TEST REPORT

Report Number:	XH2611L110103GR
Testing Laboratory:	
Name:	Xihua International Testing & Certification (Shenzhen) Co., Ltd.
Address:	Building 10, No.23, North Lane 1, Beihuan Road, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Testing location:	Xihua International Testing & Certification (Shenzhen) Co., Ltd.
Date of issue:	Jul. 24, 2026
Date of Test:	Jul. 13, 2026 To Jul. 24, 2026
Applicant:	
Name:	Milky Way Transformer Co.,Ltd.
Address:	No. 8, Dongfeng Road, Wanshi Town, Yixing City, Jiangsu Province, China
Test specification:	
Standard:	IEC 60076-1:2011
Test procedure:	N/A
Non-standard test method:	N/A
Test item:	
Test Item description:	Three Phases Oil-immersed Transformer
Trade Mark:	N/A
Model and/or type reference:	S11-10000/69
Additional Model:	SJ-63,SJ-80,SJ-100,SJ-120,SJ-150,SJ-180,SJ-200,SJ-250, SJ-300,SJ-350,SJ-400,SJ-450,SJ-500,SJ-550,SJ-630, SJ-800,SJ-1000,SJ-1200,SJ-1250,SJ-1500,SJ-1800, SZ-2000,SZ-2400,SZ-3000,SZ-3600
Manufacturer:	Milky Way Transformer Co.,Ltd.
Address:	No. 8, Dongfeng Road, Wanshi Town, Yixing City, Jiangsu Province, China
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):	
Testing Laboratory:	Xihua International Testing&Certification(Shenzhen)Co.,Ltd.
Testing location/address:	Building 10,No.23,North Lane 1,Beihuan Road,Shiyan,Bao'an District,Shenzhen,Guangdong,China
Tested by(name,function,signature):	Penny Chen/ Project Handler
Approved by(name,function,signature):	Johnson Xu/ Designated Reviewer

TEST REPORT

IEC 60076-1

Power transformers - Part 1: General

Test item description ..... : Three Phases Oil-immersed Transformer

Rating(s)..... : See Copy of marking plate

Test case verdicts:

Test case does not apply to the test object : N(/A)

Test item does meet the requirement ..... : P(ass)

Test item does not meet the requirement .. : F(ail)

General remarks:

This report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item(s) tested.

"(see remark #)" refers to a remark appended to the report.

"(see Annex #)" refers to an annex appended to the report.

Clause numbers between brackets refer to clauses in EN IEC 60598-1,EN IEC 60598-2-1

Throughout this report a comma is used as the decimal separator.

General product information:

The series products have the same circuit diagram, PCB layout and functionality. The differences are the model name and power, so, we select S11-10000/69 to test.

Copy of marking plate:

Product: Three Phases Oil-immersed Transformer
Model:S11-10000/69
Input: AC69/13.2KV, 60Hz, 83.7/437.4A, 10000KVA

Milky Way Transformer Co.,Ltd.
Made In China

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
1	SCOPE		P
	This part of IEC 60076 applies to three-phase and single-phase power transformers (including auto- transformers)		P
	with the exception of certain categories of small and special transformers suchas:		N/A
	• single-phase transformers with rated powerless than 1 kVA and three-phase transformers less than 5 kVA;		N/A
	• transformers, whichhave nowindings withrated voltage higher than 1 000 V;		P
	•instrument transformers		P
	•starting transformers		N/A
	•testing transformers		P
	•welding transformers;		N/A
	•voltage regulating transformers;		N/A
	•explosion-proof and mining transformers;		N/A
	•transformers for deepwater (submerged) applications.		N/A
	When IEC standards do not exist for such categoriesoftransformers(inparticulartransformer having no winding exceeding 1000 Vforindustrial applications), this part of IEC 60076 may still be applicable either asa whole orin part.		N/A
	At several places in this part it is specified or recommended that an 'agreement' should be reached concerning alternative or additional technical solutions or procedures. Suchagreement is made between the manufacturer and the purchaser. The matters should preferably be raised at an early stage and the agreements included in the contractspecification.		N/A
4	Service conditions		N/A
4.1	General		N/A
	The service conditions set out in 4.2 represent the normal scope of operation of a transformerr Specified to this standard.for any unusual service conditions which require special Consideration in the design of a transformer see 5.5.such conditions include high altitude, Extreme high or low external cooling medium temperature,tropical humidity,seismic activity, Severe contamination,unusual voltage or load current wave shapes,high solar radiation and		N/A

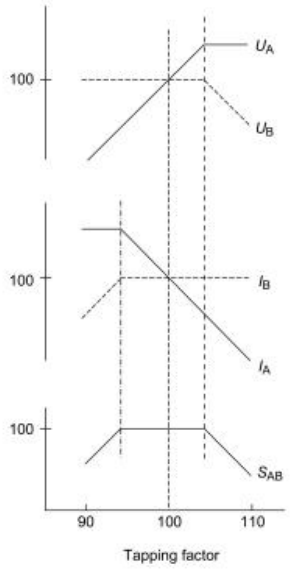
IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Intermittent loading.they may also concern conditions for shipment,storage and installation, Such as weight or space limitations(see annex a).		
4.2	Normal service conditions		P
	This part of iec 60076 gives detailed requirements for transformers for use under the following conditions: Altitude A height above sea-level not exceeding 1000 m.		P
5	Rating and general requirements	See Copy of marking plate	P
5.1	Rated power	See Copy of marking plate	P
5.1.1	General		P
	The rated power for each winding shall either be specified by the purchaser or the purchaserr Shall provide sufficient information to the manufacturer to determine the rated power at the enquiry stage.		P
	The transformer shall have an assigned rated power for each winding which shall be marked On the rating plate.the rated power refers to continuous loading.this is a reference value for Guarantees and tests concerning load losses and temperature rises.		P
5.1.2	Preferred values of rated power	See Copy of marking plate	P
	For transformers up to 20 mva,values of rated power should preferably be taken from the R10 series given in iso 3:1973,preferred numbers-series of preferred numbers:		P
5.1.3	Minimum power under alternative cooling modes		N/A
	Where the user has a particular requirement for a minimum power under a particular cooling Mode other than the cooling mode for rated power,this shall be stated in the enquiry.		N/A
5.1.4	Loading beyond rated power	See Copy of marking plate	P
	A transformer and its component parts in accordance with this standard is able under some circumstances to carry loading beyond rated power.the method for calculating the permissible loading can be found in iec 60076-7 for liquid immersed transformers and in Iec 60076-12 for dry-type transformers.	See Copy of marking plate	P
5.2	Cooling mode		N/A
	The user shall specify the cooling medium(air or water).		N/A

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	If the user has particular requirements for the cooling method(s)or cooling equipment,this shall be stated in the enquiry.		N/A
	For additional information see iec 60076-2.		N/A
5.3	Load rejection on transformers directly connected to a generator		N/A
	Transformers intended to be connected directly to generators in such a way that they may be Subjected to load rejection conditions shall be able to withstand 1,4 times rated voltage for 5 s At the transformer terminals to which the generator is to be connected.		N/A
5.4	Rated voltage and rated frequency	See Copy of marking plate	P
5.4.1	Rated voltage	See Copy of marking plate	P
	The rated voltage shall either be specified by the purchaser or for special applications the Purchaser shall provide sufficient information to the manufacturer to determine the rated Voltage at the enquiry stage.	See Copy of marking plate	P
	The transformer shall have an assigned rated voltage for each winding which shall be marked On the rating plate.		P
5.4.2	Rated frequency	See Copy of marking plate	P
	The rated frequency shall be specified by the purchaser to be the normal undisturbed Frequency of the network.	See Copy of marking plate	P
5.4.3	Operation at higher than rated voltage and/or at other than rated frequency		P
	Methods for the specification of suitable rated voltage values and tapping range to cope with A set of loading cases(loading power and power factor,corresponding line-to-line service Voltages)are described in iec 60076-8.	See Copy of marking plate	P
	Within the prescribed values of um,for the transformer windings,a transformer shall beCapable of continuous operation at rated power without damage under conditions of 'overfluxing'where the value of voltage divided by frequency(v/hz)exceeds the Corresponding value at rated voltage		N/A
5.5	Provision for unusual service conditions		P
	The purchaser shall identify in his enquiry any service conditions not covered by the normal Service conditions.examples of such conditions are: -external cooling medium temperature outside the limits prescribed in 4.2;		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	-restricted ventilation;		
	Supplementary requirements,within defined limits,for the rating and testing of transformers designed for other than normal service conditions listed in clause 4,such as high temperature of cooling air or altitude above 1000 m are given in iec 60076-2.		P
5.6	Highest voltage for equipment umand dielectric tests levels		P
	For line terminals,unless otherwise specified by the purchaser,um shall be taken to be the Lowest value that exceeds the rated voltage of each winding given in iec 60076-3.		N/A
	For transformer windings with a highest voltage for equipment greater than(>)72,5kv the Purchaser shall specify whether any neutral terminals for that winding are to be directly Earthed in service or not,and if not,the um for the neutral terminals shall be specified by the Purchaser.		P
	Unless otherwise specified by the purchaser,dielectric test levels shall be taken to be the Lowest applicable value corresponding to um,given in iec 60076-3.		P
5.7	Additional information required for enquiry		P
5.7.1	Transformer classification	Class B/F	P
	The kind of transformer,for example,separate winding transformer,auto-transformer or Series transformer shall be specified by the user.		N/A
5.7.2	Winding connection and number of phases	Three Phases Oil-immersed Transformer	P
	The required winding connection shall be specified by the user in accordance with the Terminology given in clause 7 to suit the application.		P
	If a delta connected stabilizing winding is required,it shall be specified by the purchaser.for Star-star connected transformers or autotransformers,if the design has a closed magnetic Circuit for zero sequence flux and no delta winding is specified,then the requirement shall be Discussed between the manufacturer and the purchaser(see iec 60076-8).	Three Phases Oil-immersed Transformer	P
	Note a closed magnetic circuit for zero sequence flux exists in a shell-form transformer,and in a core-form Transformer with an unwound limb or limbs.		N/A

