERC09a, ERC09b, ESVOC SpERC 9.13b.v1 Market sector by type of chemical product: Not applicable. Article category related to subsequent service life: Not applicable.
Environmental contributing scenarios	Functional Fluids
Health Contributing scanarios	Functional Fluids
Number of the ES Industry Association	9.38 1b Concanve 2012
Generic expusure scenario Processes and activities covered by the expusure scenario Additional information	13b Use as functional fluids e.g. cable oils, transfor oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers. Professional

Section 2 - Exposure controls

Substance is complex UVCB. Prodominantly hydrophobic Fraction of EU tonnage used in region0.1 Regional uses formages1.2E+3 Fraction of Regional formage used locally1 Annual site tonnage 0.0E-1 Modinum daily site tonnages.	Continuous ralense Emission Days (days/year)365	Local freshwater dilution factor 10 Local marine water dilution factor 100	Release fraction to air from process (initial release prior to RMM)0.05 Release fraction to wastewater from process (initial release prior to RMM)0.025 Release fraction to soil from process (initial release prior to RMM)0.025	Common practices vary across sites thus conservative process roleans astimates used.	Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Product characteristics Amounts used	Frequency and duration of use	Environment factors not influenced by risk management	Other given operational conditions affecting environmental exposure	Technical conditions and measures at process level (source) to prevent release	Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil

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Treat air emission to provide a typical removal officiency of N/A

Risk management measures - Air

vofessional (Other Lubricant Base Oils, IP346<3%, H304) Jses in Functional fluid Nytro 10 XN

Section 2 - Exposure controls

Risk management

measures - Water

prevent/limit release from site Organisational measures to related to municipal sewage treatment plant Conditions and measures

related to external treatment Conditions and measures of waste for disposal

related to external recovery Conditions and measures

Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 64.9

If discharging to domestic sewage treatment plant, provide the required onsite

Do not apply industrial sludge to natural soils. Sludge should be incinerated, wastewater removal afficiency of

Estimated substance removal from wastewater via on-site sewage treatment94.7 contained or reclaimed.

Maximum allowable site tonnage (Mass) based on release following total wastewater Total efficiency of removal from wastewater after on-site and off-site (domestic reatment plant) RMMs94.7

treatment removal1.1E+1

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scanario controlling worker exposure for 0: Functional Fluids

Concentration of substance Product characteristics

in mixture or article

Physical state

Covers percentage substance in the product up to 100% (unless stated differently). Liquid, vapour pressure < 0.5 kPa at STP

Liquid With potential for aerosol generation

Covers daily exposures up to 8 hours (unless stated differently)

temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient

Asolration hazard if swallowed implemented

conditions affecting workers

exposure

Other given operational

Frequency and duration of

Aspiration means the entry of a liquid substance directly into the traches and lower Aspiration of hydrocarbon substances can result in in severe acute effects such as

This property relates to the potential for low viscosity material to spread quickly into chemical pneumonitis, varying degree of pulmonary injury or death.

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. the deep lung and cause severe pulmonary tissue damage. Do not Induce vomiting as there is high risk of aspiration.

SWALLOWED: Immediately call a POISON CENTER or physician.

Contributing scenarios - Operational conditions and risk management measures

Health

No other specific measures identified. Bulk transfers - Closed system

Drum/batch transfers - Dedicated facility No other specific measures identified. Filling of articles/equipment - closed systems No other specific measures identified. Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified

No other specific measures identified General exposures (closed systems)

Restrict area of openings to equipment. Provide extract ventilation to emission General exposures (open systems) - Elevated temperature points when contact with warm (>50°C) lubricant is likely. 37/39 ^(ES Revision date) Date of issue/Date of revision

Nytro 10 XN

Uses in Functional fluids - Professional (Other Lubricant Base Oils, IP346-234, H304)

Section 2 - Exposure controls

Remanufacture of reject articles

No other specific measures identified.

Equipment cleaning and maintenance

Drain down system prior to equipment break-in or maintenance. Storage

Store substance within a closed system,

Conditions and measures related to personal protection and hygiene

Personal protection

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

3 - Exposure estimation and reference to its source Section

Not applicable. Website:

Exposure estimation and reference to its source - Environment: 2: Functional Fluids

Not available,

Exposure assessment

The Hydrocarbon Block Method has been used to calculate environmental exposure Exposure estimation

with the Petrorisk model

Exposure estimation and reference to its source - Workers: 1: Functional Fluids

Not available Exposure assessment Exposure estimation

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved SpERC (actsheet, (http://cefic.org/en/reach-for-industries-libraries.html) Scaled local assessments for EU refineries have been performed using site-specific data and are Guidance is based on assumed operating conditions which may not be applicable to using onsite/offsite technologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or attached in PETRORISK file - "Site-Specific Production" worksheet

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to

vomited following ingestion.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ A DNEL (derived no effect levels) cannot be derived. avoid contact or incidents with the substance.

However, imptementation of risk management measures (RMMs) and operational

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

physico-chemical properties of the substance. The risk can therefore be controlled by uses of the substance. The risk arising from aspiration hazard is solely related to the There are no routine anticipated exposures by ingestion related to any supported implementing risk management measures tailored to this specific risk. is considered to be controlled to a level of no concern.

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Nytro 10 XN
Uses in Functional fluids - Professional (Other Lubricant Base Oils, IP346<3%, H304)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For any substance, classifies as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then scek immediate medical assistance.

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hizzard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management mensures are bassed on qualitative risk characterisation.

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Regu' 7 (EU) No. 453/2010

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SAFETY DATA SHEET

No previous validation 2015-09-17 2015-09-17 Date of issue/ Date of revision Date of previous issue Date of printing Version

SECTION 1 Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Insulating oil Nytro Libra Liquid. Product description MARPOL Annex 1 Product name Product type

1.2 Identified uses

Identified uses

Formulation and (re)packing of substances and mixtures - Industrial Manufacture of substance - Industrial Distribution of substance - Industrial

Functional Fluids - Professional Functional Fluids - Industrial

This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the Uses advised against

Reason

Head office: Supplier/Manufacturer

1.3 Details of the supplier of the safety data sheet

Nynas AB P.O. Box 10700 SE-121 29 Stockholm

+46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) ими.пупав.соп SWEDEN

ProductHSE@nynas.com e-mail address of person responsible for this SDS

National contact

Nynas sp. z o.o. ul. Kolberga 48D PL-44 100 Gliwice POLAND

1.4 Emergency telephone number

National advisory body/Poison Centre

+44 (0) 1235 239 670 24 hour service Telephone number s of operation

Version :1 : No previous validation : 2015-09-17 Date of previous issue Date of issue/Date of revision

Conforms to Regulatior 3) No. 1907/2006 (REACH), Annex II

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SECTION 2. Hazards identification

2.1 Classification of the substance or mixture

Product definition

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Asp. Tox. 1, H304

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended,

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms

Danger

Hazard statements Signal word

H304 - May be fatal if swallowed and enters airways.

Precautionary statements Prevention

Response

Storage Disposal

P301 + P310 + P331 - IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting Not applicable.

P405 - Store locked up.

P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Not applicable,

Annex XVII - Restrictions on the manufacture, placing on substances, mixtures and the market and use of certain dangerous

2.3 Other hazards

Not applicable. Substance meets the criteria for PBT according to

Regulation (EC) No. 1907/2006, Annex XIII

Not applicable. Substance meets the criteria for vPvB according to

1907/2006, Annex XIII Regulation (EC) No.

SECTION 3. Composition/Information on ingredients

3.2 Mixtures

Product/ingredient name	Identifiers	%	Classification Regulation (EC) No. 1272/2008 [CLP]	Туре
Distillate (petroleum), hydrotraethed light naphthenic	REACH#: 01-2119480375-34	60 - 70	50 - 70 Asp. Tox. 1, H304	[1]
Distillate (petroleum), hydrotreated light paraffinic	EC: 285-156-6 Index: 64742-53-6 Index: 649466-00-2 REACH #: 01-2119487077-29 EC: 265-158-7	0 - 20	Asp. Tox. 1, H304	E

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SECTION 3: Composition/information on ingredients

	i	Ξ		Ξ	
	Not classified.	Asp. Tox. 1, H304	Not classified.	Asp. Tox. 1, H304	See Section 16 for the full text of the H statements declared above.
	0- 50	0 - 50	. c	9-0	
Solidor III College	CAS: 64742-55-8 REACH #: 01-2119484627-25	EC; 265-157-1 CAS: 64742-54-7 Index: 649-467-00-8 REACH #: 01-2119474878-16	EC: 276-737-9 CAS: 72873-86-0 Index: 949-482-00-X REACH #: 01-2119483621-38	EC: 265-007-6 625: 64741-96-4 Index: 649-457-00-3 REACH #: 01-2119480374-36	CAS: 64741-97-5 Index: 649-458-00-9
OF CHAIR SOUND IN THE STATE OF	Distillates (petroleum), hydrotreated heavy paraffinic	Lubricating oils (potroloum), C15-30, hydrofreated neutral oil-based	Distillates (petroleum), solvent-refined heavy naphthenic	Distillates (petroleum), solvent-refined light naphthenic	

Annex I Nota i, applies to the base oil(s) in this product. Nota I. - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346

concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been There are no additional ingredients present which, within the current knowledge of the supplier and in the assigned a workplace exposure limit and hence require reporting in this section.

[1] Substance classified with a health or environmental hazard [2] Substance classified with a workplace exposure limit [3] Substance ments the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII [4] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII [5] Substance of equivalent concern

SECTION 4. First aid measures

4.1 Description of first aid measures

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If initation, blurred vision or swalling occurs and persists, obtain medical advice from a specialist. Eye contact

If breathing is difficult, remove victim to fresh air and keep at rest in a position

Inhalation

comfortable for breathing. If casualty is unconscious and; if not breathing, if

Wash with soap and water. Remove contaminated clothing and shoes, Handle with oxygen by trained personnel. Get mexical attention if adverse health effects persist breathing is irregular or if respiratory arrest occurs, provide artificial respiration or care and dispose of in a safe manner. Seek medical attention if skin initiation, or are severe. Maintain an open airway.

Skin contact

Accidental high pressure injection through the skin requires immediate medical swelling or redness develops and persists.

attention. Do not wait for symptoms to develop.

. Version tion, : No previous : 2015-09-17 Date of previous issue Date of Issue/Date of revision

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II

Nytro Libra

SECTION 4: First aid measures

Innestion

lungs and cause damage. If vemiting occurs, the head should be kept low so that Always assume that aspiration has occurred. Do not induce vorniting. Can enter vomit does not enter the lungs. Stark professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop.

Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

may he dangerous to the person providing aid to give mouth-to-mouth resuscitation No action shall be taken involving any personal risk or without suitable training. It

Protection of first-aiders

ignifion including disconnecting electrical supply. Ensure adequate ventilation and Before attempting to rescue casualties, isolate area from all potential sources of check that a safe, breathable atmosphere is present before entry into confined

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Inhalation of oil mist or vapours at elevated temperatures may cause respiratory Eye contact may rause redness and transient pain. Eye contact Inhalation

No known significant effects or critical hazards. May be fatal if swallowed and enters airways. irritation. Skin contact Ingestion

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. No action shall be taken involving any personal risk or without suitable training. It

ignition including disconnecting electrical supply. Ensure adequate ventilation and Before attempting to rescue casualties, isolate area from all potential sources of check that a safe, breathable atmosphere is present before entry into confined

Always assume that aspiration has occurred.

