



TEİAŞ

**TURKISH
ELECTRICITY
TRANSMISSION
CORPORATION**

TECHNICAL SPECIFICATION FOR 170 KV AND 420 KV LINE TRAPS

The original version of this technical specification has been prepared in Turkish and in case of any inconsistency between English and Turkish, the Turkish language shall prevail.

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TECHNICAL SPECIFICATION FOR 170 KV AND 420 KV LINE TRAPS

1. GENERAL

1.1. Subject and Scope

These specifications cover the electrical, physical and RF (Radio-Frequency) characteristics of the line traps necessary for the Carrier (PLC) devices connected to 170 kV and 420 kV Energy Transmission Lines.

All articles in the specifications apply for a complete line trap consisting of the main coil, tuning device, protection unit and accessories.

1.2. Standards

The design, production and tests of the line traps included in the scope of these specifications shall be performed taking into consideration the latest editions of the following standards.

Standard Number		Standard Name (Turkish/ English)
TSE Standard No.	International Standard No.	
TS EN ISO 9001	ISO 9001	Kalite yönetim sistemleri - Şartlar Quality management systems - Requirements
TS EN ISO 14001	ISO 14001	Çevre yönetim sistemi - Şartlar ve kullanım kılavuzu Environmental Management Systems – Requirements With Guidance For Use
	IEC 60353	AC Güç sistemleri için hat tıkaçları Line traps for a.c. power systems
TS EN 60099-4	IEC 60099-4	Parafudrlar - Bölüm 4: a.a. sistemleri için ark aralığı bulunmayan metal oksit parafudrlar Surge arresters Part 4: Metal oxide surge arresters without gaps for a.c. systems
TS EN ISO 1461	ISO 1461	Demir ve çelikten imal edilmiş malzemeler üzerine sıcak daldırmayla yapılan galvaniz kaplamalar - Özellikler ve deney metotları Hot dip galvanized coatings on fabricated iron and steel articles - specification and test methods
TS EN 60529	IEC 60529	Mahfazalarla sağlanan koruma dereceleri (IP kodu) (elektrik donanımlarında) Degrees of protection provided by enclosures (IP code) (For electrical equipments)
TS EN 60060-1	IEC 60060-1	Yüksek gerilim deney teknikleri - bölüm 1: Genel tarifler ve deney kuralları

Standard Number		Standard Name (Turkish/ English)
TSE Standard No.	International Standard No.	
		High-voltage test techniques - Part 1: General definitions and test requirements
	IEEE 693	Trafo merkezlerinin sismik tasarımı için önerilen uygulama
		Recommended practice for seismic design of substations

The design, production and tests of the line traps included in the scope of these specifications shall be performed taking into consideration the latest editions of the following standards.

If other equivalent or superior standards are applied, their copies in Turkish and/or English shall be submitted together with the bid.

In case of a difference between TSE and IEC standards, written permission shall be obtained from the Directorate on the standard to be applied about the matters, for which differences exist.

The Bidder/ Contractor shall propose international standards to be approved by the Directorate in relation with the special parts, for which there are no TSE and IEC standards.

All chemical, physical and dielectric characteristics of the materials used in the production of line traps shall be as prescribed in the relevant ASTM (American Society for Testing and Materials) or in the norms of European Countries.

1.3. Operating Conditions

Unless otherwise specified in the List of Warranted Characteristics, the line traps constituting the subject of the order shall be suitable for use under the following operating conditions.

The following conditions are normal operating conditions and the values given in the technical specifications and their annexes are given in accordance with those conditions. If the Directorate has any requests different from those conditions, those requests shall be indicate before the tender. The manufacturer shall perform its works in compliance with the relevant standards taking the requests notified by the Directorate before the tender into consideration. The changes that may occur in the technical specifications and if any in the design as the result of those works shall be submitted to the Directorate for approval.

▪ Altitude	Less than 1000 m
▪ Ambient temperature	

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➤ Daily maximum	+45 °C
➤ Daily minimum	-40 °C
➤ 24h Average	+35 °C'nin altında
➤ Annual Average	+25 °C'nin altında
▪ Maximum wind pressure	
➤ On round surface	700 pascal
➤ On flat surface	1200 pascal
▪ Maximum solar radiation	1000 W/m ²
▪ Ice load	Class 10, 10 mm
▪ Susceptibility to industrial pollution	Yes (Heavy pollution)
▪ Maximum relative humidity (24h average)	%100
▪ Lightning strike probability	Yes
▪ Earthquake (*)	
➤ Horizontal acceleration	0,5 g (at ground level)
➤ Vertical acceleration	0,25 g
<p><i>(*) Line traps shall be designed so as to withstand horizontal and vertical acceleration values and so that none of their units will be damaged, and the designs, drawings and materials necessary for the installation of line traps at their place of operation and the earthquake withstand calculations of line traps shall be submitted by the Contractor in compliance with IEEE 693..</i></p>	

2. TECHNICAL CHARACTERISTICS

Line traps shall have the technical characteristics indicated in these specifications.