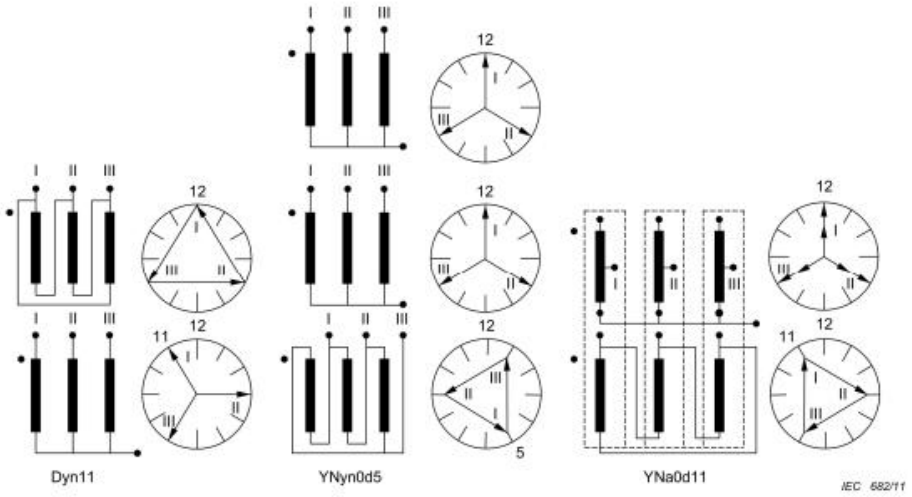
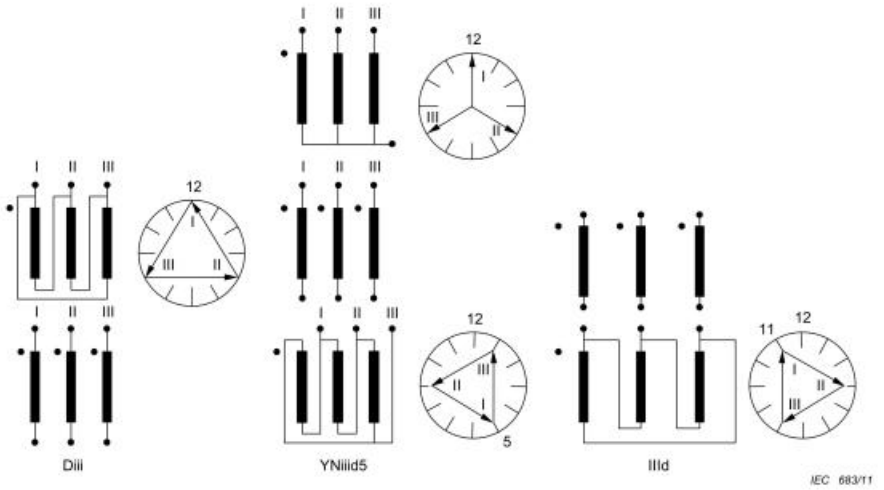
IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	If there is a particular requirement for either a bank of single phase transformer or a three Phase unit,then this shall be specified by the user;otherwise the manufacturer shall make it Clear in the tender document what type of transformer is being offered.		P
5.7.3	Sound level		P
	Where the purchaser has a specific requirement for a guaranteed maximum sound level,this Shall be given in the enquiry and should preferably be expressed as a sound power level.		P
	Unless otherwise specified,the sound level shall be taken as the no load sound level with all Cooling equipment required to achieve rated power in operation.if an alternative cooling mode Is specified(see 5.1.3)the sound level for each alternative mode may be specified by the Purchaser and if specified shall be guaranteed by the manufacturer and measured on test.		P
5.7.4	Transport		P
5.7.4.1	Transport limitation		N/A
	If transport size or weight limits apply,they shall be stated in the enquiry.		N/A
	If any other special conditions apply during transportation,they shall be stated in the enquiry. This might include a restriction on the transportation with insulating liquid or different Environmental conditions expected to be experienced during transportation than those Expected in service.	See manufacturer's product manual	P
5.7.4.2	Transport acceleration		P
	The transformer shall be designed and manufactured to withstand a constant acceleration of At least 1 g in all directions(in addition to the acceleration due to gravity in the vertical Direction)without any damage,demonstrated by static force calculations based on a constant Value of acceleration.	See manufacturer's product manual	P
	If the transport is not the responsibility of the manufacturer and an acceleration in excess of 1 g is expected during transport,the accelerations and frequencies shall be defined in the Enquiry.if higher accelerations are specified by the customer,the manufacturer shall Demonstrate compliance by means of		N/A

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	calculation.		
5.8	Components and materials		N/A
	All components and materials used in the construction of the transformer shall comply with The requirements of the relevant iec standards where they exist unless otherwise agreed or Specified.in particular bushings shall comply with iec 60137,tap-changers shall comply with Iec 60214-1,and insulating liquid shall comply with iec 60296 for mineral oil or as agreed for Other liquids.		N/A
6	Requirements for transformers having a tapped winding		P
6.1	General-notation of tapping range		P
	The following subclauses apply to transformers in which only one of the windings is a tapped winding.		P
	In a multi-winding transformer,the statements apply to the combination of the tapped winding with either of the untapped windings.		N/A
	For transformers specified in accordance with 6.4.2,the notation shall be as specified by the Purchaser in item 3 of that subclause.		N/A
	In auto-connected transformers,tappings are sometimes arranged at the neutral which means That the effective number of turns is changed simultaneously in both windings.for such Transformers,unless they are specified in accordance with 6.4.2,the tapping particulars are Subject to agreement.the requirements of this subclause should be used as far as Applicable.	See manufacturer's product manual	P
6.2	Tapping voltage-tapping current.standard categories of tapping voltage variation.maximum voltage tapping		P
	The short notation of tapping range and tapping steps indicates the variation range of the Ratio of the transformer.but the assigned values of tapping quantities are not fully defined by This alone.additional information is necessary.this can be given either in tabular form with		N/A