SECTION 5. Firefighting measures

Specific treatments

5.1 Extinguishing media

Use dry chemical, CO2, water spray (fog) or foam. Suitable extinguishing media

Unsuitable extinguishing media

Do not use direct water jots on the burning product, they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards ansing from the substance or mixture

In a fire or if heated, a pressure increase will owar and the container may burst. This substance will float and can be reignited on surface water. Hazards from the substance

Invamplete combustion is likely to give itse to a complex mixture of airborne solid and liquid particulates, gases, including carbor monoxide, ILRS, SOx (sulfur oxides) or sulfurio acid and unidentified organic and inorganic compounds. decomposition products

Special procedutions for tire-5,3 Advice for firefighters

Special protective

fighters

Hazardous thormal

or mixture

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

breathing apparatus (SCBA) with a full face-piece operated in positive pressure Fire fighters should wear appropriate protective equipment and self-contained mode. equipment for fire fighters

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SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Avoid breathing vapour or mist. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas. of any actions should always be assessed and advised, if possible, by a trained,

product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous Eliminate all ignition sources if safe to do so. Spillages of limited amounts of

Note: recommended measures are based on the most likely spillage scenarios for direction and speed) may significantly influence the choice of appropriate actions. his material; however, local conditions (wind, air temperature, wave/current For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.

Small spillages: normal antistatic working clothes are usually adequate. For emergency responders Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and for face shield, if splashes or contact with eyes is possible or Respiratory protection: A half or full-face respirator with filter(s) for organic vapours sítuation cannot be completely assessed, or if an oxygen deficiency is possible, only be used according to the extent of spill and pradictable amount of exposure. If the (and when applicable for H2S) a Self Contained Breathing Apparatus (SCBA) can SCBA's should be used

6.2 Environmental precautions

Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific Roating absorbents. If possible, large spillages in open waters should be contained with floating barriers The use of dispersants should be advised by an expert, and, if required, approved spillage, and collect the product by skimming or other suitable mechanical means. or other mechanical means. If this is not possible, control the spreading of the by local authorities.

Stop leak if without risk. Absorb spilled product with suitable non-combustible for containment and cleaning up 6.3 Methods and

Small spill

Large spillages may be cautiously covered with foam, if avaitable, to limit vapour materials. Large spill

materials to suitable containers for recovery or safe disposal. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. See Section 8 cloud formation. Do not use water jet, When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated for information on appropriate personal protective equipment

> 6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

: No previous validation :2015-09-17 Date of previous Issue Date of issue/Date of revision

Conforms to Regulatio

Nytro Libra

;) No. 1907/2006 (REACH), Annex II

SECTION 7. Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s)

General information

Obtain special instructions before use. Hazard of slipping on split product. Keep away from head/sparks/open flames/hot surfaces. - No smoking. Use and store only outdoors or in a well-ventilated area.

Avoid release to the environment,

7.1 Precautions for safe handling Protective measures

Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Avold contact with eyes, skin and dothing.

Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product Nota ; See Section 8 for information on appropriate personal protective equipment.

See section 13 for waste disposal information.

where this material is handled, stored and processed. Wash hands thoroughly after Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.

design, equipment and operating procedures must comply with the relevant regional, Storage area layout, tank design, equipment and operating procedures must comply national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal with the relevant European, national or local legislation. Storage area layout, tank structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, tocal or company regulations.

7.2 Conditions for safe

storage, including any

incompatibilities

occupational hygiene

Advice on general

Store separately from oxidising agents.

containers or container linings depending on the material specification and intended stainless steel. Not suitable : Some synthetic materials may be unsuitable for Recommended materials for containers, or container linings use mild steel use. Compatibility should be checked with the manufacturer.

unlabelled containers. Containers that have been opened must be carefully resealed fammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards. Store locked up. Profect from sunlight. Keep only in the original container or in a suitable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in and kept upright to prevent leakage. Empty containers may contain harmful,

> Industrial sector specific 7.3 Specific end use(s) Recommendations solutions

Not available. Not available

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SECTION 8: Exposure controls/personal protection

The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scanario(s)

8 1 Control parameters

Occupational exposure limits

Product/Ingredient name	Exposure limit values
Oll mist	[Air contaminant] Rozporzadzenie Minietra Pracy i Politykl Społecznej (Dz.U. 2014 poz. 817) (Poland, 6/2014). TWA: 5 mg/m³ 8 hours. Form: Inhalable fraction
Recommended monitoring	If this product contains ingredients with exposure limits, personal, workplace

atmosphere or biological monitoring may be required to determine the effectiveness

procedures

of the wantilation or other control measures and/or the necessity to use respiratory

protective equipment. Reference should be made to appropriate monitoring

standards. Reference to national guidance documents for methods for the

determination of hazardous substances will also be required

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Product/ingredient name	Туре	Type Exposure	Value	Population	Effects
Distillate (petroleum), hydrotreated	DNEL	DNEL Long term	5,4 mg/m³ Workers	Workers	Local
light naphthenic		Inhalation			
Distillate (pertoleum), hydrotreated	DNEL	DNEL Long term	5,4	Workers	Local
light paraffinic		Inhalation			
Distillates (petroleum), solvent-	DNE	NEL Lang term	5,4 mg/m³ Workers	Workers	003
refined light naphthenic	ļ	Inhalation			

No PNECs available

PNEC Summary

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

8.2 Exposure controls

Appropriate engineering

resistant material in construction of handling equipment. Store under recommended Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil conditions and if heated, temperature control equipment should be used to avoid

Individual protection measures Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers an close to the workstation location. Wash contaminated clothing before reuse. Eye/face protection

Recommended: Safety glasses with side shields.

Hand protection Skin protection

Wear protective dothing if there is a risk of skin contact. Change contaminated 4 - 8 hours (breakthrough time): nitrile rubber clothes at the end of working shift. Body protection

selected based on the task being performed and the risks involved and should be Respirator selection must be based on known or anticipated exposure levels, the Appropriate footwear and any additional skin protection measures should be approved by a specialist before handling this product. Other skin protection Respiratory protection

nazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a isk assessment indicates this is nexassary.

In some cases, fume scrubbors, filters or ungineering modifications to the process ensure they comply with the requirements of environmental protection legislation. Emissions from ventilation or work process equipment should be checked to Environmental exposure controls

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equipment will be necessary to reduce emissions to acceptable levels.

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SECTION 9 Physical and chemical properties

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II

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9.1 Information on basic physical and chemical properties

Appenance

Light yellow Physical state Colour

Odourless/Light petroleum. Not applicable. Not available. Odour threshold Odour

>250°C -51°C Initial boiling point and boiling Melting point/freezing point

Closed cup: >140°C [Pensky-Martens.] Not available. Not available. Not available. Upper/lower flammability or Flammability (solid, gas) Evaporation rate Flash point

160 Pa @ 100 °C Vapour pressure explosive limits

Insoluble in water. 0.88 g/cm³ [15°C] Not available. Partition coefficient, n-octanol/ Solubility(ies) Density

Kinematic (40°C): 0.096 cm²/s (9.6 cSt) Not available. >270°C >280°C Decomposition temperature Auto-ignition temperature Explosive properties Viscosity

DMSO extractable compounds for base oil substance(s) Oxidising properties acxording to IP346

Not available.

SECTION 10. Stability and reactivity

No specific test data related to reactivity available for this product or its ingredients. 10.1 Reactivity

Stable under normal conditions. 10.2 Chemical stability Under normal canditions of storage and use, hazardous reactions will not occur. 10.3 Possibility of hazardous reactions

Oxidising agent. 10.4 Conditions to avoid

Keep away from extreme heat and oxidizing agents. 10.5 Incompatible materials

Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulatos, gases, including carbon monoxide, IL2S, SOx (sulfur exides) or sulfuric acid and unidentified organic and inorganic compounds. decomposition products 10.6 Hazardous

SECTION 11: Toxicological Information

Information on toxicological effects

Acute toxicity

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material)
API 1986a (similar material)
EMBSI 1988a (similar material) material) API 1986a (similar material) material)
API 1986a (similar material)
EMBSI 1988a (similar material) material) API 1986a (similar API 1982 (similar API 1982 (similar EMBSI 1988a (similar material) API 1982 (similar API 1982 (similar EMBSI 1988a (similar material) Remarks material) Exposure 4 hours 4 hours 4 hours 4 hours >5000 mg/kg Rat - Male, >5.53 mg/l Female >5.53 mg/l >5.53 mg/l >5.53 mg/l Dose Rat - Male, Female Rat - Male, Female Rat - Male, Female Species Rabbit Rabbit Rabbit Rabbit Rat Rat Rat Rat LC50 Inhalation Dusts and mists LC50 Inhalation Dusts and mists LC50 Inhalation Dusts and mists LC50 Inhalation Dusts and SECTION 11 Toxicological information .D50 Dermal D50 Dermal D50 Dermal LD50 Dermal D50 Oral _D50 Oral .D50 Oral LD50 Oral Result mists Lubricating olls (petroleum), C15-30, hydrotreated neutral oil-Distillates (petroleum), solvent-refined light naphthenic Distillate (petroleum), hydrotneated light naphthenic Distillate (petroleum), hydrotreated light **Product/Ingredient** paraffinic based name

Conclusion/Summary

No known significant effects or critical hazards.

Irritation/Corrosion

Irritation/Comosion					
Product/ingredient name	Result	Species	Score	Observation Remarks	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar meterial)
	Eyes - Non-irritating to the eves.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
Lubricating oils	Eyes - Non-irritating to the	Rabbit	0.17 to 0.33	24 to 72	UBTL 1984i
(petroleum), C15-30, hydrotreated neutral oil- hased	eyes.			hours	(similar material)
Distillate (petroleum), hydrotreated light	Skin - Non-Imitant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar material)
	Eyes - Non-irritating to the	Rabbit	0.17 to 0.33	24 to 72	UBTL 1984i (similar material)
Distillates (petroleum), solvent-refined light	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	(Similar material)
naphthanic	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
Skin	No known significant effects or critical hazards	fects or crif	ical hazards.		

No known significant effects or critical hazards.

No known significant effects or critical hazards. No known significant effects or critical hazards.

Respiratory Sensitisation

Eyes

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Productingredient name	Route of exposure	Species	Result	Remarks
Distillate (petroleum), hydrotreated light naphthenic	skin	Guinea pig	Not sensitizing	UBTL 1984j.k,I (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil- based	skin	Guinea pig	Not sensitizing	UBTL 1984j.k.l (similar material)
Distillate (petroleum), hydrotreated light paraffinic	skin	Guinea pig	Not sensitizing	UBTL 1984j.k,l (similar material)
Distillates (petroleum), solvent-refined light naphthenic	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)

No known significant effects or critical hazards. No known significant effects or critical hazards.

Mutagenicity

Respiratory

Product/Ingredient name	Test	Experiment	Result	Remarks
Distillate (petroleum), hydrotreated light naphthenic	OECD 473 473 In vitro Mammalian Chromosomal Aberration Test	Experiment: In vitro	Negative	
		Subject: Mammalian- Animal Metabolic activation:		
Lubricating oils (petroleum), C15-30,	OECD 473 473 In vitro	with and without Experiment in vitro	Negative	89
hydroueared neutral oil- based	Mammallan Chromosomal Aberration Test			
		Subject: Mammalian- Animal Metabolic activation:	,	
Distillate (petroleum),	OECD 473 473	with and without Experiment: In vitro	Negative	ı
paraffinic	Mammalian Chromosomal Aberration Test			
		Subject: Mammallan- Animal		
		Metabolic activation: with and witout		
Distillates (petroleum), solvent-refined light naphthenic	OECD 473 473 In vitro Mammalian	Experiment: In vitro	Negative	Reference report 1987 (similar material)
	Chromosomal Aberration Test			1.0
		Subject: Memmallan-		
		Metabolic activation: With and without		1
				1 //

No known significant effects or critical hazards Conclusion/Summary Carcinogenicity

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SECTION 11: Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure Remarks	Remarks	
Distillate (petroleum), hydrotreated light	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	0.22 to 0.25 78 weeks; Doak, 1983, McKen, ml Various 1989 (similar metwial)	
Lubricating oils (petroleum), C15:30, hydrotreated neutral oil-	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	0.22 to 0.25 78 weeks; Doak, 1983, McKre, ml Various 1989 (similar material)	
Dased Distillate (petroleum), hydrotreated light	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	0.22 to 0.25 78 weeks; Douk, 1983, McKee, ml Various 1989 (similar material)	
parallinic Distillates (petroloum), solvent-refined light naphthenic	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks, Various	ml Doak 1983, McKoo Marious 1989 (similar material)	
Condusion/Summary	The base oi(s) in this product is based on an se	this product	this product is based on an soverely hyd	severely hy	The base oil(s) in this product is based on an seweraly hydrotreated distillate. The	

The base oil(s) in this product is based on an sewardy hydrotreated distillate. The product should not be regarded as a carcinogen.

