

## תשתיות אנרגיה בע"מ

### החלפת שנאים במתקנים אשל ובילו

# Standard Specification for Three Oil Immersed Power Transformers 1X(22/0.4KV – 1000KVA) 2X(22/0.4KV – 1250KVA)

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		Description	Approved	



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1. **SCOPE**

1.1 **General**

This specification covers the design, manufacture, painting, test, and the supply of three sealed oil immersed power transformers 22/0.4KV - 1000KVA, 22/0.4KV - 1250KVA.

In addition, for each tender, a Data Sheet and Bill of materials (BOM) will be issued.

1.2 **Quote Conditions**

Purchaser and Final Owner: **Energy Infrastructures Ltd.**

Installation Site ..... Eshel & Bilu, Israel.

1.3 **Transport and Erection**

The vendor shall be responsible for the transportation of the transformers to the final installation location at **Eshel Hanasi site & Bilu site** (Israel), this includes all loading, unloading, coordinating local law authorities during land transportation (if needed).

## 2. APPLICABLE CODES AND STANDARDS

The following documents form part of this specification, according to their latest published issue.

All aspects, tests etc., not covered by the IEC publications shall be executed according to the latest published issue of the official or otherwise approved standards of the manufacturer's country.

No.	Title
IEC 60050	International Electro technical vocabulary
IEC 60076-1 (2004-04)	Power transformers General
IEC 60076-1 (am1)	Power transformers General
IEC 60076-2 (1993-04)	Power transformers Temperature rise
IEC 60076-3 (2000-03)	Power transformers Insulation levels dielectric tests and external clearances in air
IEC 60076-4 (2002-06)	Power transformers Lightning impulse and switching-impulse testing
IEC 60076-5 (2006-02)	Power transformers ability to withstand short circuits
IEC 60076-7 (2005-12)	Power transformers Loading guide for oil immersed transformers
IEC 60076-8 (1997-11)	Power transformers application guide
IEC 60076-10	Power transformers Determination of sound levels
IEC 60076-10-1	Power transformers Determination of sound levels
IS 50464	Distribution transformer Requirements for energy efficiency and labeling

**3. ENVIRONMENTAL AND GRID CONDITIONS**Environmental conditions

Temperature ..... 0<sup>0</sup>C to 45<sup>0</sup>C the ambient temperature shall be considered for design as 45<sup>0</sup>C.

Humidity ..... max 95%

Altitude ..... less than 100 m.

Location:..... Outdoor, corrosive, with heavy industrial pollution, such as H<sub>2</sub>S and SO<sub>2</sub> gases.

## 4 **TECHNICAL SPECIFICATION**

The terminology used in this section is, in general, according to IEC Publications 60076. The term “guaranteed” used in this Specification in connection with specified quantities means that the magnitude of the quantity to which it is applied shall be subjected to the tolerances given in IEC Publication 60076.

### 4.1 **Transformer Data**

- 4.1.1 Rated Power (ONAN) ..... See Data Sheet
- 4.1.2 Number of phases ..... 3
- 4.1.3 Rated frequency ..... 50Hz
- 4.1.4 Rated primary voltage ..... 22KV
- 4.1.5 Impulse withstand voltage ..... 125KV respective.
- 4.1.6 One-minute power frequency test ..... 50KV R.M.S.
- 4.1.7 Rated secondary voltage between  
any two phases and neutral  
(when transformer is not loaded) ..... 400V
- 4.1.8 No. of L.V. bushings ..... 4
- 4.1.9 Rated current of phase bushing ..... according to transf. size
- 4.1.10 Rated current of neutral bushing ..... according to transf. size
- 4.1.11 Cooling ..... ONAN
- 4.1.12 Connection vector group ..... Dyn-11
- 4.1.13 Guaranteed impedance voltage  
(short circuit impedance) ..... 6%

4.1.14 H.V. and L.V. winding material .....Copper or Aluminum

4.1.15 Maximum top oil temperature rise .....55°K

4.1.16 Maximum winding temperature rise .....60°K  
(measured by resistance)

4.1.17 Nameplate .....as per IEC standard  
60076 and IS 5484

4.1.18 Off load tap changer on .....H.V. side

- No. of Taps .... 5
- Voltage range . .....±2x2.5%

4.1.19 Losses: Tolerance .....5%

	1250KVA	1000KVA
• Maximum No load losses (PO).....	AO (950W)	AO (770W)
• Maximum load losses (Pe).....	AK (9500W)	AK (7600W)

4.1.20 Ability to withstand short circuit.

The transformer shall be designed and constructed to withstand the thermal and dynamic effects of external short circuits according to IEC Publication.