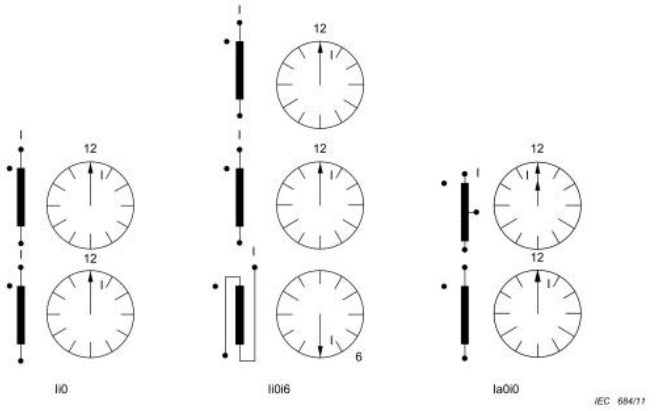
IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	 **Figure 1c – Combined voltage variation (CbVV)** The change-over point is shown in the plus tapping range. It constitutes both a maximum voltage tapping (U_A) and a maximum current tapping (I_B constant, not rising above the change-over point). An additional, optional maximum current tapping (in the CFVV range) is also shown. **Key for Figure 1a, 1b and 1c:** U_A , I_A tapping voltage and tapping current in the tapped winding U_B , I_B tapping voltage and tapping current in the untapped winding S_{AB} tapping power Abscissa tapping factor, percentage (indicating relative number of effective turns in tapped winding) 1 indicates full-power tappings throughout the tapping range 2 indicates 'maximum-voltage tapping', 'maximum current tapping' and range of reduced power tappings **Figure 1 – Different types of voltage variation**		P
6.3	Tapping power.full-power tappings-reduced-power tappings		P
	The following shall apply unless the voltage and current at each tapping is otherwise specified.		P
	All tappings shall be full-power tappings,that is,the rated tapping current at each tapping shall be the rated power divided by the rated tapping voltage at each tap except as specified below.	See manufacturer's product manual	P
6.4	Specification of tappings in enquiry and order		P
6.4.1	General		N/A
	The purchaser shall specify the requirements for tapping either according to 6.4.2 or 6.4.3.		N/A
	The purchaser shall specify if the tap changer or tap changers are intended to be operated on load or de-energized.		N/A
6.4.2	Constructional specification		P
	The following data are necessary to define the design of the transformer:		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
6.4.3	Functional specification		N/A
	This type of specification is intended to allow the purchaser to specify operational Requirements and not the category of voltage variation or which winding is to be tapped.		N/A
6.5	Specification of short-circuit impedance		P
	For transformers with no tappings exceeding a voltage variation of±5%from the principal tapping,the short-circuit impedance of a pair of windings shall be specified at the principal tapping only,either in terms of ohms per phase z or in percentage terms z referred to the rated power and rated voltage of the transformer(see 3.7.1).alternatively,the impedance may be specified in accordance with one of the methods below.	±5%	P
6.6	Load loss and temperature rise		P
	A)if the tapping range is within±5%,and the rated power not above 2500 kva,load loss Guarantees and temperature rise refer to the principal tapping only,and the temperature Rise test is run on that tapping.	See Copy of marking plate	P
7	Connection phase displacement symbols		P
7.1	Connection and phase displacement symbols for three-phase transformers and for single phase transformers connected in a three phase bank		P
7.1.1	Connection symbol		P
	The star,delta,or zigzag connection of a set of phase windings of a three-phase transformer Or of windings of the same voltage of single-phase transformers associated in a three-phase Bank shall be indicated by the capital letters y,d or z for the high-voltage(hv)winding and Small letters y,d or z for the intermediate and low-voltage(lv)windings.	See Copy of marking plate	P
	For an auto-connected pair of windings,the symbol of the lower voltage winding is replaced By the letter a.		P
	Open windings in a three-phase transformer(that are not connected together in the Transformer but have both ends of each phase winding brought out to terminals,for example The line windings of series and phase-shifting transformers)are indicated as Ⅲ(hv),or iii (intermediate or low-voltage windings).		N/A
7.1.2	Phase displacement in clock number notation		P
	The following conventions of notation apply.	Apply	P
	The connection diagrams show the high-voltage		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	winding above,and the low-voltage winding below.(the directions of induced voltages are on the upper part of the windings as indicated in figure 2.)		
	The high-voltage winding phasor diagram is oriented with phase i pointing at 12 o'clock.the phase i phasor of the low-voltage winding is oriented according to the induced voltage relation which results for the connection shown.the clock number symbol is the hour on which the low voltage points.		N/A
	Note this numbering is arbitrary.terminal marking on the transformer follows national practice.guidance may Be found in iec/tr 60616.		P
7.1.3	Windings not intended to be loaded		P
	The existence of a stabilizing or a test winding(a delta or star-connected winding which is not Terminated for external three-phase loading)is indicated,after the symbols of loadable Windings,with the symbol'+d'or'+y'according to its connection as in the examples below:	Comply	P
7.1.4	Reconnectable windings		P
	If a transformer is specified with a reconfigurable winding connection,the alternative coupling Voltage and connection is noted in brackets after the delivered configuration as indicated by The following examples:	Comply	P
	If hv can be 220 kv or 110 kv(dual voltage)but star-connection is required for both voltages And the transformer is delivered in 220 kv configuration and lv is 10,5 kv delta connected:		N/A
7.1.5	Examples		P
	Examples are shown below and their graphical representations are shown in figures 2 and 3.		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	 **Figure 2 – Illustration of 'clock number' notation**		P
	 **Figure 3 – Illustration of 'clock number' notation for transformers with open windings** – A three-phase transformer designed for a 20 kV delta connected HV and with a 10 kV open winding. Symbol: Diii 20 / 10 kV – A three-phase three winding transformer designed for a 220 kV star connected HV with a 40 kV open winding and a 10 kV third winding delta connected. Symbol: YNiiid5 220 / 40 / 10 kV – A three-phase series transformer designed for a 400 kV network and with a 40 kV excitation winding delta connected. Symbol: IIId 400 / 40 kV		P
7.2	Connection and phase displacement symbols for single phase transformers not in three phase bank		P
7.2.1	Connection symbol		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	The connection of a set of phase windings of single-phase transformers is indicated by the Capital letter i for the high-voltage(hv)winding and small letter i for the intermediate and low-Voltage(lv)windings.	See manufacturer's product manual	P
	Letter symbols for the different windings of a transformer are noted in descending order of Rated voltage independently of the intended power flow.the winding connection letter for any Intermediate and low-voltage winding is immediately followed by its phase displacement'clock Number'(see definition 3.10.6).		P
7.2.2	Phase displacement in clock number notation		P
	The clock number of single-phase transformers is determined as for three phase transformers But can only be 0 if both windings are in phase or 6 if they are in opposition.	See manufacturer's product manual	P
7.2.3	Windings not intended to be loaded		N/A
	The existence of a test or additional winding,which is not terminated for external loading,is Indicated,after the symbols of loadable windings,with the symbol'+i'as in the example below		N/A
7.2.4	Reconnectable windings		P
	If a transformer is specified with a reconfigurable winding connection,the alternative coupling Voltage and connection is noted in brackets after the delivered configuration as indicated by The following examples		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	 **Figure 4 – Illustration of 'clock number' notation** – A transformer with the high-voltage winding rated 20 kV, the low-voltage winding rated 400 V, the LV winding being in phase with the high voltage. Symbol: Ii0 20 000 / 400 V – A three-winding transformer: with a 123 kV HV, an intermediate voltage winding of 36 kV, in phase with the HV winding but not auto-connected, and a 7,2 kV third winding, lagging by 180°. Symbol: Ii0i6 123 / 36 / 7,2 kV – A single-phase autotransformer designed for a 400 kV HV and a 130 kV intermediate voltage with 22 kV tertiary windings all in phase Symbol: Ia0i0 400 / 130 / 22 kV If the third winding is not intended to be loaded, the symbol would indicate this by a plus sign. No phase displacement notation would then apply for the third winding. Symbol: Ii0+i 400 / 130 / 22 kV		P
8	RATINGPLATES		P
8.1	General		P
	The transformer shall be provided with a rating plate of weatherproof material, fittedina visible position, showing the appropriate items indicated below. The entries on the plate shall be indelibly marked.	The product covered bythis report isa build-incomponent, marking plating shall be evaluated in end -product modelCPSPSA1 .1MO.	P
8.2	Information tobe given in all cases		P
	The entries on the plate be indelibly marked (that is, by etching, engraving, stamping or by a photo-chemicalprocess):	The product covered bythis report isa build-incomponent, marking plating shall be evaluated in end -product modelCPSPSA1 .1MO.	P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	a) Kind of transformer (for exampletransformer, auto-transformer, series transformer, etc.).		N/A
	b) Number of this standard.		P
	c) manufacturer's name, country and town where the transformer wasassembled.	See manufacturer's product manual	P
	d) manufacturer's serial number.		P
	e) year of manufacture.		P
	f) Rated power (in kVA or MVA).	See manufacturer's product manual	P
	For multi-windingtransformers, the rated power of each winding shall be given. The loading combinations shall also be indicated unlessthe rated power ofone of the windings is the sum of the rated powers ofthe other windings.		N/A
	g) number of phases.		N/A
	h) Rated currents (in A orkA).		N/A
	i)Connection and phase displacement symbol.		N/A
	j) rated frequency;		N/A
	k) rated voltages, including tapping voltages, if any;		N/A
	l) rated currents for each kind ofcooling;		N/A
	m) connection symbol;		N/A
	n) short-circuit impedance at rated current and atthe appropriate referencetemperature;		N/A
	o) type of cooling;		N/A
	If the transformer has several assigned cooling methods, the respective power values maybe expressed as percentages of rated power, for example ONAN/ONAF 70/100 %.....		N/A
	p) totalmass;		N/A
	q) insulation levels for each winding according to IEC 60076-3 standard notation; r) degree of protection;		N/A
	s) Mass andtype ofinsulating liquid with reference tothe relevant IEC standard.		N/A
	t) Maximum system short-circuit power orcurrent used to determine the transformer withstand capability ifnotinfinite.		N/A
	If the transformer has more than one set of ratings, depending upon different connections of windings which have been specifically allowed for inthe		N/A