Reproductive toxicity

Condusion/Summary

No known significant effects or critical hazards

Leratogenicity

(similar material) 1987 (similar material) Romarks Exposure mg/kg mg/ kg/day 0 to 2000 mg/kg mg/ kg/day 0 to 2000 mg/kg mg/ kg/day mg/kg mg/ kg/day 0 to 2000 0 to 2000 Dose Species Rat Rat Rat Rat Negative - Dormal Negative - Dermal Negative · Dormal Negative - Dermal Result paraffinic Distillates (potroleum), solvent-refined light hydrotreated neutral oil Distillate (petroleum), Distillate (petroleum), Lubricating oils (petroleum), C15-30, **Product/Ingradient** hydrotreated light hydrotreated light naphthenic naphthenic

Conclusion/Summary

No known significant officets or critical hazards,

Aspiration hazard

ASPIRATION HAZARD - Category 1 ASPIRATION HAZARD - Category 1 ASPIRATION HAZARD - Category 1 ASPIRATION HAZARD - Category 1 Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-Distillate (petroleum), hydrotreated light paraffrit: Distillates (petroleum), solvent-refined light naphthenic Distillate (petroloum), hydrotreated light naphthenic Not available. Product/ingredient namo

Information on the likely routes of exposure Potential acute health effects

Inhalation of oil mist or vapours at elevated temperatures may cause respiratory lifye contact may cause redness and transient pain. Eye contact Inhalation

No known significant effects or critical hazards May be fatal if swellowed and enters airways.

Skin contact Ingestion

Potential chronic health effects

Carcinogenicity

The base oil(s) in this product is based on an severely hydrotronited distillate. The product should not be regarded as a carcinogen. No known significant effects or critical hazards.

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II

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SECTION 11 Toxicological information

No known significant effects or critical hazards. No known significant effects or critical hazards. No known significant effects or critical hazards. No known significant effects or critical hazards. Developmental effects Fertility effects **Teratogenicity** Mutagenicity

Other information

Not available,

Specific hazard

SECTION 12 Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
Distillate (petroleum), hydrotreated light naphthenic	Acute 11.50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute 1.1.50.>100 mg/l	Fish	96 hours
	Acute NOEL :-100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Acute 1,50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute 11.50 >100 mg/l	Fish	96 hours
	Acute NOEL, >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
Distillates (petroleum), hydrotreafed light paraffinic	Acute IC50 >100 mg/l	Algae	48 hours
	Acute LC50 >> 100 mg/l	Fish	96 hours
	Acutts LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LI 50 > 100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Agae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
Distillates (petroleum), solvent-refined light naphthenic	Acute 1,150 >10000 mg/l	Aquatic invertebrates	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOFL 10 mg/l	Aquatic invortebrates.	21 days

No known significant effects or critical hazards, Condusion/Summary

12.2 Persistence and degradability

~	Aquatic half-life	Photolysis	Biodegradability
Distillate (petroleum),			Inherent
hydrotroated light naphthenic Lubricating oils (petroleum),	ı	,	Inherent
C15-30, hydrotreated neutral oil-based			
Distillatos (petroleum),	ı		Inherent
hydrotreated light paraffinic			
Distillates (petroleum),	6		Inherent
solvent-refined light			
naphthenic			

Inherently biodegradable. Conclusion/Summary

12.3 Bioaccumulative potential

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SECTION 12 Ecological information

Product/Ingredient name LogPow	LogPow	BCF	Potential
Distillate (petroleum),	2 to 6	<500	wol
hydrotreated light naphthenic Lubricating oils (petroleum), 2 to 6	2 to 6	<500	low
C15-30, hydrotreated			
neutral oil-based			
Distillates (petroleum),	2 to 6	<500	low
hydrotreated light paraffinic			
Distillates (petroleum),	2 to 6	<500	low
solvent-refined light			
naphthenic			

Conclusion/Summary

12.4 Mobility in soil

Mobility

High mobility in soil predicted, based on log Kow > 3.0.

The product has a potential to bioaccumulate

12.5 Results of PBT and vPvB assessment

Not applicable.

Not applicable,

12,6 Other adverse effects

Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13. Disposal considerations

The Information in this section contains generic advice and guidance. The list of identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s)

13.1 Waste treatment methods

Methods of disposal

safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable). Disposal can be carried out directly, or by delivery to qualified Where possible (e.g. in the absence of relevant contamination), recycling of used Incinerated, subject to national/local authorizations, relevant contamination limits. waste handlers. National legislation may identify a specific organization, and/or substance is feasible and recommended. This substance can be burned or prescribe composition limits and methods for recovery or disposal

Hazardous waste

Yes.

European waste catalogue (EWC)

Waste designation	mineral-based non-chlorinated insulating and heat tran-	
Waste code	3 03 07*	

Packaging

Methods of disposal

The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 14: Transport information

international transport regulations

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SECTION 14. Transport information

	ADR/RID	ADN	IMO/IMDG Classification	ICAONATA Classification
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	r	1	ı	
14.3 Transport hazard class(es)	•			
14.4 Packing group				ı.
f4.5 Environmental hazards	No.	No.	No.	No.
Additional Information		1		

14.6 Special precautions for user

Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex I of

Oils

MARPOL 73/78 and the IBC Code

SECTION 15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Requisition (EC) No. 1907/2006 (REACH)

Annex XIV

Annex XIV - List of substances subject to authorisation

None of the components are listed, Substances of very high concern

None of the components are listed.

Not applicable. Annex XVII - Restrictions on the manufacture, placing on the market and use of

certain dangerous

substances, mixtures and

Other EU regulations Seveso Directive

This product is not controlled under the Seveso Directive.

Vational regulations

Product/Ingredient name List name	List name	Name on list	Classification	Notes
Distillates (petroleum),	Poland Carcinogen,	Destylaty lekkie	Carc. cat.2	
hydrotreated light paraffinic	Mutagen chemicals	parafinowe, obrabiane		
		wodorem (ropa		
		naftowa); olej bazowy -		
		niconomificanomi		

International lists

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SECTION 15: Regulatory information

National inventory

All components are listed or exempted All components are listed or exempted All components are listed or exempted Australia Canada China

All components are listed or exempted

Not determined Malaysia Japan

All components are listed or exempted All components are listed or exempted All components are listed or exempted. Republic of Korea New Zealand Philippines

All components are listed or exempted

All exmonnents are listed or exempted Complete. 15.2 Chemical Safety

United States

Taiwan

SECTION 16: Other information Assessment

Not available Revision comments \overline{V} indicates information that has changed from proviously issued version.

ADN ** Furopean Provisions concerning the International Carriage of Dangerous

Goods by Inland Waterway

ADR = The European Agreement concerning the International Carriage of

Dangerous Goods by Road

CL.P = Classification, Labelling and Packaging Regulation [Regulation (EC) No. ATE = Acuto Toxicity Estimate

CMR = Carcinogen, Mutagen or Reproductive toxicant 1272/20081

CSA :: Chemical Safety Assossment

CO₂ = carbon dioxide DNEL = Derived No Effect Level EC50 = Half maximal effective concentration

EUM statement =: CLP-specific Hazard statement

ATA :: International Air Transport Association IC50 ≈ Half maximal inhibitory concentration

IMDG = International Maritime Dangerous Goods

.C50 = Median lethal concentration

.D50 = Modian lethal dose

PNEC = Predicted No Effect Concentration

PBT = Persistent, Bioaccumulative and Toxic

RID = The Regulations concerning the International Carrage of Dangerous Goods

REACH * Registration, Evaluation, Authorisation and Restriction of Chemicals

Regulation [Regulation (EC) No. 1907/2006] SCBA = Self-Contained Breathing Apparatus SVHC = Substances of Very High Concorn

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Justification	Calculation method	
Classification	Asp. Tox. 1, H304	

Poland

H304 May be fatal if swallowed and enters airways. Full text of abbreviated H statements ASPIRATION HAZARD - Category 1 Asp. Tox. 1, H304 Full text of classifications [CLP/GHS]

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Notice to reader

No previous validation

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although centain hazards are described berein, we cannot guarantee that these are the only hazards that exist.

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Annex to the extended Safety Data Sheet (eSDS)



Industrial

dentification of the substance or mixture

Product definition

Nytro Libra Product name

Section 1 - Title

Distribution of substance- Industrial (Other Lubricant Base Oils, IP346<3%, H304) Short title of the exposure

List of use descriptors scenario

Process Category: PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, identified use name: Distribution of substance - Industrial

PROC09, PROC15

Substance supplied to that use in form of: Substance

Sector of end use: SU03

Subsequent service life relevant for that use: No. Environmental Release Category: ERC04, ERC05, ERC06a, ERC06b, ERC06c,

Article category related to subsequent service life: Not applicable. ERCO84, ERCO7, ESVOC SpERC 1.1b.v1 Market sector by type of chemical product: Not applicable.

Distribution of substance

scenarios

Environmental contributing

Distribution of substance Health Contributing scanarios Number of the ES

Concawe Generic exposure scenario covered by the exposure Processes and activities Industry Association scenario

Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incleantal exposures during its sampling, storage, unloading, maintenance and associated laboratory activities. Industrial

Section 2 - Exposure controls

Additional information

Substance is complex UVCB.. Predominantly hydrophobic Product characteristics Amounts used

Fraction of Regional tonnage used locally 1 Fraction of EU tonnage used in region 0.1 Regional use tonnage 8,5E+5

Maximum daily site tonnage 1.7E+4 Continuous release

Emission Days (days/year) 100 Frequency and duration of

Local marine water dijution factor 100 Local freshwater dilution factor 10 Environment factors not influenced by risk management

Release fraction to wastewater from process (initial release prior to RMM) 1.0E-7 Release fraction to soil from process (initial release prior to RMM) 0.00001 Release fraction to air from process (initial release prior to RMM) 1.0E-4

Common practices vary across sites thus conservative process release estimates

Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment

required.

emissions and releases to soil

Technical on-site conditions

measures at process level

Technical conditions and environmental exposure

Other given operational

conditions affecting

and measures to reduce or (source) to prevent release

limit discharges, air Risk management Date of issue/Date of revision

measures - Air

Treat air emission to provide a typical removal sfficiency of 90

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Distribution of substance-Industrial (Other Lubricant Base Oils, IP348<3%, H304)

Section 2 - Exposure controls

Risk management measures - Water

Organisational measures to preventilimit release from site

related to municipal sewage treatment plant

Conditions and measures

reat on-site wastewater (prior to receiving water discharge) to provide the required

If discharging to domestic sawage treatment plant, provide the required onsite Do not apply industrial sludge to natural soils. Sludge should be incinerated, wastewater removal efficiency of 0

Estimated substance removal from wastewater via on-site sewage treatment94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic contained or reclaimed.

Maximum allowabie site tonnage (Mane) based on release following total wastewater treatment plant) RMMs94.7 treatment removal1,1E+5

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

related to external treatment

of waste for disposal

Conditions and measures

related to external recovery

Conditions and measures

External recovery and recycling of waste should comply with applicable tocal and/or national regulations.

Covers percentage substance in the product up to 100% (unless stated differently). Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is Covers dally exposures up to 8 hours (unless stated differently) Contributing scenario controlling worker exposure for 0: Distribution of substance Liquid, vapour pressure < 0.5 kPa at STP Concentration of substance conditions affecting workers Frequency and duration of Other given operational Product characteristics in mixture or article Physical state

Aspiration means the entry of a liquid substance directly into the trachea and lower Aspiration hazard if swallowed respiratory tract

This property relates to the potential for low viscosity material to spread quickly into Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. the deep lung and cause severe pulmonary tissue damage.