4.1.21 Max noise level ..... 60 db (A)

4.1.22 Oil ..... EDHELL DIALA Ax or NYNAS Nitro  
10GBx, or equivalent approved by  
Israel Electric Corporation.

## 4.2 **Construction**

4.2.1 The transformer shall be an oil immersed natural air cooled (ONAN), suitable for outdoor installation.

The tank shall be fabricated from cold rolled steel (CRS) sheets folded and welded complete. The top cover shall be sealed and bolted.

The transformer shall be a hermetic sealed type transformer without conservator.

4.2.2 The transformer shall be provided with a metal flange welded around the L.V terminals enabling the client to seal the connection of the L.V. by installing a terminal box.

## 4.3 **Transformer Auxiliaries, Accessories and Components**

4.3.1 Bushings

	<b>0.4 KV</b>	<b>22KV</b>
Number	4	3
Insulation class (KV)	1	24
Impulse withstand voltage positive and negative (kV peak)		125
One-minute power frequency test (kV r.m.s.)	2.5	50



- L.V. Terminals shall permit connection to copper busbars or cables.
- The high voltage terminals' connection shall be EUROMOLD-ELASTIMOLD or approved equivalent, 400A, screw type, totally insulated elbow connectors.

The Supplier will provide without extra costs, both male and female plug connectors, suitable for a cable cross section as given in the Data Sheet.

#### 4.3.2 Transformer Base

Transformers shall be supplied with castor wheels.

#### 4.3.3 Oil Filling Cap

Transformer shall be provided with oil filling cap.

#### 4.3.4 Drainage of the Transformer Tank

There shall be an opening at the bottom of the tank for removing oil, by means of a ¾” spherical high-quality tap.

#### 4.3.5 Pressure Relief Device

The transformer shall be equipped with a pressure relief device.

The pressure relief device shall be for 0.3 Atm. with a diameter opening in the transformer's lid of 68 mm. The device shall meet the relevant IEC requirements.

#### 4.3.6 Protection

The transformer shall be equipped with a DGPT protection relay.

The relay shall include the following functions:

- Gas emission in oil.
- Oil low level.
- Pressure increase.
- High oil temperature (with two separate levels, one for alarm and one for protection).
- Oil temperature measurement.

4.3.7 The transformer shall be equipped with a stainless-steel nameplate showing the wiring diagram and giving all data according to IEC standard 60076.

4.3.8 Transformer shall be provided with lifting lugs.

4.3.9 Two earthing screws with M12 Thread shall be welded to the Transformer, one on the base and one on the cover.

#### **4.4 Painting**

4.4.1 The painting of the transformer tank and other steel parts will be in accordance with Manufacturer's standard procedures for tropical corrosive atmosphere, as approved by Purchaser. The colour of the topcoat shall be medium grey.

4.4.2 The minimum requirements are the following:

4.4.2.1 Cleaning by sand blasting to “near white metal” (prior to assembly/welding).

4.4.2.2 Phosphatizing.

4.4.3 Coating procedures:

4.4.3.1 Exterior surfaces

- Base coat: Two coats of epoxy-based primer  
Thickness of dry film: at least 80 microns
- Top coat: Epoxy based glossy finish coating  
Thickness of dry film: 40 microns
- Total thickness of the coating system: at least 120 microns

4.4.3.2 Interior surfaces

Oil resistant varnish coating Thickness of dry film at least: 20 microns

Remarks

Field repairs with commercially available epoxy enamels shall be feasible.