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	design, the additional ratings shall all be given on the rating plate, or separate rating plates shall be fitted for each set.		
8.3	Additional information tobe given when applicable		N/A
	The information listed below shall be included on the rating plate when it is applicable to a particular transformer.	The product covered bythis report isa build-incomponent, marking plating shall be evaluated in end -product modelCPSPSA1 .1MO.	N/A
	a) For transformers having one or more windings with'highest voltage for equipment' Um equal to or above 3,6kV:		N/A
	short notation of insulation levels (withstand voltages) as described in IEC 60076-3.		N/A
	b) Tapping designations		N/A
	For transformers with highest rated voltage less than or equal to 72,5 kV and with rated powerless than or equal to 20 MVA (three phase) or 6,7 MVA (single phase) having a tapping range not exceeding ±5 %, tapping voltages on the tapped winding for all tappings.		N/A
	For all other transformers:		N/A
	atable stating tapping voltage and maximum allowable tappingservice voltage, tappingcurrent, tapping power, and internal connection for all tappings,		N/A
	atable showing the short-circuitimpedance values for the principal tapping and at least the extreme tappingsin % withthe reference power.		N/A
	c) Guaranteed maximum temperature rises of top liquid and windings (if not normalvalues).		N/A
	When a transformer is intended for installation at high altitude, the altitude, power rating and temperature rise at that altitude shall be indicated on the nameplate together with one of the following:		N/A
	If the transformeris designed forinstallationat high altitude, the (reduced) temperature rise for rated		N/A