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do not induce vorniting as there is high risk of aspiration

Contributing scenarios - Operational conditions and risk management measures

No other specific measures identified General exposures (open systems)

No other specific measures identified General exposures (closed systems)

No other specific measures identified Process sampling

No other specific measures Identified Laboratory activities

No other specific measures identified. Bulk transfers closed systems

Bulk transfers open systems No other specific measures identified.

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Distribution of substance- Industrial (Other Lubnicant Base Oils, IP346<3%, H304) Nytro Libra

Section 2 - Exposure controls

No other specific measures identified. Drum and small package filling

Equipment deaning and maintenance Drain down and flush system prior to equipment break-in or maintenance.

Store substance within a closed system.

Storage

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment). Personal protection

Conditions and measures related to personal protection and hygiene

Section 3 - Exposure estimation and reference to its source

Website:	Not applicable.
Exposure estimation and refe	Exposure estimation and reference to its source - Environment 2; Distribution of substance
Exposure assessment (environment):	Not available.
Exposure estimation	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.
Exposure estimation and refe	Exposure estimation and reference to its source - Workers: 1: Distribution of substance

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Not available

Exposure assessment Exposure estimation

(human)

by the ES

Environment

management measures. Required removal officiency for wastowater can be achieved Guidance is based on assumed operating conditions which may not be applicable to SpERC factsheet. Scaled local assessments for EU refinerias have been performed using onsite/offsite texhnologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all situs; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

The CLP hazard statement H304: May be fatal if swallowed and enture airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physics chemical properties (i.e. kinematic viscosity) that can occur during ingustion and also if it is vornited following ingestion.

Health

A DNEL (durived no effect levels) cannot be duriwd.

This general qualitative CSA (chemical safety assessment) approach aims to reduce

However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health avoid contact or incidents with the substance.

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable hazard presented by the substance.

physico-chemical proporties of the substance. The risk can therefore be controlled by uses of the substance. The risk arising from aspiration hazard is solely related to the There are no routine anticipated exposures by ingestion related to any supported mplementing risk management measures tailouxd to this specific risk. is considered to be controlled to a level of no concern.

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or any substance, classifies as H304 (R65), these measures should be

Nytro Libra

Distribution of substance-Industrial (Other Lubricant Base Oils, IP346<3%, H304)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES communicated via the safety data sheet by use of the following phrase. Do not ingest.

If swallowed then seek immediate medical assistance.

Nytro Libra

Annex to the extended Safety Data Sheet (eSDS)



Industrial

dentification of the substance or mixture

Product definition Product name

Nytro Libra

Section 1 - Title

Formulation & (re)packing of substances and mixtures- Industrial (Other Lubricant Base Olls. IP346<3%) Short title of the exposure scenario

identified use name: Formulation and (re)packing of substances and mixtures -

List of use descriptors

Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a,

Article category related to subsequent service life: Not applicable. Subsequent service life relevant for that use: No. Environmental Release Category: ERC02, ESVOC SpERC 2.2.v1 Market sector by type of chemical product: Not applicable. PROC08b, PROC09, PROC14, PROC15 Substance supplied to that use in form of: Substance Sector of end use: SU10

Formulation and (re)packing of substances and mixtures

Health Contributing scenarios scenarios

Number of the ES

Environmental contributing

Formulation and (re)packing of substances and mbtures

Generic exposure scenario Processes and activities covered by the exposure Industry Association

Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities. Industrial Additional information

Section 2 - Exposure controls

Amounts used

Product characteristics

Frequency and duration of

Environment factors not nfluenced by risk management

(source) to prevent release measures at process level Technical conditions and environmental exposure Other given operational conditions affecting

Annual site tonnage 3.0E+4

Fraction of Regional tonnage used locally Fraction of EU tonnage used in region 0.1 Regional use tonnage 8.5E+5

Substance is complex UVCB.. Predominently hydrophobic

Maximum daily site tonnage 1.0E+5

Continuous release

Local marine water dilution factor 100 Local freshwater dilution factor 10 Emission Days (days/year)300

Common practices vary across sites thus conservative process release estimates Release fraction to wastewater from process (Initial release prior to RMM)5.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.0001 Release fraction to air from process (initial release prior to RMM)2.5E-3

Risk from environmental exposure is driven by freshwater sediment.

Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

emissions and releases to soil

Imit discharges, air

Technical on-site conditions

and measures to reduce or

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Nytro Libra

Formulation & (re)packing of substances and mixtures-Industrial (Other Lubricant Base Olls, IP346<3%)

Section 2 - Exposure controls

Risk management measures - Air

Risk management measures - Water

Ireat on-site wastewater (prior to receiving water discharge) to provide the required If discharging to domestic sewage treatment plant, provide the required onsite removal efficiency of69,5

reat air emission to provide a typical removal efficiency of

wastewater removal efficiency of 0

Do not apply industrial sludge to natural soils. Sludge should be incinerated. contained or reclaimed. prevent/limit release from site Organisational measures to

Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic Not applicable as there is no release to wastewater.

related to municipal sewage

Conditions and measures

Maximum allowable site tonnage (ฟัลงง) based on release following total wastewater treatment plant) RMMs94.7 treatment removal5.7E+5

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or national regulations,

related to external treatment

of waste for disposal

Conditions and measures

related to external recovery

of waste

Conditions and measures

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Covers percentage substance in the product up to 100% (unless stated differently). Contributing scenario controlling worker exposure for 0: Formulation and (re)packing of substances and mixtures Liquid, vapour pressure < 0.5 kPa at STP Concentration of substance Product characteristics

Liquid

Covers daily exposures up to 8 hours (unless stated differently)

Operation is carried out at elevated temperature (> 20°C above amblent temperature) Assumes a good basic standard of occupational hygiene is Aspiration hazard if swallowed.

Other given operational conditions affecting workers

Frequency and duration of

in mixture or article

Physical state

Aspiration of hydrocarbon substances can result in in severe acute effects such as Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract

This property relates to the potential for low viscosity material to spread quickly into chemical pneumonitis, varying degree of pulmonary Injury or death. the deep lung and cause severe pulmonary tissue damage.

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do not induce vomiting as there is high risk of aspiration.

Contributing scenarios - Operational conditions and risk management measures

No other specific measures identified General exposures (closed systems)

Batch processes at elevated temperatures No other specific measures identified

No other specific measures identified

General exposures (open systems)

No other specific measures identified, Use in contained batch processes

No other specific measures identified Process sampling

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"(ES Revision date)

Formulation & (re)packing of substances and mixtures-Industrial (Other Lubricant Base Oils, IP346<3%)

Section 2 - Exposure controls

Nytro Libra

Laboratory activities

No other specific measures identified. Bulk transfers Dedicated facility

No other specific measures identified.

No other specific measures identified. Mixing operations (open systems)

Fransfer from/pouring from containers Manual Non-dedicated facility No other specific measures identified.

Drum/batch fransfers Dedicated facility No other specific measures identified Production of preparation or articles by tabletting, compression, extrusion or pelletisation

No other specific measures identified.

Drum and small package filling No other specific measures identified.

Drain down and flush system prior to equipment break in or maintenance. Equipment cleaning and maintenance

Store substance within a closed system Storage

Conditions and measures related to personal protection and hygiene

Personal protection

See Section 8 of the safety data sheet (guneral health and safety measures). See Section 8 of the safety data shvet (pursonal protective equipment).

Section 3 - Exposure estimation and reference to its source

Not applicable.

Exposure estimation and reference to its source - Environment: 2: Formulation and (re)packing of substances and

mixtures

Exposure assessment

Not available.

(environment):

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model Exposure estimation

Exposure estimation and reference to its source - Workers: 1: Formulation and (re)packing of substances and mixtures Not available. Exposure assessment

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Exposure estimation

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set

by the ES

Guidance is based on assumed operating conditions which may not be applicable to

Environment

23/36 management measures. Required removal efficiency for wastewater can be achieved combination. Further details on scaling and control technologies are provided in SpERC factsheet. Scaled local assessments for EU refinence have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific." using onsite/offsite technologies, either alone or in combination. Required removal all sites; thus, scaling may be nexassary to define appropriate site-specific risk efficiency for air can be achieved using on-site technologies, either alone or in "roduction" worksheet A(ES Revision date) Date of issue/Date of revision

Nytro Libra

Formulation & (re)packing of substances and mixtures-Industrial (Other Lubricant Hase Oils, 1P346~3%)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set

by the ES

Health

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is DPD risk phraso R65: Harmful: may cause lung damage if swallowed) relates to

A DNEL (derived no effect levels) cannot be derived vomited following ingestion.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ avoid contact or incidents with the substance

However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable is considered to be controlled to a level of no concern.

uses of the substance. The risk anising from aspiration hazard is solely related to the physixa-chamical properties of the substance. The risk can therefore be controlled by There are no routine anticipated exposures by ingestion related to any supported For any substance, classifies as H304 (R65), these measures should be implementing risk management measures tailored to this specific risk

communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seck immediate medical assistance.

Nytro Libra

Annex to the extended Safety Data Sheet (eSDS)



Industrial

dentification of the substance or mixture

Product definition Product name

Nytro Libra

Section 1 - Title

Manufacturer of substance-Industrial (Other Lubricant Base Oils, IP346<3%, H304) Short title of the exposure

Process Category: PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, dentified use name: Manufacture of substance - Industrial List of use descriptors

Substance supplied to that use in form of: Substance

Sector of end use: SU03, SU08, SU09

Subsequent service life relevant for that use: No.

Article category related to subsequent service life: Not applicable. Environmental Release Category: ERC04, ESVOC SpERC 1.1.v1 Market sector by type of chemical product: Not applicable.

Manufacture of substance Environmental contributing Manufacture of substance Health Contributing scenarios

within closed or contained systems. Includes incidental exposures during recycling/ Manufacture of the substance or use as a process chemical or extraction agent recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk Concawe 2012 container), Industrial Generic exposure scenario covered by the exposure Processes and activities Additional information Industry Association Number of the ES scenario

Section 2 - Exposure controls

Product characteristics

Frequency and dure

Environment factors not influenced by risk management

measures at process level **Technical conditions and** environmental exposure Other given operational conditions affecting

limit discharges, air emissions and releases to soil Technical on-site conditions and measures to reduce or

(source) to prevent release

Substance is complex UVCB.. Predominantly hydrophobic

Fraction of EU tonnage used in region0.1 Regional use tonnage 8.5E+5

Fraction of Regional tonnage used locally 1 Annual site tonnage 6.0E+5

Maximum daily site tonnage 2.0E+6

Continuous release

Local freshwater dilution factor 10 Emission Days (days/year)300

Local marine water dilution factor 100

Common practices vary across sites thus conservative process release estimates Release fraction to wastewater from process (initial release prior to RMM) 1.0e-5 Release fraction to soil from process (initial release prior to RMM) 0.000 Release fraction to air from process (initial release prior to RMM) 1.0e-4

if discharging to domestic sewage treatment plant, no onsite wastewater treatment required. Prevent discharge of undissolved substance to or recover from onsite wastawater. Risk from environmental exposure is driven by freshwater sediment.

Nytro Libra

Manufacturer of substance-Industrial (Other Lubricant Base Oils, IP348<394, H304)

Section 2 - Exposure controls

Risk management measures - Air

Treat on-site wastewater (prior to receiving water discharge) to provide the required reat air emission to provide a typical removal efficiency of 90 removal efficiency of84,8 Risk management measures - Water

If discharging to domestic sewage treatment plant, provide the required onsite Do not apply industrial sludge to natural soils. Sludge should be incinerated, wastewater removal efficiency of 0 Organisational measures to prevent/limit release from site

Estimated substance removal from wastewater via on-site sewage treatment94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7 contained or reclaimed.

related to municipal sewage

treatment plant

Conditions and measures

Maximum allowable site tonnage (Ms...) based on release following total wastewater treatment removal5.7E+6

Assumed on-site sewage treatment plant flow 10000

During manufacturing, no waste of the substance is generated.