## 5. DOCUMENTATION

- 5.1 Vendor shall provide with the bid the following documents and information in three copies + reproducible.
  - 5.1.1 Customer's Data Sheet.
  - 5.1.2 Detailed dimension drawings specifying also weights.
  - 5.1.3 Technical catalogue.
  - 5.1.4 Type test report (see paragraph 7).
  - 5.1.5 No load, full load and the total losses corrected to 75<sup>0</sup>C.
  - 5.1.6 Noise level according to the latest IEC recommended methods of measurement.
  - 5.1.7 Information about manufacturer's experience and list of similar transformers installed in Israel.
  - 5.1.8 Summary of data.
  - 5.1.9 Best delivery time.
  
- 5.2 Three weeks after award of order the contractor shall supply the following:
  - 5.2.1 Final dimension drawings and weights.
  - 5.2.2 Certified data sheet.
  - 5.2.3 Civil guide
  - 5.2.4 Sub-vendor list
  - 5.2.5 Catalogues and instruction books.
  
- 5.3 Vendor shall supply copies of routine test when accomplished and before shipping.

**6. WARRANTY**

Three years warranty of satisfactory performance under normal utilization conditions from date of first operation or two years from date of delivery to site shall be included in the price of each transformer.

During the warranty period any request of assistance shall be dealt with within 24 hours.

Repairs shall be made as far as possible on the spot with any other repair being carried out in the Manufacturer's repair station in Israel in reasonable time and to full Purchaser's satisfaction.

Transport of the transformer to and from the repair station shall be at the Manufacturer's expense.

**7. TESTS**

7.1 The transformer shall be subjected to routine tests as per IEC 60076 at the Manufacturer's works.

7.2 The Manufacturer shall submit with the bid a copy of the type test performed on an identical transformer as per I.E.C 60076 by an internationally recognized laboratory.

Has the type test report not been submitted with the bid, one of the transformers shall be subject to a full type test on manufacturer's expense.

**TRANSFORMER DATA SHEET**

General Data	<b>1.0</b>	<b><u>Customer Data</u></b>		
	1.1	Data Sheet No.		
	1.2	Location:	BILU	
	1.3	Plant/Unit:	BILU	
	1.4	Project Name:		
	1.6	Transformer Tag Number	TR-1	
	1.7	Max./Min. Ambient. Temp.:	0-45 <sup>0</sup> C	
	1.8	Altitude Over Sea Level	10m.	
	1.9	Relative Humidity:	95%	
	1.10	Atmosphere:	Petrochemicals	
	1.14	Specification:		
1.15	Prepared By:	A. Shvartsman		
1.16	Date:	30/01/2022		
Transformer Data	<b>2.0</b>	<b><u>Customer Transformer Data</u></b>		
	2.1	Transformer Type	Oil Imerased Sealed	
	2.2	Rated Power	1000	KVA
	2.3	Rated Secondary Voltage	400	V
	2.4	Rated Primary Voltage	22000	V
	2.5	Frequency:	50	Hz
	2.6	Tap Changer Steps	±2x2.5	%
	2.7	Connection (Vector) Group	Dyn-11	
	2.8	Suitable for outdoor installation	Yes	
	2.9	Primary Connecting Cable Size/Secondary Connection	3X95	mm <sup>2</sup>
	2.10	Primary Terminal's Rated Current	400	A
General Data	<b>3.0</b>	<b><u>Manufacturer transformer Data</u></b>		
	3.1	Prepared By:		
	3.2	Date:		
	3.3	Manufacturer:		
	3.4	Transformer Type		
	3.5	Type of cooling		
Electrical Data	3.5	Rated Power		KVA
	3.6	Short-circuit impedance at rated current at 75 <sup>0</sup> C, X <sub>k</sub>		%
	3.7	Temperature rise of the top layer of oil:		<sup>0</sup> C
	3.8	Temperature rise of the windings:		<sup>0</sup> C
	3.9	Rated short circuit current for 2 sec.		(KA)
	3.10	No-load current:		%xI <sub>n</sub>
	3.11	No-load losses:		W
	3.12	Rated load losses at 75 <sup>0</sup> C		W
	3.13	Noise level (measured at a distance of one meter):		db (A)
	3.14	Total Weight		Kg.
	3.15	Weight of Oil		Kg.
3.16	Dimensions [W x L x H]		cm.	
3.17	Type of mineral oil			
High Voltage	3.18	High voltage winding material:		
	3.19	High Voltage bushings type and manufacturer (PLUGS INCLUDED)		
	3.20	Number of high voltage bushings:		
	3.21	Rated voltage of the high voltage bushings:		KV
	3.22	Creepage distance of the high voltage bushing:		mm.
	3.23	Rated current of the high voltage bushing:		A
	3.24	Rated lightning impulse withstand voltage 1.2/50 msec.		KV peak
	3.25	Rated short duration power frequency withstand voltage at 50Hz, 1min.		KV r.m.s
Low Voltage	3.26	Low voltage winding material:		
	3.27	Low Voltage bushings type and manufacturer		
	3.28	Number of low voltage bushings:		
	3.29	Rated voltage of the low voltage bushings:		KV
	3.30	Creepage distance of the low voltage bushing:		mm.
	3.31	Rated current of the low voltage bushing:		A