2.1. Electrical Characteristics

The electrical characteristics of line traps shall be as follows unless otherwise specified in the List of Warranted Characteristics.

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Characteristic	170 kV Line Trap	420 kV Line Trap
▪ Maximum system voltage	170 kV	420 kV
▪ Rated voltage	154 kV	400 kV
▪ Rated power frequency (*)	50 Hz	50 Hz
▪ Rated inductance ($\pm\%10$)	Shall be determined by the Directorate	
▪ Rated continuous current	Shall be determined by the Directorate	
▪ Rated short-time current (1 sec.)	50 kA-rms (Change: 22/07/2020 – 246597 GM)	63 kA-rms
▪ Rated short circuit peak withstand current	125 kA (Change: 22/07/2020 – 246597 GM)	160 kA
▪ Carrier frequency	40-500 kHz	40-500 kHz
▪ Trap loss	≤ 2.6 dB	≤ 2.6 dB
▪ Line impedance	400 Ω	400 Ω
▪ Temperature Class	F	F
<p><i>(*) Frequency variation range: Unless otherwise specified in the Electricity Network Regulation, the line traps must be designed so as to operate continuously in 49-50.5 Hz frequency range, taking into consideration that the system frequency can increase to 52.5 Hz or decrease to 47.5 Hz in extraordinary cases, 10 minutes in 52.5 Hz-51.5 Hz frequency range, 1 hour in 50.5 Hz-51.5 Hz frequency range, 1 hour in 48.5 Hz-49 Hz frequency range, 20 minutes in 48 Hz-48.5 Hz frequency range, 10 minutes in 47.5 Hz-48 Hz frequency range, staying connected to the transmission grid.</i></p>		

- a) Line Traps shall have the capacity to carry the rated continuous current, the short period rated current indicated above for 1 second and at the same time, minimum 5-period rated short circuit peak withstand current without any mechanical damage.
- b) It shall have high strength so as not to shorten its life in case of emergency current rises that may result in 20% overload for a period of 60 minutes without any permanent damage at an environmental temperature of +40 °C.
- c) Well-being factor shall not be less than (Q) 30 (at 100 kHz).

- d) There shall not be any change in the tuning device and protection unit, in their physical and RF characteristics in case of magnetic field and temperature rises on the main coil under rated continuous current, short period rated current or inrush overload currents.
- e) The insulation level between the terminals of line trap depends on the rated voltage of the protection mechanism. The insulation of the main coil or tuning device shall be selected appropriately for “U” voltage occurring on the line trap at rated short period current and at rated frequency and the residual voltage caused by the rated discharge current of protection unit or the wave side of impulse flashover voltage, whichever is higher.
- The rated voltage of the protection appliance at rated discharge current shall be higher than “U” voltage.
- [Here, the “U” voltage is the voltage occurring between the ends of the trap at 50 Hz (f) and inrush (short period) current (I) and is calculated in accordance with the formula $U=2\pi f L I$. (L=inductance of main coil at 50 Hz.)]*
- f) The rated discharge current of the protection unit shall be 10 kA.
- g) Radio interference test voltage (RIV); For 170 kV line traps, it shall be 113 kV and for 420 kV line traps, it shall be 280 kV.
- h) The power consumed by the main coil shall be as low as possible. The bidders shall indicate the DC resistance of the proposed trap at 20°C and its verified power loss at 75 °C.
- i) The verified power losses at 75 °C; for 170 kV/1250 A, 0.5 mH line traps ≤6 kW, for 420 kV, 4000 A, 0.5 mH line traps ≤50 kW. In case line traps out of those values are needed, the power losses shall be determined by the Directorate.

2.2. Incompliance with the Warranties and Deviations

The matters indicated in the technical specifications and the values given in the list of warranted characteristics have to be completely complied with. In case they are not complied with, the Bidder/ Contractor shall clearly indicate the deviations in the list given in Annex-3. The list of deviations, which is completed by the Bidder/ Contractor shall be assessed by the Directorate in terms of compliance with the essence of the technical specifications and with the relevant standards.

At the stage of bid assessment, the Directorate reserves the right to reject or accept the bids containing technical deviations.

If nothing is indicated in the list of deviations, it shall be assessed that the line traps are completely compliant with the technical specifications.

2.3. Structural Characteristics

2.3.1. General

- The line traps shall be suitable for horizontal or vertical assembly on the support or shall be hanger type.
- The line traps shall have a structure providing facilities such as lifting eyes, which are preferred to be at the center of the upper section.
- Precautions to prevent entrance of birds shall be taken in the line traps.
- The material that is least affected from corona shall be used in the line traps.
- All metal sections shall be made of corrosion-resistant materials or shall be hot dip galvanized.
- All parts exposed to sunlight shall be protected against ultraviolet effects.

2.3.2. Main Coil

The structural characteristics of the main coil shall be compliant with the environmental conditions, temperature rise limits and all requirements of the system.