During manufacturing, no waste of the substance is generated

related to external recovery

of waste

Conditions and measures

of waste for disposal

Conditions and measures

Covers percentage substance in the product up to 100% (unless stated differently). temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient Covers daily exposures up to 8 hours (unless stated differently) Contributing scenario controlling worker exposure for 0: Manufacture of substance Liquid With potential for aerosol generation Liquid, vapour pressure < 0.5 kPa at STP mplemented Concentration of substance conditions affecting workers Frequency and duration of Other given operational Product characteristics in mixture or article Physical state

Aspiration means the entry of a liquid substance directly into the trachea and lower Aspiration hazard if swallowed respiratory tract

chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into Aspiration of hydrocarbon substances can result in in severe acute effects such as the deep lung and cause severe pulmonary tissue damage.

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties Do not induce vorniting as there is high risk of aspiration. Contributing scenarios - Operational conditions and risk management measures

IF SWALLOWED: Immediately call a POISON CENTER or physician.

No other specific measures identified General exposures (closed systems)

No other specific measures identified Process sampling

General exposures (open systems) No other specific measures identified

No other specific measures identified. Laboratory activities

No other specific measures identified. Bulk transfers (Closed system)

Bulk transfers open systems

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Manufacturer of substance- Industrial (Other Lubricant Base Oils, IP346<3%, H304) Nvtro Libra

Section 2 - Exposure controls

No other specific measures identified.

Equipment cleaning and maintenance Orain down and flush system prior to equipment break-in or maintenance.

Bulk product storage

Store substance within a closed system.

Conditions and measures related to personal protection and hygience Personal protection

See Section 8 of the safety data sheet (general health and sufoty measures). See Section 8 of the sufety data sheet (pursonal protoctive equipment).

Section 3 - Exposure estimation and reference to its source

Website:

Not applicable.

Exposure estimation and reference to its source - Environment: 2: Manufacture of substance

Not available.

Exposure assessment

The Hydroxarbon Block Method has been used to calculate environmental exposure Exposure estimation (environment):

Exposure estimation and reference to its source - Workers: 1: Manufacture of substance

with the Petrorisk model.

Not available, Exposure assessment

(human):

The ECETOC TRA tool has been used to estimate workplace exposures unless

otherwise indicated Exposure estimation

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved assessments for EU refineries have bosn performed using site-sposific data and are Guidance is based on assumed operating conditions which may not be applicable to SpERC factsheed, (http://cefic.org/en/reach-for-industries-libraries.html) Scaled local The CLP hazand statement H304: May be fittal if swallowed and enture airways (the using ensite/offsite technologiss, either alone or in combination. Required removal combination. Further details on scaling and central technologies are provided in all sites; thus, scaling may be necessary to define appropriate sim-specific risk efficiency for air can be achieved using on site technologies, cittier alone or in attached in PETRORISK file - "Site-Specific Production" worksheet.

potential for aspiration , a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can order during ingestion and also if it is DPD risk phrase R65; Harmful: may cause lung damage if swallowed) relates to vomited following ingestion.

Health

This general qualitative CSA (chemical safety assessment) approach aims to reduced A DNEL (derived no effect levels) cannot be derived.

avoid contact or incidents with the substance

However, implementation of risk management measures (RMMs) and operational conditions (OCs) next to be proportional to the degree of concern for the health hazard presented by the substance

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will unsure that the Exposures should be controlled to at least the levels that represent an acceptable

physicu-chemical properties of the substance. The risk can therefore be controlled by uses of the substancy. The risk arising from aspiration hazard is solely related to the There are no routine anticipated exposures by ingestion related to any supported implementing risk management measures tailored to this specific risk. For any substance, classifion as H304 (R65), these measures should be is considered to be controlled to a level of no concorn.

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communicated via the safety data sheat by use of the following phrase: Do not ingest.

Nytro Libra

Manufacturer of substance- Industrial (Other Lubricant Base Oils, 19348<3%, H304)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

If swallowed then seek immediate medical assistance.

management measures/operational conditions outlined in section 2 are implemented. Predicted exposures are not expected to exceed the DN(M)EL when the risk

When other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels Available hazard data do not enable the derivation of a DNEL for dermal initant

effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk

characterisation.

Nytro Libra

Annex to the extended Safety Data Sheet (eSDS)

dentification of the substance or mixture Product definition Product name

Nytro Libra

Section 1 - Title

Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304) Short title of the exposure scenario

Process Category: PROC01, PROC03, PROC08a, PROC08b, PROC02, PROC04. Identified use name: Functional Fluids - Industrial

List of use descriptors

Substance supplied to that use in form of: Substance

Subsequent service life relevant for that use: No. Environmental Release Category: ERC07 Sector of end use: SU03

Market sector by type of chemical product: Not applicable.

Article category related to subsequent service life: Not applicable.

Functional Fluids Environmental contributing

Health Contributing scenarios

Functional Fluids

Concawe 2012 9.37.1b Industry Association Number of the ES

Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, rafrigerants, hydraulic fluids in industrial equipment including maintenance and related material 38 Generic exposure scenario

Processes and activities covered by the exposure

Section 2 - Exposure controls

ndustrial

Additional information

scenario

Substance is complex UVCB. Predominantly hydrophobic Product characteristics

Fraction of EU tonnage used in region0.1 Amounts used

Fraction of Regional tonnage used locally1 Regional use tonnage1.2E+3

Maximum daily site tonnage5.0E+2 Annual site tonnage 1.0E+1

Continuous release

Emission Days (days/year)20 Frequency and duration of

Release fraction to wastewater from process (initial release prior to RMM)1.0E-6 Release fraction to air from process (initial release prior to RMM)5.0E-4

Local marine water dilution factor 100

Local freshwater dilution factor 10

Environment factors not

influenced by risk

management

Other given operational

conditions affecting

Common practices vary across sites thus conservative process release estimates

Release fraction to soil from process (initial release prior to RMM)0.001

Risk from environmental exposure is driven by freshwater sediment.

Technical on-site conditions

measures at process level

Technical conditions and environmental exposure

and measures to reduce or (source) to prevent release

limit discharges, air Risk management

measures - Air

If discharging to domestic sewage treatment plant, no onsite wastewater treatment Prevent discharge of undissolved substance to or recover from onsite wastewater emissions and releases to soil

Treat air emission to provide a typical removal efficiency of

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Nytro Libra

Uses in Functional fluids - Industrial (Other Lubricant Base Oils, 19346<3%, H304)

Section 2 - Exposure controls

Risk management measures - Water

Industrial

Organisational measures to preventilimit release from site

related to municipal sewage

Conditions and measures

Freat on-site wastewater (prior to receiving water discharge) to provide the required

if discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of

Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed. Estimated substance removal from wastewater via on-site sewage treatment94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7

Maximum allowable site tonnage (Msxs) based on release following total wastewater treatment removal3.3E+3

Assumed on-site sewage treatment plant flow 2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

related to external treatment

of waste for disposal

Conditions and measures

related to external recovery

Conditions and measures

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Covers percentage substance in the product up to 100% (unless stated differently). temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient Covers daily exposures up to 8 hours (unless stated differently) Liquid With potential for aerosol generation Liquid, vapour pressure < 0.5 kPa at STP Contributing scenario controlling worker exposure for 0: Functional Fluids Concentration of substance conditions affecting workers Frequency and duration of Other given operational Product characteristics in mixture or article Physical state

Aspiration means the entry of a liquid substance directly Into the traches and lower Aspiration hazard if swallowed. respiratory tract

This property relates to the potential for low viscosity material to spread quickly into Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. the deep lung and cause severe pulmonary tissue damage.

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties Do not induce vorniting as there is high risk of aspiration.

F SWALLOWED: Immediately call a POISON CENTER or physician.

Contributing scenarios - Operational conditions and risk management measures

No other specific measures Identified. Bulk transfers - Closed system

Drum/batch transfers - Dedicated facility No other specific measures identified Filling of articles/equipment - closed systems No other specific measures identified Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified

No other specific measures identified. General exposures (closed systems)

Restrict area of openings to equipment. Provide extract ventilation to emission points when contact with warm (>50°C) lubricant is likely. General exposures (open systems) - Elevated temperature

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Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304) Nytro Libra

Section 2 - Exposure controls

No other specific measures identified. Remanufacturo of reject articles

Drain down system prior to equipment break-in or maintenance. Equipment cleaning and maintenance

Storage

Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment). Personal protoction

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 2: Functional Fluids

Not applicable

Not available Exposure assessment

(environment):

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Exposure estimation

Exposure estimation and reference to its source - Workers: 1; Functional Fluids

Not available Exposure assessment

The ECETOC TRA tool has been used to estimate workplace exposures unless Exposure estimation (human);

otherwise indicated

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved Guidance is based on assumed operating canditions which may not be applicable to SpERC factsheet. (http://cuffc.org/en/roach-for-industries-libraries.html) Scaled local assessments for EU refinerics have been performed using site-specific data and are using onsite/offsite technologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site-specific risk efficiency for air can be achieved using on site technologies, uither alone or in attached in PETRORISK file - "Site Specific Production" worksheet

The CLP hazard statement M304; May be fatal if swallowed and enters airways (the potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is OPD risk phraso R65: Harmful: may cause lung damage if swallowed) relates to vornited following ingestion.

Health

A DNEL (derived no effect levels) cannot be derived.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ avoid contact or incidents with the substance.

However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

likelihood of an event occuring due to the substance hazard is negligitale, and the risk evel of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable is considered to be controlled to a level of no concern.

uses of the substance. The risk arising from aspiration hazard is solely related to this physical chemical proporties of the substance. The risk can therefore be controlled by There are no couting anticipated exposures by ingestion related to any supported mplementing risk management measures taikned to this specific risk 31/36

^(ES Revision date)

Date of issue/Date of revision

Nytro Libra

Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For any substance, classifies as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seek immediate medical assistance.

management measures/operational conditions outlined in section 2 are implemented. Predicted exposures are not expected to exceed the DN(M)EL when the risk

Where other risk management measures/operational conditions are adopted, then

users should ensure that risks are managed to ut least equivalent levels.

effects. Available hazard data do not support the need for a DNEL to be established for other health offects. Risk management measures are based on qualitative risk Available hazard data do not enable the derivation of a DNEL for dermal irritant characterisation

Nytro Libra

Annex to the extended Safety Data Sheet (eSDS)



Nytro Libra

dentification of the substance or mixture

Product definition

Nytro Libra Product name

Section 1 - Title

Uses in Functional fluids - Professional (Other Lubricant Base Oils, 1P346<3%, H304) Short title of the exposure

List of use descriptors

Identified use name: Functional Fluids - Professional
Process Category: PROC01, PROC02, PROC03, PROC08a, PROC09, PROC20
Substance supplied to that use in form of: Substance

Sector of end use: SU22

Subsequent service life relevant for that use; No.

Environmental Release Catagory: ERC09a, ERC09b, ESVOC SpERC 9.13b.v1 Market sector by type of chemical product: Not applicable.

Functional Fluids

Article category related to subsequent service life: Not applicable. Environmental contributing

Health Contributing scenarios

scenarios

Functional Fluids

Concawe 9.38.1b Industry Association Number of the ES

38 Generic exposure scenario Processes and activities

Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers. covered by the exposure scenario

Professional Additional information

Section 2 - Exposure controls

Product characteristics Amounts used Frequency and auration of

Environment factors not influenced by risk

environmental exposure Other given operational conditions affecting management

emissions and releases to soil Technical on-site conditions and measures to reduce or (source) to prevent release measures at process level limit discharges, air

used.