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	power under normal external cooling medium temperatureconditions.		
	If the transformer is designed for normalexternal cooling medium temperature conditions, the rated power for guaranteed temperature rise undernormal external cooling medium temperature conditions.		N/A
	d) Connection diagram (in cases wherethe connectionsymbolwillnot givecompleteinformation regardingtheinternalconnections).		N/A
	If the connections can be changed insidethe transformer, this shall be indicated either on the same plate, a separate plate or with duplicateor reversible rating plates. The connection fitted at delivery shall be indicated. Where non-linear resistors or fuses are employed withinthe transformer, the location and connection of such equipment shall be shown on the connection diagramplatewithterminalmarkings. Anindication of any built-incurrent transformers when used shall be presented on thediagram.		N/A
	e) Transportation mass (if different from total mass).		N/A
	f) Untanking mass (for transformers exceeding 5t total mass).		N/A
	g) Vacuum withstand capability of the tank, conservator, tap-changersand cooling equipment.		N/A
	h) For multi-winding transformers, any restriction on power-loading combinations.		N/A
	i) For transformers equipped with winding temperature indicators (WTI), the settings for each WTI.		N/A
	j) For all current transformers installed inside the transformer, the location, ratio(s), accuracy class and rated output (VA rating) of the current transformer.		N/A
	k) Minimum temperature of cooling medium if not- 5 °C for indoor transformers or -25 °C for outdoor transformers		N/A
	Plates with identification and characteristics of auxiliary equipment according to standards for such components (bushings, tap-changers,current transformers, special cooling equipment) shall be provided either on the components themselves or on thetransformer.		N/A
	If the transformeris designed forinstallationat high altitude, the (reduced) temperature rise		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	for rated power under normal external cooling medium temperatureconditions.		
	If the transformer is designed for normalexternal cooling medium temperature conditions, the rated power for guaranteed temperature rise undernormal external cooling medium temperature conditions.		N/A
	d) Connection diagram (in cases wherethe connectionsymbolwillnot givecompleteinformation regardingtheinternalconnections).		N/A
	If the connections can be changed insidethe transformer, this shall be indicated either on the same plate, a separate plate or with duplicateor reversible rating plates. The connection fitted at delivery shall be indicated. Where non-linear resistors or fuses are employed withinthe transformer, the location and connection of such equipment shall be shown on the connection diagramplatewithterminalmarkings. Anindication of any built-incurrent transformers when used shall be presented on thediagram.		N/A
	e) Transportation mass (if different from total mass).		N/A
	f) Untanking mass (for transformers exceeding 5t total mass).		N/A
9	Safety, environmental and otherrequirements		P
9.1	Safetyandenvironmental requirements		P
9.1.1	Liquid leaks		P
	Transformer manufacturers shall consider the effective containment of the liquid of the transformer and take effective measures to prevent leakage. Consideration shall be given to the long term performance of items such as:		P
	- joint design;	Product passed tightness test, but shall be doubleconsidered in end product model CPS PSA1.1MO.	P
	- gasketmaterials;	Gasket used between valves, meters,terminals. Product passed tightness test, but shall be doubleconsidered in	P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
		end product model CPS PSA1.1MO.	
	-welds;	Oil tank was welding together. Product passed tightness test, but shall be doubleconsidered in end product model CPS PSA1.1MO.	P
	-corrosionprevention.	Oil tank was covered by painting. Product passed tightness test, but shall be doubleconsidered in end product model CPS PSA1.1MO.	P
	Transformers shall be designed to be leak free and any leakage found on site at the end of commissioning shall be corrected bythe responsible supplier.		P
9.2	Dimensioning of neutral connection		N/A
	The neutral conductor and terminal oftransformers intended to carry a load between phase and neutral (for example, distribution transformers) shall be rated for the appropriate load current and earth-fault current (see IEC 60076-8).	Shall be considered in end product model CPS PSA1.1MO.	N/A
	The neutral conductor and terminal oftransformers not intended to carry load between phase and neutral shall be designed to carry earth-fault current as ifthe transformer was directly earthed.	Shall be considered in end product model CPS PSA1.1MO.	N/A
9.3	Liquid preservation system		P
	For liquid-immersed transformers, the type of liquid preservation system may be specified in the enquiry and order. If not specified, the manufacturershall indicate the liquid preservation system in the tender. The following types are distinguished:		N/A
	- Freely breathing system or conservator system where there is free communication between the ambient air andanair-filled expansion space		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	above the surface of the liquid, in the tank or in a separate expansion vessel (conservator). A moisture- removing breatheris fitted in the connection to the atmosphere.		
	- Diaphragm or bladder-type liquidpreservation system where an expansion volume of air at atmospheric pressure is provided above the liquid but prevented from direct contact with the liquid bya flexible diaphragm or bladder. Amoisture-removing breather is fitted in the connection to the atmosphere.		N/A
	- Inert gas pressure system where anexpansion space above the liquid is filled with dry inert gas at slight over-pressure, being connected toeithera pressure controlled source or an elastic bladder.		P
	- Sealed-tank system with gas cushion, in which a volume of gas above the liquid surface ina stifftank accommodates the liquid expansion under variable pressure.		N/A
	- Sealed, completely filled system inwhichthe expansion ofthe liquid is taken up by elastic movement ofthe permanently sealed, usually corrugatedtank or radiators.		N/A
	The size of the conservator or expansion system shall be sufficient to accommodate the change in liquid volume from the coldest ambient when the transformer is de-energized to the highest mean liquid temperature experienced when the transformer is loaded to the highest level allowedby the provisions of the loading guide in IEC 60076-7 for mineral oil or as specified for an alternative cooling liquid.		P
9.4	DC currents in neutral circuits		N/A
	A transformer with a grounded neutral can be influenced by DC currents flowingthroughthe neutral. For example, the DC current canbe generated by:	Shall be considered in end product model CPS PSA1.1MO.	N/A
	- DC traction systems;		N/A
	- cathodicprotectionsystems;		N/A
	-rectifiersystems;		N/A
	- geomagnetically induced currents (GIC).		N/A
	When a transformer is subjected to DC currents in the neutral, a DC magnetization bias of the	Shall be considered in end	N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	magnetic circuit will result. The magnetizing current becomes strongly asymmetrical and will have a high harmonic content. The possible consequences are:	product model CPS PSA1.1MO.	
	- an increase of soundlevel;		N/A
	- relay malfunction and falsetripping;		N/A
	- stray flux overheating;		N/A
	- significant increase in magnetizing current;		N/A
	- increase in no-loadlosses.		N/A
	The phenomenon depends on the ability ofthe DC current to magnetize the core and on the core design. The resulting effects are a function ofthe magnitude and duration of the DC current, core type and general transformer design features.		N/A
	Ifa transformer may be subject to DC currents, then the levels of these currents shall be stated by the purchaser in the enquiry together with any required limits on the consequences of these current levels. See also 4.11 of IEC 60076-8:1997.		N/A
9.5	Safety, environmental and otherrequirements		N/A
	The centre of gravity of the transformer in the transport configuration shall be permanently marked on at least two adjacent sides of the transformer for transformers with a transport mass in excess of 5 tonnes.	Not excess 5tonnes.	N/A
11	TESTS		P
11.1	General requirements for routine, type and special tests		P
11.1.1	General		P
	Tests other than temperature rise tests shallbe madeatan external cooling medium temperature between 10 °Cand 40 °C. See IEC 60076-2 for temperature rise tests.	See Attachment2.	P
	Tests shall be made at the manufacturer's works, unless otherwise agreed between the manufacturer and the purchaser.		P
	All external components and fittings that are likely to affect the performance of the transformer during the test shall be in place.		P
	If the transformer cannot be mounted in its intended operating condition for testing (for example if the transformer is fitted with test-turrets and test-bushings orthe arrangement of cooling equipment cannot be mountedinthein-service		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	position, during the relevant factory test), an agreement shall be found between manufacturer and purchaser before the commencement of tests. If there are any limitations known atthe tender stage, these shall be made clear by the manufacturer.		
	Where it is required that test results are tobe corrected toa reference temperature, this shall be:		P
	a) for dry-type transformers, the reference temperature shall be according to the general requirements fortestsin IEC 60076-11;	Liquid-immersed	N/A
	b) for liquid-immersed transformers withrated average winding temperature rise less than or equal to 65 Kfor OF or ON, or 70 Kfor OD;	Refer to Attachment 2.	P
	1) reference temperature is 75 °C;		P
	Where it is required that test results are tobe corrected toa reference temperature, this shall be:		P
	2) on request by the customer, reference temperature is rated average winding temperature rise + 20 °C, or rated average winding temperature rise + yearly external cooling medium average temperature, whicheverishigher;		N/A
	c) for liquid-immersed transformers with other rated average winding temperature rise, the reference temperature is equal to rated average winding temperature rise + 20 °C, or rated average winding temperature rise + yearly external cooling medium average temperature, whichever ishigher.		N/A
	Ifa purchaser needs to make a comparison between the losses of transformers in category b) with transformers in categories a) and c) (with different insulation systems and with different average winding temperature rises) it is necessary for the reference temperature to be determined according to b)2 above. If the purchaser wishes to make such a comparison, he shall state this in the tender inquiry.		N/A
	Liquid-immersed transformers shall be tested with the same type and specification of liquid that they will contain inservice.		P
	All measurements and tests requiring power frequency supply shall be performed with the		P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	supply frequency within 1 % of the rated frequency of the transformer. The waveshape of the supply voltage shall be such that the total harmonic content does not exceed 5 %. If this condition is not satisfied then the effect of the waveshape on the measured parameter shall be evaluated by the manufacturer and subject to approval by the purchaser. Loss measurements should not be corrected downwards to account for harmonics in the supply voltage except as allowed in 11.5. Where a three-phase supply is used, the supply voltage shall be symmetrical. The maximum voltage across each phase winding under test shall not differ from the minimum voltage by more than 3 %.		
11.1.2	Routine tests		P
	a) Measurement of winding resistance (11.2).		P
	b) Measurement of voltage ratio and check of phase displacement (11.3).		P
	c) Measurement of short-circuit impedance and load loss (11.4).		P
	d) Measurement of no-load loss and current (11.5).		P
	e) Dielectric routine tests (IEC 60076-3).	Refer to Attachment 3.	P
	f) Tests on on-load tap-changers, where appropriate (11.7).	No-load tap-changer	N/A
	g) Leak testing with pressure for liquid-immersed transformers (tightness test) (11.8).		P
	h) Tightness tests and pressure tests for tanks for gas-filled transformers (refer to 60076-15).		N/A
	i) Check of the ratio and polarity of built-in current transformers.		N/A
	j) Check of core and frame insulation for liquid immersed transformers with core or frame insulation (11.12).		N/A
11.1.2.2	Additional routine tests for transformers with Um > 72,5 kV		N/A
	a) Determination of capacitances windings-to-earth and between windings.		N/A
	b) Measurement of d.c. insulation resistance between each winding to earth and between windings.		N/A
	c) Measurement of dissipation factor (tan δ) of the insulation system capacitances.		N/A
	d) Measurement of dissolved gasses in		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	dielectric liquid from each separate oil compartment except diverter switch compartment.		
	e) Measurement of no-load loss and current at 90 % and 110 % of rated voltage (11.5).		N/A
11.1.3	Type tests		P
	a) Temperature-rise type test (IEC 60076-2).	Refer to Attachment 2.	P
	b) Dielectric type tests (IEC 60076-3).	Refer to Attachment 3.	P
	c)Determination of sound level(IEC 60076-10)for each method of cooling for which a guaranteed sound level is specified.	51.7dB measured,60dB guaranteed.	P
	d) Measurement of the power taken by the fan and liquid pump motors.		N/A
	e) Measurement of no-load loss and current at 90 % and 110 % of rated voltage.		P
11.1.4	Special tests		P
	a) Dielectric special tests (IEC 60076-3).		N/A
	b)Winding hot-spot temperature-rise measurements.		N/A
	c) Determination of capacitances windings-to-earth, and between windings.		P
	d) Measurement of dissipation factor (tan d) of the insulation system capacitances.		P
	e) Determination of transient voltage transfer characteristics (Annex B of IEC 60076-3:2000).		N/A
	f) Measurement of zero-sequence impedance(s)on three-phase transformers(11.6).		N/A
	g) Short-circuit withstand test (IEC 60076-5).		N/A
	h) Measurement of d.c. insulation resistance each winding to earth and between windings.		P
	i) Vacuum deflection test on liquid immersed transformers (11.9).		N/A
	j) Pressure deflection test on liquid immersed transformers (11.10).		N/A
	k) Vacuum tightness test onsite on liquid immersed transformers (11.11).		N/A
	l) Measurement of frequency response (Frequency Response Analysis or FRA). The test procedure shall be agreed between manufacturer and purchaser.		P
	m) Check of external coating (ISO 2178 and ISO 2409 or as specified).		N/A
	n) Measurement of dissolved gasses in dielectric liquid.		P
	o) Mechanical test or assessment of tank for		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	suitability for transport (to customer specification).		
	p) Determination of weight withtransformer arranged for transport. For transformers up to 1,6 MVA by measurement. For larger transformers by measurement or calculation as agreed between manufacturer andpurchaser.		N/A
	Other tests for transformers maybe defined in the specific documents for specialized transformers such as dry-type, self-protected and other groups.		N/A
	If test methods are not prescribed in this standard, or if tests other than those listed above are specified in the contract, such test methods are subject to agreement.		N/A
11.2	Measurement ofwindingresistance		P
11.2.1	General		P
	The resistance of each winding, the terminals between which it is measured and the temperature ofthe windings shall be recorded. Direct current shall be used for the measurement.		P
	In all resistance measurements, care shall betaken thattheeffects ofself-inductionare minimized.		P
11.2.2	Dry-type transformers		P
	Before measurement the external cooling medium temperature shall not have changed by more than 3 °C for at least 3 h and all winding temperatures of the transformer measured by the internal temperature sensors shall not differ from the external cooling medium temperature by more than 2°C.	Dry-type transformer See appendTable.	P
	Winding resistance and winding temperature shall be measured at the same time. The winding temperature shall be measured by sensors placed at representative positions, preferably inside theset of windings, for example, ina duct between the high-voltageandlowvoltage windings.	Dry-type transformer See appendTable.	P
11.2.3	Liquid-immersed type transformers		N/A
	Afterthe transformer has been under liquid without excitation for at least 3 h, the average liquid temperature shall be determined and the temperature ofthe winding shall be deemed to		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	be the same as the average liquid temperature. The average liquid temperature is taken as the mean of the top and bottom liquidtemperatures.		
	In measuring the cold resistance for the purpose of temperature-rise determination, special efforts shall be made to determine the average winding temperature accurately. Thus, the difference in temperature between the top and bottom liquid shall not exceed 5 K. To obtain this result more rapidly, the liquid maybe circulated by a pump.		N/A
11.3	Measurement of voltage ratio and check of phase displacement		P
	The voltage ratio shall be measured on each tapping. The polarity of single-phase transformers and the connection symbol of three-phase transformers shall be checked. Ifa voltage measurement is used, the voltages of both windings shall be measured simultaneously.	See appendTable.	P
11.4	Measurement ofshort-circuit impedance andloadloss		P
	The short-circuit impedance and load loss for a pair of windings shall be measured at rated frequency with voltage applied to the terminals of onewinding, with the terminals ofthe other windingshort-circuited, and with possible other windings open-circuited. (For selection of tapping for the test, see 6.5 and 6.6). The supplied current should be equal to the relevant rated current (tapping current) but shall not be less than 50 % thereof. The measurements shall be performed quickly sothat temperature rises do not cause significanterrors. The difference intemperature between the topliquid and the bottom liquid shall be small enough to enable the mean temperature to be determined accurately. The difference in temperature between the top and bottom liquid shall not exceed 5 K. To obtain this result more rapidly, the liquid may be circulated by a pump.	See appendTable.	P
	The measured value of load loss shall be multiplied with the square of the ratio of rated current (tapping current) to test current. The resulting figure shall then be corrected to reference temperature	See appendTable.	P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	(11.1). The I 2R loss (R being d.c. resistance) is taken as varying directly with the temperature and all other losses inversely with the temperature. The measurement of winding resistance shall be made according to 11.2. The temperature correction procedure is detailed in Annex E.		
	The short-circuit impedance is represented as reactance and a.c. resistance in series. The impedance is corrected to referencetemperature assuming that the reactance is constant and that the a.c. resistance derived from the load loss varies as described above.	See appendTable.	P
	On transformers having a tapped winding with tapping range not exceeding ±5 %,the short circuit impedance shall be measured on the principal tapping.		P
	For transformers withtappings exceeding a voltage variation of 5 % from the principal tapping, impedance values shall be measured for the principal tapping and the extreme tapping(s) exceeding 5 %. Measurements at other tap positions maybe specifiedin the enquiry.		N/A
	On a three-winding transformer, measurements are performed on the three different two winding combinations. The results are re-calculated, allocating impedances and losses toindividual windings (see IEC 60076-8). Total losses for specified loading casesinvolvingallthese windings aredeterminedaccordingly.		P
11.5	Measurement of no-load loss and current		P
	The no-load loss and the no-load currentbe measured on one of the windings at rated frequency and at a voltage corresponding to rated voltage if the test is performed on the principal tapping, orto the appropriate tapping voltage if the test is performed onanothertapping.	See appendTable.	P
	The remaining winding or windings be left open-circuited and any windings which can be connected in open delta shall have thedeltaclosed.		P
	Where indicated in 11.1.2 and 11.1.3, the measurement shall also be made at 90 % and 110 % of rated voltage (or appropriate		P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	tapping voltage).		
	Thetransformer be approximately at factoryambient temperature.		P
	For a three-phase transformer, the selection of the winding and the connection to the test power source be made to provide, as far as possible,symmetrical and sinusoidal voltages across the three phases.		P
	The test voltage be adjusted according toa voltmeter responsive to the mean value ofvoltage but scaled to read the r.m.s. voltage of a sinusoidal wave having the same meanvalue.		P
	The reading of this voltmeter is U’ .		P
	Atthe sametime, a voltmeter responsive to the r.m.s. value of voltage be connected in parallelwith the mean-value voltmeter and its indicated voltage U be recorded.		P
	When a three-phase transformer is tested, the voltages be measured between line terminals, ifa delta-connected winding is energized, and between phase and neutral terminalsifaYNor ZN connected windingisenergized.		P
	Phase to phase voltages may be derived from phase to ground measurements, but phase to neutral voltages shall not be derived from phase to phase measurements.		P
	The test voltage wave shape is satisfactory if the readings U¢and U are equal within 3 %.		P
	If the difference between voltmeter readings is larger than 3 %, the validity of the test is subject to agreement.		P
	A larger difference maybe acceptable at higher than rated voltage unless this measurement is subject to guarantee.		P
	It is recognized that the most severe loading conditions for test voltage source accuracyare usuallyimposed bylarge single-phase transformers.		P
	The measured no-load loss is Pm, and the corrected no load loss is takenas:		P
	Po = Pm (1 + d)		P
	d=(U’-U)/U’		P
	The r.m.s. value of no-load current is measured at the same time as the loss.		P
	For a three phase transformer, the mean value of readings in the three phases is taken.		P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	The no load losses shall not be corrected for any effectoftemperature.		P
	In deciding the place ofthe no-load test in the complete test sequence, it should be borne in mind that no-load loss measurements performedbefore impulse tests and/or resistance measurements are, in general, representative ofthe average losslevel over longtime in service, assuming, that the core is notpre-magnetized.		P
	That means, if no-load tests are carried out after resistance measurements and/or lightningimpulse tests, the core of the transformer should be demagnetized by overexcitation before the no-load test is carried out.		P
	The no-load loss and the no-load currentbe measured on one ofthe windings at rated frequency and at a voltage corresponding to rated voltage if the test is performed on the principal tapping, orto the appropriate tapping voltage ifthe test is performed onanothertapping.		P
	The remaining winding or windings be left open-circuited and any windings which can be connected in open delta shall have the delta closed.		P
11.6	Measurement of zero-sequence impedance(s) on three-phase transformers		N/A
	The zero-sequence impedance is measured at rated frequency between the line terminals ofa star-connected or zigzag-connected winding connected together, and its neutral terminal. It is expressed in ohms per phase and is given by I/3U , where U is the test voltage and I is the test current.		N/A
	The test current per phase I/3 shall be stated inthe testreport.		N/A
	It shall be ensured that the current in the neutral connection is compatible with its current carrying capability.		N/A
	In the case ofa transformer with an additional delta- connected winding, the value ofthe test current shall be such that the current in the delta- connected winding is not excessive, taking into account the duration of application.		N/A
	If winding balancing ampere-turns are missing in the zero-sequence system, for example, ina		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	star-star-connectedtransformerwithout delta winding,the applied voltage shall not exceed the phase-to-neutral voltage at normal operation. The current in the neutral and the duration of application should be limited to avoid excessive temperatures ofmetallicconstructional parts.		
	In the case of transformers having more than one star-connected winding with neutral terminal, the zero-sequence impedance is dependent upon the connection (see 3.7.3) and the tests to be made shall be subject to agreement between the manufacturer and the purchaser.		N/A
	Forautotransformers andYY transformers, there are several combinationsofteststo perform:		N/A
	- HV with LV open circuit;		N/A
	- HV with LV shortcircuit;		N/A
	- LV with HV open circuit;		N/A
	- LV with HV shortcircuit.		N/A
	For YD transformers, the zero sequence impedance is measured from theY side only.		N/A
	Auto-transformers with a neutral terminal intended to be permanently connected to earth shall be treated as normal transformers with two star-connected windings. Thereby, the series winding and the common winding together form one measuring circuit, and the common winding alone forms the other. The measurements are carried out with a current not exceeding the difference between the rated currents on the low-voltage side and the high voltage side.		N/A
11.7	Tests on on-load tap-changers - Operation test		N/A
	With the tap-changer fully assembled onthe transformer, the following sequence of operations shall be performed withoutfailure:		N/A
	a) withthe transformer de-energized, eight complete cycles of operation (a cycle of operation goes from one end of the tapping range to the other, and back again).		N/A
	b) with the transformer de-energized, and with the auxiliary voltage reduced to 85 % of its rated value, onecomplete cycle of operation.		N/A
	c) with the transformer energized at rated voltage and frequency at no load, one complete cycle of operation.		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	d) with one winding short-circuited and, as faras practicable, rated current in the tapped winding, 10 cycles oftap-change operations across the rangeof two steps on each side from where a coarse or reversing changeover selector operates, or otherwise from the middle tapping (the tap changer will pass 20 times through the changeover position).		N/A
11.8	Leak testing with pressure for liquid immersed transformers (tightness test)		P
	The transformer manufacturer shall perform an agreed test to prove the transformer tank will not leak in service. If there is no agreement, a pressure of at least 30 kPa over the normal liquid pressure shall be applied and maintained for 24 h for transformers greater than 20 MVA or 72,5kV.	30kPa,12h.	P
	8 h fortransformers oflower rating and voltage.	12h	P
	Typically,thisisappliedeither usingaliquid column or gas pressure in the conservator. Thereafter, the entire transformer shall be visually inspected for leaks. For tanks that are specifically designed tobe flexible forliquid expansion (corrugated), leak and lifetime tests need to be agreed.		N/A
11.9	Vacuum deflection test for liquid immersed transformers		N/A
	This test is applicable to transformers designed to be vacuum filledintheir own tanks onsite.		N/A
	Generally, these transformers are transported withoutliquid.		N/A
	The test shall be carried out on the transformer when it is complete in all relevant respects andon all compartments that require vacuum to be applied on-site.		N/A
	Before vacuum is applied, a suitable measuring reference point, attached rigidly to the test room structure or floor, independent ofthe transformer shall be established as close as possible to the point on the tank where the maximum deflection under vacuum is expected. The distance from the reference point to the tank wall in a direction approximately normal to the tank wall shall be measured and noted.		N/A
	Following the application of the vacuum to the level required for the site operation, the distance from the reference point to the tank wall in a direction		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	approximately normal to the tank wall shall be measured again. The deflection under vacuum is the difference between this measurement and the first measurement.		
	The vacuum shall then be released and a third measurement of the distance from thereference point tothe tank wall ina direction approximately normal to the tank wall shall be taken. The permanent deflectionis the difference between this measurement and the first measurement.		N/A
	Alternative equivalent methods of measurement may be used and additional measurements onthe opposite side ofthe transformer maybe required to compensate for tank movement during the test.		N/A
	Normally the expected deflection under vacuum and the permanent deflection shall be calculated and declared by the manufacturer before the test. Alternatively the following typical values shall be used:		N/A
	a) medium range transformers between 20 MVA and 100MVA:		N/A
	· permanent deflection after vacuum is released: 1 mm;		N/A
	b) large power transformers (with plain tank walls), above 100 MVA:		N/A
	· permanent deflection after vacuum is released: 5 mm.		N/A
	If the expected values are exceeded, the testshall be repeated to see if the tank dimensionshave stabilized. If not, remedial actions, for example adding additional stiffening to the tank, shall be carriedout.		N/A
11.10	Pressure deflection test for liquid immersed transformers		N/A
	Where specified, the deflection ofthe tank when pressure is applied and the permanent deflection of the tank when the pressure is released shall be measured. For tanks that are specificallydesigned tobe flexiblefor liquidexpansion (corrugated), this testis not applicable.		N/A
	The test shall be carried out on the transformer when it is complete in all relevant respects and filled with liquid. It shall be carried out on allseparate compartments that contain liquid.		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Unless otherwise specified, the test pressure in the tank shall be 35 kPa over the normal operating pressure. If the transformer is fitted withpressure relief devices, the pressure, applied during this test shall exceed the pressure required to operate the pressure relief device by at least 10 kPa. Pressure relief devices will therefore need to be blanked off during this test.		N/A
	Before pressure is applied, whilst the tank is at its normal working liquid level, a suitable measuring reference point, attached rigidly to the test room structure or floor, independent ofthe transformer shall be established as close as possible to the point on the tank where the maximum deflection under pressure is expected, taking into accountthe expected deflection. The distance from the reference point to the tank wall in a direction approximately normal to the tank wall shall be measured and noted.		N/A
	Following the application ofthe additional pressure, the distance from the reference point to the tank wall ina directionapproximately normal to the tank wall shall be measured again. The deflection under pressure is the difference between this measurement and the first measurement.		N/A
	Normally the expected deflection under pressure and the permanent deflection shall be calculated and declared by the manufacturer before the test. Alternativelythe followingtypical valuesshall be used:		N/A
	a) medium range transformers between 20 MVA and 100MVA:		N/A
	· permanent deflection after overpressure: 1 mm;		N/A
	b) large power transformers (with plain tank walls), above 100 MVA:		N/A
	· permanent deflection after overpressure: 5 mm.		N/A
	If the expected values are exceeded, the testshall be repeated to see if the tank dimensionshave stabilized. If not, remedial actions, for example adding additional stiffening to the tank, shall be carriedout.		N/A
11.11	Vacuum tightness test onsite forliquid immersed transformers		N/A