**TRANSFORMER DATA SHEET**

General Data	<b>1.0</b>	<b><u>Customer Data</u></b>		
	1.1	Data Sheet No.		
	1.2	Location:	ESHEL-HANASI	
	1.3	Plant/Unit:	ESHEL	
	1.4	Project Name:		
	1.6	Transformer Tag Number	T1, T2	
	1.7	Max./Min. Ambient. Temp.:	0-45 <sup>0</sup> C	
	1.8	Altitude Over Sea Level	10m.	
	1.9	Relative Humidity:	95%	
	1.10	Atmosphere:	Petrochemicals	
	1.14	Specification:		
	1.15	Prepared By:	A. Shvartsman	
1.16	Date:	30/01/2022		
Transformer Data	<b>2.0</b>	<b><u>Customer Transformer Data</u></b>		
	2.1	Transformer Type	Oil Imerased Sealed	
	2.2	Rated Power	1250	KVA
	2.3	Rated Secondary Voltage	400	V
	2.4	Rated Primary Voltage	22000	V
	2.5	Frequency:	50	Hz
	2.6	Tap Changer Steps	±2x2.5	%
	2.7	Connection (Vector) Group	Dyn-11	
	2.8	Suitable for outdoor installation	Yes	
	2.9	Primary Connecting Cable Size/Secondary Connection	3X95	mm <sup>2</sup>
	2.10	Primary Terminal's Rated Current	630	A
General Data	<b>3.0</b>	<b><u>Manufacturer transformer Data</u></b>		
	3.1	Prepared By:		
	3.2	Date:		
	3.3	Manufacturer:		
	3.4	Transformer Type		
	3.5	Type of cooling		
Electrical Data	3.5	Rated Power		KVA
	3.6	Short-circuit impedance at rated current at 75 <sup>0</sup> C, X <sub>k</sub>		%
	3.7	Temperature rise of the top layer of oil:		<sup>0</sup> C
	3.8	Temperature rise of the windings:		<sup>0</sup> C
	3.9	Rated short circuit current for 2 sec.		(KA)
	3.10	No-load current:		%xI <sub>n</sub>
	3.11	No-load losses:		W
	3.12	Rated load losses at 75 <sup>0</sup> C		W
	3.13	Noise level (measured at a distance of one meter):		db (A)
	3.14	Total Weight		Kg.
	3.15	Weight of Oil		Kg.
3.16	Dimensions [W x L x H]		cm.	
3.17	Type of mineral oil			
High Voltage	3.18	High voltage winding material:		
	3.19	High Voltage bushings type and manufacturer (PLUGS INCLUDED)		
	3.20	Number of high voltage bushings:		
	3.21	Rated voltage of the high voltage bushings:		KV
	3.22	Creepage distance of the high voltage bushing:		mm.
	3.23	Rated current of the high voltage bushing:		A
	3.24	Rated lightning impulse withstand voltage 1.2/50 msec.		KV peak
	3.25	Rated short duration power frequency withstand voltage at 50Hz, 1min.		KV r.m.s
Low Voltage	3.26	Low voltage winding material:		
	3.27	Low Voltage bushings type and manufacturer		
	3.28	Number of low voltage bushings:		
	3.29	Rated voltage of the low voltage bushings:		KV
	3.30	Creepage distance of the low voltage bushing:		mm.
	3.31	Rated current of the low voltage bushing:		A