Technical conditions and

Risk management measures - Air

Substance is complex UVCB. Predominantly hydrophobic Fraction of EU tonnage used in region0.1

Fraction of Regional tonnage used locally/ Regional use tonnage1.2E+3

Maximum daily site tonnage 1.6E+0 Annual site tonnage6.0E-1

Continuous release

Local marine water dilution factor 100 Local freshwater dilution factor 10 Emission Days (days/year)365

Common practices vary across sites thus conservative process release estimates Release fraction to wastewater from process (initial release prior to RMM)0.025 Release fraction to soil from process (initial release prior to RMM)0.025 Release fraction to air from process (initial release prior to RMM)0.05

Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment

Treat air emission to provide a typical removal efficiency of N/A

*(ES Revision date) Date of issue/Date of revision

Uses in Functional fluids - Professional (Other Lubricant Base Oils, IP346<3%, H304)

Section 2 - Exposure controls

Risk management measures - Water

Professional

prevent/limit release from site

Conditions and measures

Organisational measures to

related to municipal sewage treatment plant

Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of64.9

If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of

Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed. Estimated substance removal from wastewater via on-site sewage treatment94.7 Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs94.7

Maximum allowable site tonnage (Mark) based on release following total wastewater treatment ramoval1,1E+1

Assumed on-site sewage treatment plant flow2000

External treatment and disposal of waste should comply with applicable local and/or national regulations.

related to external treatment

of waste for disposal

Conditions and measures

related to external recovery

of waste

Conditions and measures

External recovery and recycling of waste should comply with applicable local and/or national regulations.

Covers percentage substance in the product up to 100% (unless stated differently). temperature) Assumes a good basic standard of occupational hygiene is Operation is carried out at elevated temperature (> 20°C above ambient Covers daily exposures up to 8 hours (unless stated differently) Liquid With potential for aerosol generation Liquid, vapour pressure < 0.5 kPa at STP Contributing scenario controlling worker exposure for 0: Functional Fluids Concentration of substance conditions affecting workers Frequency and duration of Other given operational Product characteristics in mixture or article Physical state

Aspiration means the entry of a liquid substance directly into the traches and lower Aspiration hazard if swallowed. respiratory tract

This property relates to the potential for low viscosity material to spread quickly into Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death

Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. the deep lung and cause severe pulmonary tissue damage.

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do not induce vomiting as there is high risk of aspiration.

Contributing scenarios - Operational conditions and risk management measures

No other specific measures Identified. Bulk transfers - Closed system

Drum/batch transfers - Dedicated facility No other specific measures identified Filling of articles/equipment - closed systems

No other specific measures identified.

Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified.

No other specific measures identified. General exposures (closed systems)

Restrict area of openings to equipment. Provide extract ventilation to emission points when contact with warm (>50°C) lubricant is likely. General exposures (open systems) - Elevated temperature

34/36 ^(ES Revision date) Date of issue/Date of revision

Uses in Functional fluids - Professional (Other Lubricant Base Oils, 1P346<3%, H304) Nytro Libra

Section 2 - Exposure controls

No other specific measures identified. Remanufacture of reject articless

Orain down system prior to equipment break-in or maintenance. Equipment cleaning and maintenance

Storage

Store substance within a closed system

Conditions and measures related to personal protection and hygiene

Personal protection

Seo Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website

Exposure estimation and reference to its source - Environment. 2: Functional Fluids

Not applicable

Not available Exposure assessment

(environment):

Exposure estimation

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Exposure estimation and reference to its source - Workers: 1: Functional Fluids

Exposure assessment (human):

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Not available.

Exposure estimation

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

management measures. Required removal efficiency for wastewater can be achieved Guidance is based on assumed operating conditions which may not be applicable to assessments for EU refineries have been performed using site-specific data and are SpERC factsheet, (http://cefic.org/on/reach-for-industries-libraries.html) Scaled local The CLP hazard stutument H304: May be fatal if swallowed and enters airways (the using onsitis/offsite technologies, either alone or in combination. Required removal combination. Further details on scaling and control technologies are provided in all sites; thus, scaling may be necessary to define appropriate site specific risk efficiency for air can be achieved using on-site technologies, either alone or in atrached in PETRORISK file .. "Site Specific Production" worksheet.

A DNEL (derived no effect levels) cannot be derived. vomited following ingestion.

potential for aspiration, a non-quantifiable hazard determined by physico-chemical

Health

properties (i.e. kinamatic viscosity) that can occur during ingestion and also if it is DPD risk phrase R65; Harmful: may cause lung damage if swallowed) relates to

This general qualitative CSA (chemical safety assessment) approach aims to reduce/ avoid contact or incidents with the substance.

Howover, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

likelihood of an event occuring due to the substance hazard is negligible, and the risk level of risk such that the implementation of the chosen RMMs will ensure that the Exposures should be controlled to at least the levels that represent an acceptable is considered to be controlled to a level of no concern

There are no routine anticiputed exposures by ingestion related to any supported uses of the substance. The risk ansing from aspiration hazard is solely related to the physical chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

35/36 (ES Revision date) Date of issue/Date of revision

Nytro Libra

by the ES

Base Oils, IP346<3%, H304) Uses in Functional fluids - Professional (Other Lubricant

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set

communicated via the satety data sheet by use of the following phraxe: Do not ingest. If swallowed then seek immediate medical assistance. For any substance, classifies as H304 (R65), these measures should be

management measures/operational conditions outlined in section 2 are implemented. Predicted exposures are not expected to exceed the DN(M)EL when the risk

Where other risk management measures/operational conditions are adopted, then

users should ensure that risks are managed to at least equivalent levels.

effects. Available hazard data do not support the need for a DNEI, to be established for other health effects. Risk management measures are based on qualifiative risk Available hazard data do not enable the derivation of a DNEL for dermal initiant characterisation.

	Document type	Date	No of Pages					
ADD	Recommendation	Piotr M ikulski	12 th February 2016	2				
	Address	Title						
	ABB Sp. z o.o. PGHV 59 Leszno St. 06-300 Przasnysz, POLAND		A 123a, PA 123 and PV 123 or the supporting					

As a manufacturer of transformers, we only specify recommendations for installation and parameters of the supporting structure that can serve as a guide. The installation method and requirements for the supporting structure must take into account guidelines specified by the transmission system operator, where the transformers will operate.

Requirements for the parameters of the supporting structure are presented in IEC 61936-1 "Power installations Exceeding 1 kV a.c. — Part 1: Common rules" and regarding seismic events we recommend you to take into account point 4.4.3.5 "Vibration" of the standard.

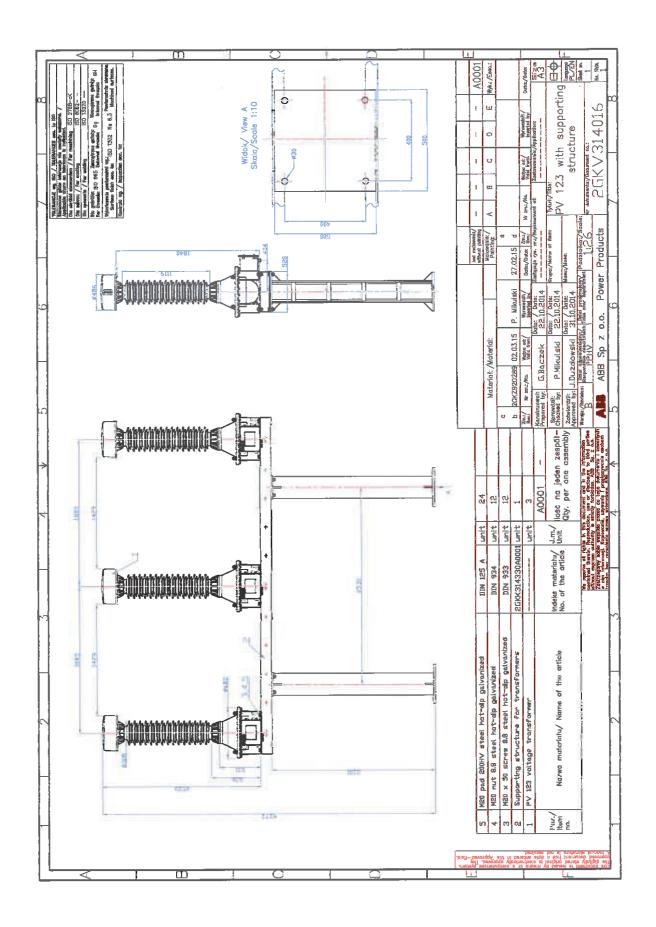
Regarding the installation of transformers on a supporting structure you need to follow the notes included in the operation and maintenance manuals for individual transformers.

Fixing holes distance in the transformers we offer is 450 x 450. The fixing holes are shown in the matrix drawings of transformers.

To install PVA 123a transformers we recommend you to use M16 or M18 mounting screws (fixing holes Φ 19) and to install PV123 and PA 123 transformers — M20 mounting screws (mounting holes Φ 24).

Example of drawing with mounted PV 123 transformers is on the next page.

My



PV 123 voltage transformer Installation and operation manual



Your safety first!

This is the reason why our instruction begins with the following guidelines:

- Use the transformer for its intended purpose.
- Observe the technical data given in the rating plate and in the specification.
- To facilitate and ensure high quality standards, the installation should be carried out by trained personnel or supervised by the service department of ABB.
- Operations have to be carried out by specially trained electricians who are familiar with the following instructions.
- It is recommended to observe the standards (DIN VDE/IEC) and local H&S regulations as well as the requirements of the local electric authority.

- Transformer work should be changed over in accordance with the instructions in the manual.
- All documentation should be available to all persons involved in installation, maintenance and operation.
- Operating personnel shall bear all responsibility for all aspects related to the operational safety as stated in EN 50110 (VDE 0105) and national regulations.
- Observe the safety rules, which are compliant with EN 50110 (VDE 0105) standard. It pertains to ensuring a dead state at the site of works carried out on a transformer.

If you have any questions regarding the information contained in this manual, our organisation will provide the necessary information.



Important information

This manual is intended to explain the mode of operation and installation of the product.



NOTE:

All descriptions contained in this document are for general information only and do not include specific design requirements. Please refer to the exact design documentation while connecting the device.

Operating the device without reading the manual may entail property damage, serious injury or death. The person responsible for the installation of the device should read the following instructions and follow the recommendations contained herein.

For your own safety:

- Make sure that all installation, service and maintenance works are performed by professionals.
- Make sure that during all the phases (installation, service, upkeeping) all applicable regulations will be preserved.
- Ensure that the guidelines contained in this manual are followed.

Basic guidelines for this manual.

Read the relevant chapters of this manual to provide adequate operation. Chapters are marked according to their significance.



For the purposes of this manual, failure to follow the instructions concerning the dangers could result in death or serious injury.

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PV 123 voltage transformer

1. Introduction

The manual covers PV 123 overhead inductive voltage transformers. Those instrument transformers are used for feeding measurement and protection systems in power networks of 123 kV highest system voltage or lower (the greatest effective value of phase-to-phase voltage) and 50 Hz frequency. They are designed either to operate in grids with effectively earthed or insulated neutral points or in compensated networks.

2. Transformer delivery

Typically the transformers are delivered in bulk packaging (3 pcs) where they are stacked vertically. The packaging is in the form of a complete crate or just the base. The delivered transformers are fully assembled, tested and ready for direct use. Product testing protocols are delivered together with the transformers. Immediately after delivery, check whether the transformer has not been damaged during transportation. Check the transport packaging. Damaged packing may point out to careless handling of the transformer. Next, check the transformer itself. Special attention should be paid to possible damage of sheds and binder at insulator flanges, to the tightness of the transformer and the correct oil level indication in the device.

One should ensure that technical parameters of the transformer given in the rating plate are in accordance with the parameters given when submitting the order and in accordance with the design documentation parameters.

Any damage found or other error should be immediately notified to the manufacturer, and if appropriate, the carrier. Sending photos of damage will be helpful in its assessment.

3. Transportation, unpacking, lifting

Transformers should be transported in a vertical position. Horizontal transport is not possible.

Transformers should be lifted with a crane with appropriate load capacity using four slings of the same length (min. 3 m). Hooks should be placed in designated holders in the bottom tank cover.

4. Storage

Transformers should be stored in the vertical position on a levelled and hardened surface, preferably in the original packaging. In the case of long-term storage, it is recommended to protect contact surfaces against corrosion.

Transformers can be stored in the open air for up to two years. If this period is exceeded, it is recommended to place transformers in a well-ventilated room or under a roof, and to insert silica gel or another moisture absorbent into terminal boxes.