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	This test is applicable to transformers designed to be vacuum filled in their own tanks on siteand transported without liquid. Following erectionon-site but before liquid filling, the ability ofatransformer that requires the application of vacuum for filling or other site operations to hold a vacuum without admitting air shall be demonstrated as follows:		N/A
	A vacuum to the highest level required by the site operation shall be applied fora period of two hours or until a stable vacuum level is obtained.The vacuum pump shall then be stopped andthe transformersealed.		N/A
	The vacuum inside the transformer shall then be monitored,using a suitable vacuum gauge until a steady rate of change of vacuum is observed.The increase in pressure shall be less than 0,2 kPa per hour measured over a period of at least 30 min.		N/A
11.12	Check of core and frame insulation		N/A
	This test shall be carried out on all liquid immersed transformers whichincorporateinsulationseparating core and frame and/or frame and tank.		N/A
	For transformers where the core and frame earth connections are not accessible when the transformer isliquid filled, the insulationshall be tested at 500 Vd.c. for 1 min without breakdown before the active part is installed in the tank.		N/A
	For transformers where the core and frameearth connections are accessible when the transformeris liquid filled, the insulation shall betested at 2 500 V d.c. for 1 min without breakdown after the transformeris filled withliquid.		N/A
12	Electromagneticcompatibility(EMC)		P
	Power transformers shall be considered aspassive elements in respect toemission of, and immunity to, electromagnetic disturbances.		P
13	High frequency switching transients		P
	Switching lightly loaded and/or low power factor (inductively loaded) transformers with vacuumand SF6 interrupters may subject the transformer to potentially damaging voltage transients with frequencies up to the MHz range and voltages exceeding the transformer impulse withstand. Mitigation measures, while not part of the		P