5. Installation

The support structure should be flat and horizontal. Levelling correction can be performed using distance washers, placing them between the transformer and the structure. Observe the notes given in item 3 while shifting the transformer. It should be fastened to the structure with screw elements of an adequate size. The support structure and fastening elements are not included in the delivery. The transformer should be placed in the vertical position at least 24 h before energizing (if it was tilted for any reason).

5.1. Earthing terminals

Two earthing terminals are found on the bottom tank of the transformer across its diagonal. Prior to connection, the contact surface of the terminals should be thoroughly cleaned from oxide layers so it becomes uniform and smooth. Additionally, a thin layer of conducting grease can be applied in order to improve contact. The earthing should be connected with stainless bolts.

5.2. Primary terminal (A)

Primary terminal (A) is located on the plate located on the transformer isolator.

The contact surface of the primary terminal should be even and cleaned from the oxide layer before connecting.

To a terminal prepared in such a way the line cable terminals should be tightened with M12 bolts (stainless bolts are recommended).



Primary connections should be made in such a way so as to minimise mechanical static loads of the transformer terminal. It is recommended to use flexible elements as rigid connections may cause damage of the transformer. The maximum allowable static load on a transformer terminal is equal to 3,600 N in any direction. Also, it is recommended to maintain the sum of the loads acting on the primary terminal during normal operation of the transformer below 50% of such a value.

5.3. Secondary terminals

Secondary windings are connected to terminal blocks placed in the terminal box on the bottom tank of the transformer. These are typically Phoenix ST spring connectors with terminals adapted to connection of cables of cross-section up to 10 mm² or up to 6 mm². Each terminal is described in accordance with winding markings given on the rating and schematic diagram plates. Yellow-green terminals (with the earthing mark) are intended for

earthing secondary windings with the use of pushed crosswise bridges. The crosswise bridge can be removed with a screwdriver, by inserting it in the slit and levering. Apart from secondary terminals, there are two additional terminals in the terminal box. voltage coil screen terminal (E) primary winding terminal (N)

Optionally, the connectors to which metering windings are led may be adapted for sealing with use of a transparent cover.

A rating plate is placed on the external side of the door, while the schematic diagram plate is placed inside.

In the bottom wall of the terminal box, there is a plate with openings for glands for secondary circuits' connection cables. In the typical execution, they are two M32 glands with the choking range of $211 \, \text{mm} - 221 \, \text{mm}$.

An example of a terminal box for secondary windings of the transformer is shown in Figure 1.

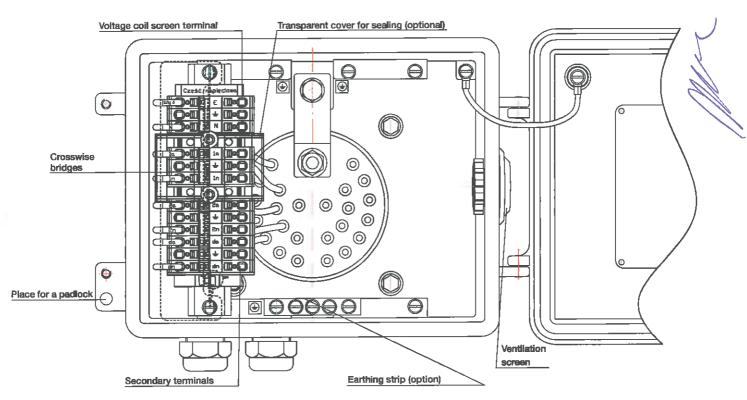


Fig. 1. Example of a terminal box

Connect external circuits to secondary terminals of the voltage module of the transformer pursuant to the design documents and wiring shown on the schematic diagram plate.

The screen terminal (E) and the primary winding (N) terminal of the voltage coll shall be earthed with crosswise bridges with the neighbouring earthing connector during normal transformer operation.

Connectors inside the terminal box are arranged so that, when using crosswise bridges, earthing is possible for any secondary terminal of a given winding. The unused secondary windings shall remain open and its "end" marked as "..n" should be earthed with a crosswise bridge.

In PV 123 type transformers, the chokes on all secondary windings are constructed of copper wire Cu-ETP of the diameter of 1.2 mm and length of 50 mm. The chokes are installed in the conductors running out of the resin bushing downstream the terminal block located in the transformer box.

The chokes protect the transformer against damage in the case of shorting of the transformer secondary terminals. This type of protection is sufficient to protect the transformer at a short section to the nearest point in which proper protections are installed. Additional fuses in the transformer terminal box are not necessary. If a short circuit has occurred and this type of protection has been activated, the choke must be replaced.

A

NOTE:

Secondary terminals of the transformer shall never be shorted.

Residual voltage windings marked as "da-dn", used to connect three transformers in an open delta to adjacent phases, should be grounded in one point only (in one of three transformers). Earthing of "da-dn" windings connected in such a way in more than one point will cause shorting and may lead to damage of the transformer.

5.4. Ferroresonance phenomenon

The PV 123 transformers are resistant to ferroresonance in a wide range of capacitance to earth and of control capacitors used in circuit breakers. However, in the case of networks for which these phenomena occurred before or network configurations being particularly sensitive to such phenomena (e.g. with long cable lines), it is recommended to use an additional damping resistor with a value of 50–50 onms and power of 200 W, connected in the open delta circuit of three da-dn transformer windings.

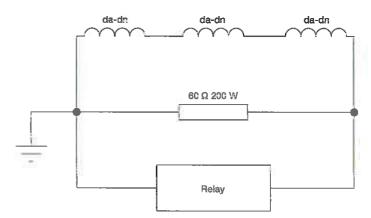


Fig. 3. Schematic diagram of a resistor in the open delta circuit

6. Bolt tightening torques

Primary terminal polts M12	80 Nm
Bolts fastening the transformer to the support structure	280 Nm

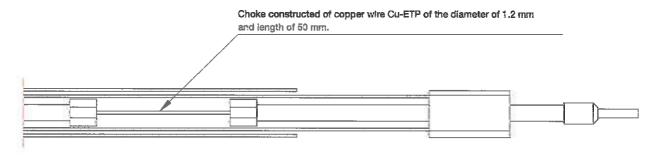


Fig. 2. Secondary winding



7. Operation and maintenance



NOTE:

Voltage transformers are HV equipment, hence appropriate safety precautions shall be observed during their operation.

The metrological range of the transformer is guaranteed exclusively in the field determined by the applicable standard on the basis of rated data. The standard is given on the rating plate of the transformer. The metrological range of the transformer is also shown in the record of the test of product, which is supplied with the transformer. Metrological values of the transformer are not guaranteed in any way beyond this field.

7.1. Operation

Transformers do not require special servicing. Visual inspection is usually sufficient. The check-list is placed at the end of this manual.

Visual inspection:

Visual inspection should be based on:

- position of the oil level indicator,
- tightness of the transformer,

- lack of mechanical damage,
- condition of the insulator and binder connecting the insulator with flanges.

Occasionally, check the tightening degree of the primary terminal.

The transformer tightness is a particularly important criterion as in the case of oil leaks moisture can penetrate the device. Small insulator damage may be repaired on site.

Oil level indicator:

Changes of the position of the oil level indicator depend on oil temperature in the transformer. The position of the indicator should be in the green field range. Shifting of the indicator to the upper or bottom red field points out to incorrect transformer operation. In such a case, the transformer should be put out of service, and the manufacturer should be contacted.

On the top of the transformer a stainless steel expansion bellow (1) is placed, used for compensation of oil volume thermal changes in the transformer. The oil level indicator (2) is placed on the upper surface of the bellows. The bellows are placed in a metal cover (3) equipped with a view-finder (4). Cover removal does not result is unsealing of the transformer. The whole compensation system is shown in Figure 4.

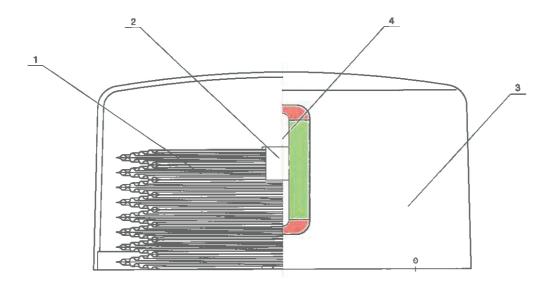


Fig. 4. Construction of the compensation system

Position of the oil level indicator	Interpretation		
Indicator in the green area	Correct transformer operation		
	Oil pressure too high		
	Transformer over heating		
Indicator on the upper red field	Oil gasification		
	(insulation failure)		
	Further inspection necessary		
	Cil level too low		
Indicates on the large and tiple	Suspicion of oil leakage (moisture		
Indicator on the lower red field	may penetrate inside)		
	Further inspection necessary		



NOTE:

Oil level indication for all three transformers installed on adjacent phases should be almost equal.

Measurement of the dielectric loss factor tg δ :

During measurement of the dielectric loss factor tg δ , the measuring bridge should be connected to the correct terminal marked with an E.

One should remember to earth it after performing the measurement. Usually, the test voltage should equal 10 kV RMS, and it should be applied across transformer primary terminal A and earth.

Oil sampling:

Due to the fact that transformers are air-tight, they do not require periodical oil checking. Oil used in the transformer meets the requirements of the PN-EN 60296 (IEC 60296) standard. It is recommended to check the oil after 15–20 years of operation or after a non-conformity state if there are suspicions as to transformer efficiency.

Contact the manufacturer in order to obtain necessary instructions concerning oil sampling. If oil samples are taken during the guar-

antee period without the manufacturer's permission, the device loses its guarantee.

7.2. Corrosion protection

External elements of the transformer casing are made in the form of aluminium alloy casts, resistant to corrosion. Casts can be unpainted or painted. Typical colours in the case of painted casts include light-grey (RAL 7035) or grey-green (RAL 7033). While remaining metal elements, such as bolts, are made of stainless steel.

8. Transformer construction

PV 123 type voltage transformer comprises a voltage coil in a tight enclosure filled with transformer oil.

On the coiled, cut apron magnetic core, concentric secondary windings and the primary winding are located. Multilayered primary winding is insulated using transformer oil impregnated electrical grade paper. The distribution of stresses in the paper insulation is capacitor controlled. The core with windings is located in the lower tank.

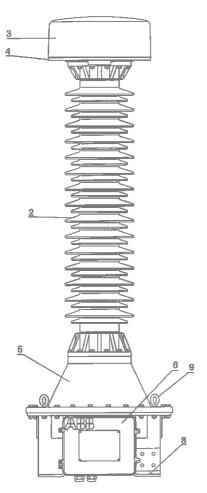
The transformer primary insulation constitutes electric grade paper dried at a high temperature and high vacuum impregnated with transformer oil. The free spaces inside the transformer are filled with transformer oil.

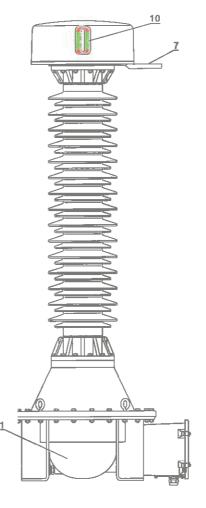
External insulation comprises a hollow insulator made out of electrical porcelain with brown enamel or a glass reinforced plastic (FRP) tube coated with grey silicon rubber.

The seals in the transformer are of the o-ring type, and they are made of NBR oil-resistant rubber.

If calibration of measuring windings has been performed, additional respective markings (designations) have been placed on the transformer and the rating plate (where required).







- 1. bottom tank
- 2. hollow insulator
- 3. compensation bellows
- 4. bellow plate
- 5. voltage coil
- 6. secondary coils terminal box
- 7. primary terminal (A)
- 8. openings for fastening the transformer
- holders for lifting the transformer
- 10. oil level Indicator



Fig. 5. PV 123 voltage transformer

9. Disposal

During correct operation and when no mechanical damage occurs, the transformer should operate over 30 years. Once this period of time has expired or if operation is no longer required, it is recommended to dispose of the transformer.