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	transformer, might include means to increase damping through resistor-capacitor snubbers, pre-insertion resistors within the switches, or switching under load. If specified by the purchaser, the manufacturer shall provide details of natural resonant frequencies and/or high frequency model parameters of the transformer.		

Annex A
(informative)

Check list of information to be provided with enquiry and order

A.1 Rating and general data

A.1.1 Normal information

The following information shall be given in all cases:

a) Particulars of the specifications to which the transformer shall comply.

b) Kind of transformer, for example, separate winding transformer, auto-transformer or series transformer.

c) Single or three-phase unit.

d) Number of phases in system.

e) Frequency.

f) Dry-type or liquid-immersed type. If liquid-immersed type, whether mineral oil, natural insulating liquid or synthetic insulating liquid. If dry-type, degree of protection (see IEC 60529).

g) Indoor or outdoor type.

h) Type of cooling.

i) Rated power for each winding and, for tapping range exceeding ±5 %, the specified maximum current tapping, if applicable.

If the transformer is specified with alternative methods of cooling, the respective lower power values are to be stated together with the rated power (which refers to the most efficient cooling).

j) Rated voltage for each winding.

k) For a transformer with tappings (see 6.4):

- whether 'de-energized' or 'on-load' tap-changing is required;
- any requirements for fixing the ratio of turns between two particular windings on a more than two winding transformer;
- whether any tapping or range of tappings can be reduced power tappings;
- the number of tapping steps and the size of the tapping step or the tapping range;

and either:

- which winding is tapped;
- if the tapping range is more than ±5 %, the type of voltage variation, and the location of the maximum current tapping, if applicable;

or:

- direction of power flow (can be both directions);
- which voltage shall vary for the purpose of defining rated tapping voltage;
- minimum full load power factor.

l) Highest voltage for equipment (U_m) for each winding line and neutral terminals (with respect to insulation, see IEC 60076-3).

m) Method of system earthing (for each winding).

n) Insulation level and dielectric test levels (see IEC 60076-3), for each winding line and neutral terminals.

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

q) Any particular environmental considerations regarding the impact of the transformer on the environment that shall be taken into account in the transformer design, see Annex G.

r) Any particular health and safety considerations that shall be taken into account in the transformer design regarding manufacture, installation, operation, maintenance and disposal, see Annex G.

s) Unusual electrical operating conditions as follows:

1) whether a transformer is to be connected to a generator directly or through switchgear, and whether it will be subjected to load rejection conditions and any special load rejection conditions.

2) whether load current wave shape will be heavily distorted. Whether unbalanced three-phase loading is anticipated. In both cases, details to be given.

3) whether a transformer is to be connected directly or by a short length of overhead line to gas-insulated switchgear (GIS).

4) whether transformers will be subjected to frequent overcurrents, for example, furnace transformers and traction feeding transformers.

5) details of intended regular cyclic overloading other than covered by 5.1.4 (to enable the rating of the transformer auxiliary equipment to be established).

6) unbalanced a.c. voltages, or departure of a.c. system voltages from a substantially sinusoidal wave form.

7) loads involving abnormal harmonic currents such as those that may result where appreciable load currents are controlled by solid-state or similar devices. Such harmonic currents can cause excessive losses and abnormal heating.

8) specified loading conditions (kVA outputs, winding load power factors, and winding voltages) associated with multi-winding transformers and autotransformers.

9) excitation exceeding either 110 % rated voltage or 110 % rated V / Hz.

10) planned short circuits as a part of regular operating or relaying practice.

11) unusual short-circuit application conditions differing from those in IEC 60076-5.

12) unusual voltage conditions including transient overvoltages, resonance, switching surges, etc. which may require special consideration in insulation design.

13) unusually strong magnetic fields. It should be noted that solar-magnetic disturbances can result in telluric currents in transformer neutrals.