Primary materials used in the transformer:

Linner	ry materials used in the transitinier.	
Item	Material	Quantity [kg]
1	Copper (Cu – ETP)	10
2	Aluminium alloy AC-AI Si10Mg (Cu)	40
3	Steel	20
4	Transformer plate	50
6	Mineral trans former oil	50
7	Electrical grade paper	25
8	Solid insulation materials (epoxy resin, bakelite	5
	paper)	
9	Porcelain	80
10	Composite insulator	20

Item 9 and 10 alternatively.

Above values are approximate.

9.1. Recycling and disposal proceedings

Recycling and disposal should meet national (or local) regulations. On the territory of the Republic of Poland, the manner by which the transformer should be recycled and disposed is defined in the Waste Act of 14 December 2012, published in Journal of Laws, 2013, item 21, as amended.

10. Check list

10.1. Before first energising

What to check:	When	Check:
External packing appearance	Ą	No signs of careless handling
2. Transformer tightness	A B C	No visible oil leaks or greasy stains (even if the packing is intact)
3. Transformer housing	в с	Insulator, terminals and housing of the transformer show no signs of mechanical damage.
4. Oil level	8, C	Oil level indicator is in the proper position
5. Quality and correctness of performed connections	C	Performed connections are reliable and in accordance with the design

10.2. After first energising

What to check:	When	Check:
6. Transformer tightness	D, E	No visible oli leaks or greasy stains
7. Transformer housing	D, E	Insulator, terminals and housing of the transformer show no signs of mechanical damage.
8. Oil level	D, E	Oil level indicator is in the proper position
Secondary winding insulation test (measurement method	E	Values dependent on age, voltage level, measurement method and temperature
depends on local practices)		
10. Dielectric loss factor tg δ (measurement method depends	Ε	Values dependent on age, voltage level, measurement method and temperature
on local practices)		Respective terminals are marked as: Ε/tg δ
11. Oil sampling: gas analysis (DGA), tg δ , water content	E	Measurements did not indicate exceeding of permissible limits

When

A	After arrival of the transformer to the final location
5	After unpacking
C	Directly before applying voltage
D	During routine inspection in accordance with the schedule determined for the station
Ξ	After 15-20 years or inspection of efficiency after the non-conformity state if there are suspicions as to transformer efficiency

11. End

For additional information concerning the operation and maintenance of PV 123 transformers, please contact the transformer manufacturer.

Notes			
	 	l)	

For more information, please contact:

ABB Contact Center

Phone: +48 22 22 37 777 e-mail: kontakt@pl.abb.com

ABB Sp. z o.o. Branch Office in Przasnysz ul. Leszno 59

Phone: +48 22 22 38 931, +48 22 22 39 255

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06-300 Przasnysz

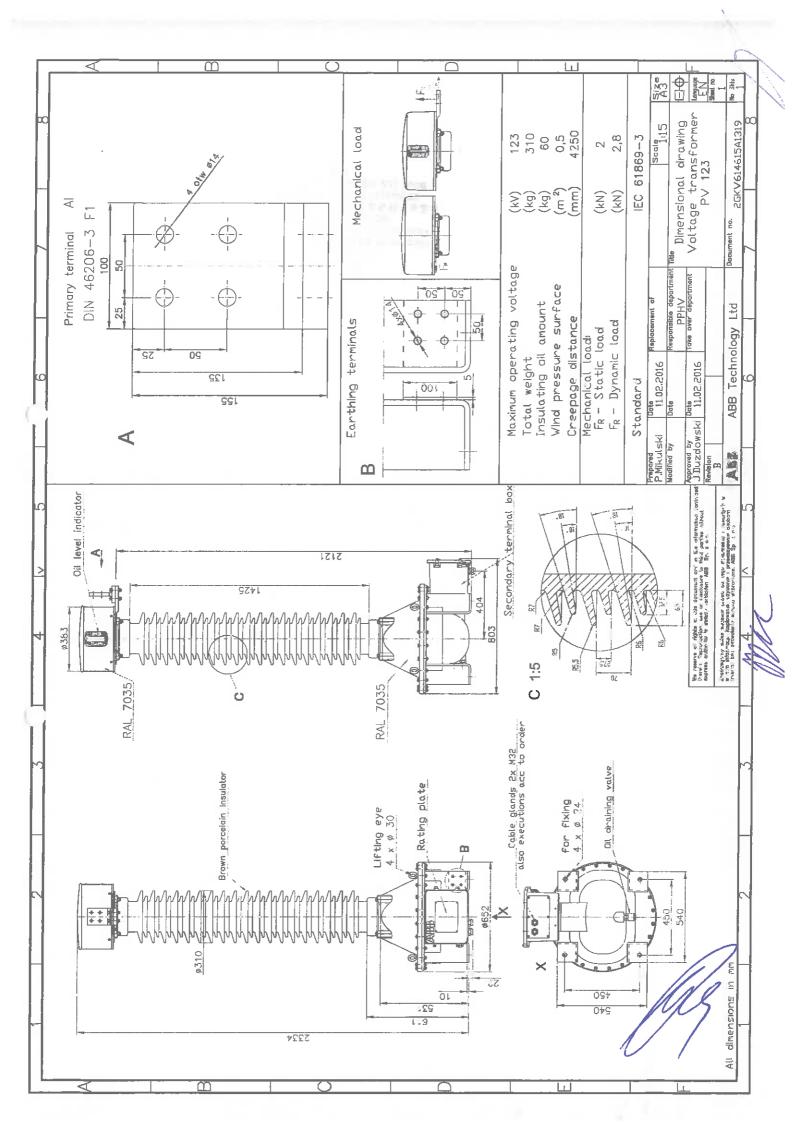
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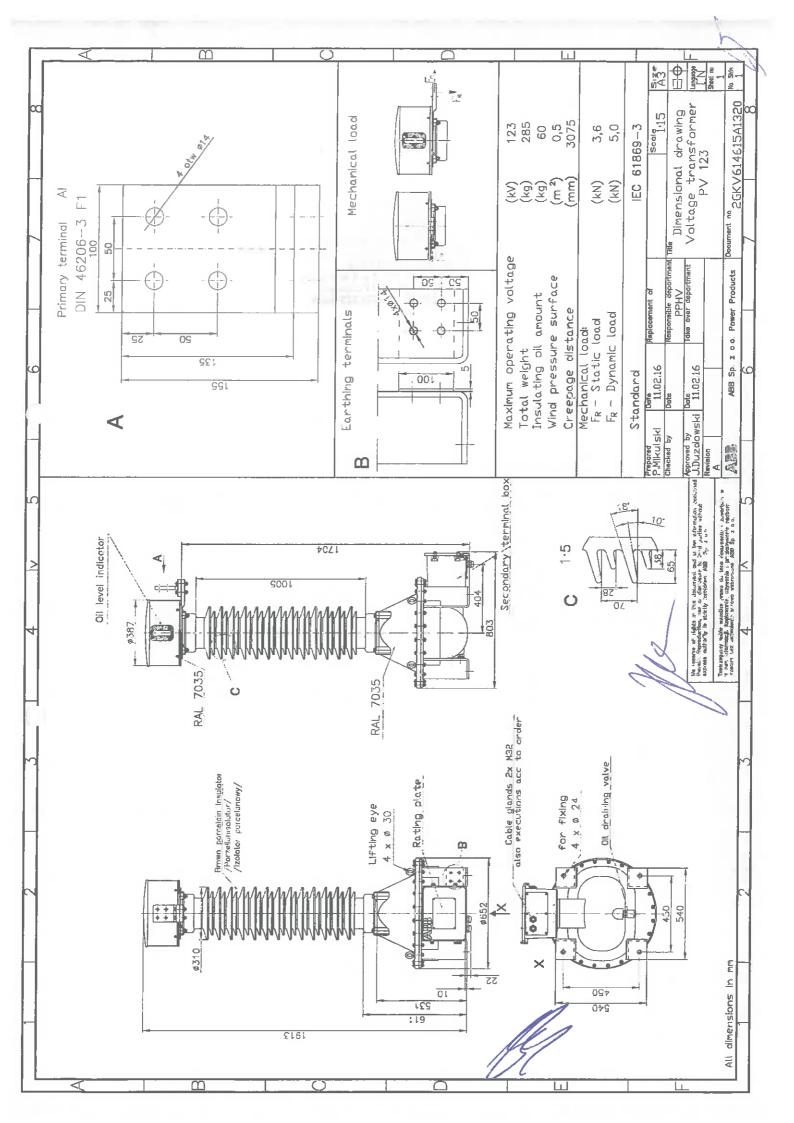






Заличено по чл.2 от ЗЗЛД

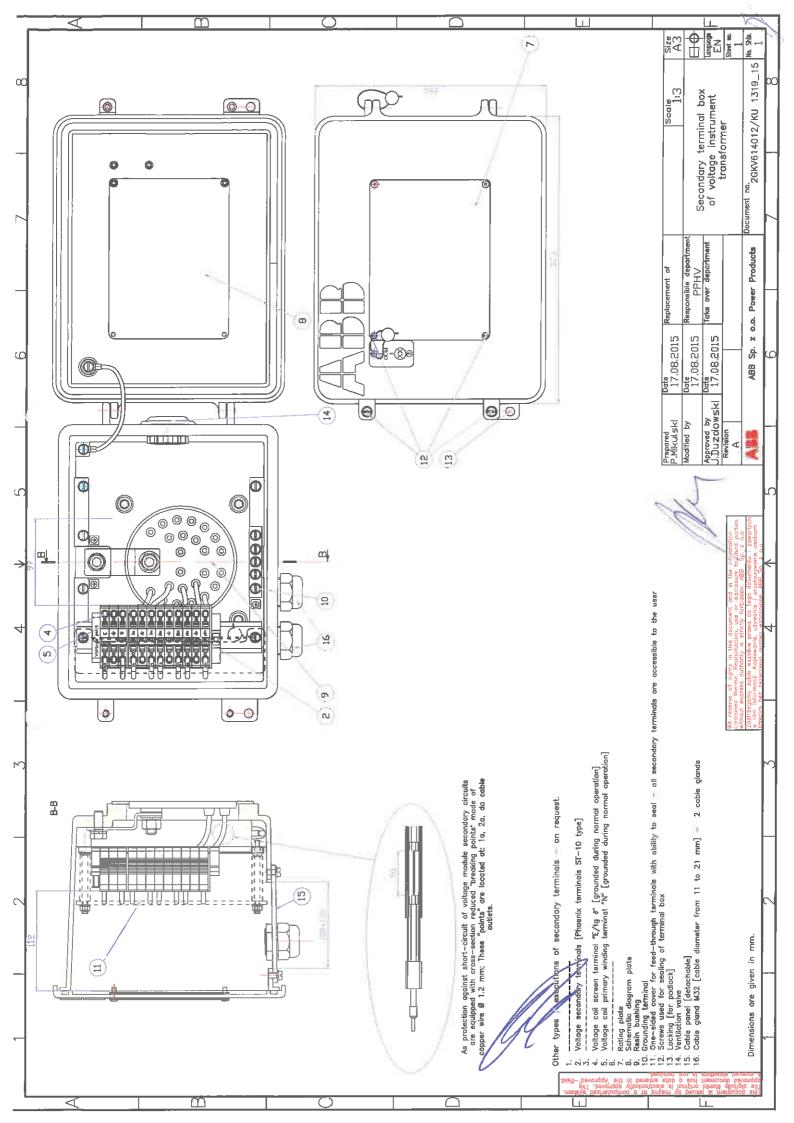






Заличено по чл.2 от ЗЗЛД

O D D'E LA E W PRZASNYSZU Ul. Lešzno 59, 06-300 Przesnysz tel. (22) 223 8849, fax (22) 223 8958 (16)





Списък на всички използвани стандарти при конструирането и изпитванията

ЕСО ЕАД, гр. София 1404, бул. "Гоце Делчев", №105 Процедура за възлагане на обществена поръчка с предмет: "Доставка на измервателни трансформатори за напрежение 110 kV",

Обособена позиция № 2 "Напреженови измервателни трансформатори 110 kV"

Предложените напреженови измервателни трансформатори 110 kV тип PV, отговарят на следните стандарти:

- IEC 61869-1
- IEC 61869-3

Заличено по чл.2 от ЗЗЛД

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