14) large transformers with high-current bus bar arrangements. It should be noted that high-current isolated phase bus ducts with accompanying strong magnetic fields may cause unanticipated circulating currents in transformer tanks, covers, and in the bus ducts. The losses resulting from these unanticipated currents may result in excessive temperatures when corrective measures are not included in the design.

15) parallel operation. It should be noted that while parallel operation is not unusual, it is advisable that users advise the manufacturer when paralleling with other transformers is planned and identify the transformers involved.

16) regular frequent energisation in excess of 24 times per year.

17) frequent short circuits.

t) Unusual physical environmental conditions

1) altitude above sea-level, if in excess of 1 000 m (3 300 ft).

2) special external cooling medium temperature conditions, outside the normal range (see 4.2 b)), or restrictions to circulation of cooling air.

3) expected seismic activity at the installation site which requires special consideration.

4) damaging fumes of vapours, excessive or abrasive dust, explosive mixtures of dust or gasses, steam, salt spray, excessive moisture, or dripping water, etc.

5) abnormal vibration, tilting, or shock.

IEC 60076-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

A.2 Parallel operation

If parallel operation with existing transformers is required, this shall be stated and the following information on the existing transformers given:

a) Rated power.

b) Rated voltage ratio.

c) Voltage ratios corresponding to tappings other than the principal tapping.

d) Load loss at rated current on the principal tapping, corrected to the appropriate reference temperature, see 11.1.

e) Short-circuit impedance on the principal tapping and on the extreme tappings, if the voltage on the extreme tappings is more than 5 % different to the principal tapping. Impedance on other tappings if available.

f) Diagram of connections, or connection symbol, or both.

NOTE On multi-winding transformers, supplementary information will generally be required.

11.2	TABLE: Windingresistance						P
	Type object.....	Dry-type Transformer					
	Identical number.....	S11-10000/69					
	Ambient (°C).....	25.6					
	Humidity	55.1%					
	Oil temperature.....						
Number	Resistance	H.V. (Ω)					L.V.(mΩ)
		Tap 1	Tap 2	Tap 3	Tap 4	Tap 5	
1	H1~H2	6.879	5.916	6.321	6.211	5.569	N/A
2	H2~H3	5.984	5.997	6.231	6.098	6.115	N/A
3	H3~H1	6.987	6.236	6.115	5.268	5.612	N/A
4	X1~X2	N/A	N/A	N/A	N/A	N/A	3.0115
5	X2~X3	N/A	N/A	N/A	N/A	N/A	2.9987
6	X3~X1	N/A	N/A	N/A	N/A	N/A	3.5213
7	X0~X1	N/A	N/A	N/A	N/A	N/A	1.7284
8	X0~X2	N/A	N/A	N/A	N/A	N/A	1.6209
9	X0~X3	N/A	N/A	N/A	N/A	N/A	1.7112
Supplementary information:							

11.3	TABLE: Ratio and connectiongroup		P
	Type object..... :	Dry-type Transformer	
	Identical number.....	S11-10000/69	
	Ambient (°C)..... :	25.6	
	Humidity.....	55.1%	
	Oil temperature .....:	N/A	

H.V.		L.V.	Ratio	Measured deviation (%)			Connection group
Tap position	Voltage (kV)	Voltage(kV)		H1H2/X1 X2	H2H3/X2 X3	H3H1/X 3 X1	
1	380V	220V	--	0.04	0.07	0.00	Dyn5
2	380V	220V	--	0.05	0.06	0.01	Dyn5
3	380V	220V	--	0.04	0.02	-0.01	Dyn5
4	380V	220V	--	0.05	0.07	0.00	Dyn5
5	380V	220V	--	0.07	0.06	0.05	Dyn5
Supplementary information:							

11.4	TABLE:Loadloss		P
	Typeobject.....:	Dry-type Transformer	
	Identical number.....	S11-10000/69	
	Ambient (°C) .....:	25.6	
	Humidity ..... :	55.1%	
	Oil temperature..... :	N/A	

Values calculated to 75°C	Tap 1	Tap 3	Tap 5
Load loss / Guaranteed[W]	--	--	--
Impedance[%]	4.42	4.32	4.24
Impedance / Guaranteed [%]	--	4±10%	--
Supplementary information:			

11.5	TABLE:Noload loss		P
	Type object..... :	Dry-type Transformer	

	Identical number.....	S11-10000/69	
	Ambient (°C)..... :	25.6	
	Humidity..... :	55.1%	
	Oil temperature .....:	N/A	

Ratedno-loadvoltage	Average current	Averagecurrent/ Guaranteed	No-load loss / Guaranteed
[V]	[A]	[%]	[W]
380	1519	0.02%	1000KW

Supplementary information:
The result has been calculated to ambient temperature 75℃.

11.1.3 e)	TABLE: Measurement of no-load loss and current at 90 % and 110 % of rated voltage		P
	Type object. :	Dry-type Transformer	
	Identical number..	S11-10000/69	
	Ambient (°C) :	25.6	
	Humidity :	55.1%	
	Oil temperature:	N/A	

Ratedno-loadvoltage	Average current	Averagecurrent/Guaranteed	No-load loss / Guaranteed
[V]	[A]	[%]	[W]
380V*0.9	1517.2	-0.73	992.7KW
380V*1.1	1518.7	+0.32	1003.2KW

Supplementary information:
The result has been calculated to ambient temperature 75℃.

11.1.4	TABLE: Special tests		P
	Test items	Enclosure #	Features
a)	Dielectric special tests (EN 60076-3)		N/A
b)	Winding hot-spottemperature-rise measurements		N/A
e)	Determination of transient voltage transfer characteristics (Annex B of EN 60076-3:2000)		N/A
f)	Measurement of zero-sequence impedance(s) on three-phase transformers		N/A

g)	Short-circuit withstand test (IEC 60076-5)		N/A
i)	Vacuum deflection test on liquid immersed transformers		N/A
j)	Pressure deflection test onliquid immersed transformers		N/A
k)	Vacuum tightness test on site on liquidimmersedtransformers		N/A
l)	Measurement of frequency response (Frequency Response Analysis or FRA)		Pass
m)	Check of external coating(ISO 2178 and ISO 2409 or as specified)		N/A
o)	Mechanical test or assessment of tank for suitability for transport (to customer specification)		N/A
p)	Determination of weight with transformer arranged fortransport. For transformers up to 1,6 MVAby measurement. For larger transformers by measurement or calculation as agreed between manufacturer and purchaser		N/A

11.1.4 c) & 11.1.4 d)	TABLE: Determination of capacitances windings-to-earth, andbetween windings & Measurement of dissipation factor (tan δ) of the insulation system capacitances.					P
	Type object	Dry-type Transformer				
	Identicalnumber	S11-10000/69				
	Ambient (°C)	25.6				
	Humidity	55.1%				
	Oil temperature	N/A				
Number	Measurement position	Test Voltage(kV)	Capacitances (nF)	tan δ(%)	tan δ (%)@20℃	Remark
1	H.V. - L.V. / earth	9.8	6.113	0.502	0.411	——
2	L.V. - H.V./earth	0.9	18.426	0.412	0.298	——
Supplementary information:						

11.1.4 h)	TABLE: Insulationimpedance		P
	Type object..:	Dry-type Transformer	
	Identical number..	S11-10000/69	
	Ambient (°C) :	25.6	
	Humidity :	55.1%	

	Oil temperature :	N/A	
Number	Measurement position	Insulationresistance	Remark
1	H.V. - L.V. / earth	17512 Ω	PASS
2	L.V. - H.V./ earth	17076 Ω	PASS
Supplementary information:			

11.1.4 n)	TABLE: Measurement of dissolved gasses in dielectricliquid			P
	Type object	Dry-type Transformer		
	Identical number.....	S11-10000/69		
	Ambient (°C).....	25.6		
	Humidity.....	55.1%		
	Oil temperature.....	N/A		
Dissolved gasses in oil analysis （ppm）	Gases	Beforetemperature rise	Aftertemperaturerise	Remark
	H2	0.00	0.00	
	CH4	0.35	0.59	
	C2H4	0.00	0.00	
	C2H6	0.00	0.00	
	C2H2	0.00	0.00	
	Total hydrocarbons	0.37	0.629	
	CO	6.25	8.29	
	CO2	525.87	586.51	
Supplementary information:				

ANNEX A: Photo-documentation



Photo 1 General Appearance of the EUT



Photo 2 General Appearance of the EUT



Photo 3 General Appearance of the EUT



Photo 4 General Appearance of the EUT



Photo 5 General Appearance of the EUT



Photo 6 General Appearance of the EUT



Photo 7 General Appearance of the EUT

End of the Report