2.3.3. Tuning Device

As a whole, the tuning device shall be protected against the environmental and mechanical impacts and all of its tuning members shall be placed in a waterproof box. The protection degree of the tuning device shall be minimum IPX3. The tuning device shall be easily replaceable with another tuning device without disassembling the line trap and without making any changes in the main coil.

2.3.4. Protection Device (Surge Arrester)

The protection device shall be a non-linear metal oxide resistance type overvoltage protector that is designed and produced in compliance with TS EN 60099-4 standard.

2.3.5. Terminals

All terminals and connection members shall be made of aluminum or aluminum alloy. The position of terminals, their dimensions and hole details shall be compliant with the Directorate's system and shall be submitted to the Directorate for approval.

2.3.6. Nameplate

The main members of the line trap such as the main coil, tuning device, protection device shall be separately labeled using a stainless steel or corrosion – resistant metal material. The nameplates shall be attached at appropriate places allowing easy reading using steel screws or rivets and the main characteristic information specific to that section as requested in IEC 60353 and TS EN 60099-4, and production dates and order number of the Directorate shall be written on them in Turkish. The writings on the label shall not be deleted in time.

The following information shall be provided on the main coil nameplate:

- Manufacturer's name,
- Year of manufacture,
- Type,
- Serial number,
- Rated inductance (mH),
- Power- frequency inductance (mH)
- Rated continuous current (A),
- Rated frequency (Hz),
- 1-sec rated short circuit current (kA),
- Rated short circuit peak withstand current (kA),
- Maximum system voltage (kV),
- Standards,
- Temperature class,
- Cooling type,
- Dimensions (mm),
- Total weight (kg),
- Material code number,
- Order number of the purchaser.
- 7/24 Service tel no

The following information shall be provided on the tuning device nameplate:

- Name of the manufacturer,
- Year of manufacture,
- Type,
- Serial number,
- Frequency band/ bands (kHz),
- Trap impedance (min. value) (Ω),
- Trap resistance (min. value) (Ω),
- Rated impulse protection level (kV),
- Order number of the purchaser.

2.3.7. Field Assembly

The line traps shall be assembled on posts or shall be hung. The posts and the post insulators are not included in the scope of the specifications. However, the Contractor shall provide all connection parts (post type feet) and hardware necessary for assembly. The bidders shall provide the drawings and all necessary documentation for the typical post arrangement including the fittings and hardware.

2.3.8. Protection Against Corrosion

2.3.8.1 General

All metal parts shall be made of corrosion – resistant material and the surfaces shall be processed so as to minimize corrosion.

The following precautions shall be taken against corrosion:

- Current carrying parts shall be made of non-ferrous metal.
- All surfaces shall be arranged so as not to hold water as much as possible and enclosure boxes shall have protection against water and dust.
- The material to be used in production shall be selected and arranged so as not to cause galvanic corrosion.
- Aluminum alloys, which carry current or which are used as structural members, shall be resistant against corrosion.

2.3.8.2 Galvanizing

The galvanizing operation and the tests on galvanized surfaces shall be performed in compliance with TS EN ISO 1461 on galvanizing. Unless otherwise specified, on each part of the surfaces that are hot dip galvanized, the galvanize thickness shall be compliant with the values defined in TS EN ISO 1461 standard.

The hot dip galvanizing of all metal parts including the threads of bolts and screwed bars shall be performed after the completion of processing, bending, cutting, punching, drilling, marking and welding operations and after the rust and oils on the surfaces are thoroughly cleaned through blasting, chemical cleaning etc. methods. Bolts, nuts, screwed bars etc. can also be made of rustproof material.

3. TESTS

All tests on the main coil, tuning device and protection unit on the line trap shall be performed in compliance with IEC 60353 standard.

3.1. Type Tests

The type tests to be applied on line traps are indicated hereunder.

- Temperature rise test (IEC 60353 Clause 19.1)
- Measurement of radio influence voltage (IEC 60353 Clause 19.2)
- Impulse voltage test (IEC 60353 Clause 19.3.1)
- Power frequency voltage test on tuning device (IEC 60353 Clause 19.3.2.)
- Short - time current tests (IEC 60353 Clause 19.4)
- Measurement of the rated inductance of the main coil (IEC 60353 Clause 19.5)
- Measurement of the power frequency inductance of the main coil (IEC 60353 Clause 19.6)
- Measurement of blocking resistance and blocking impedance (IEC 60353 Clause 19.7)
- Measurement of tapping loss and tapping loss based on the blocking resistance (IEC 60353 Clause 19.8)

3.2. Routine Tests

The routine tests to be applied on line traps are indicated hereunder:

- Power- frequency voltage test on tuning device (IEC 60353 Clause 19.3.2.)
- Measurement of the rated inductance of the main coil (IEC 60353 Clause 19.5)
- Measurement of the power frequency inductance of the main coil (IEC 60353 Clause 19.6)
- Measurement of blocking resistance and blocking impedance (IEC 60353 Clause 19.7)
- Measurement of tapping loss and tapping loss based on the blocking resistance (IEC 60353 Clause 19.8)
- Measurement of power losses (IEC 60353 Clause 12)
- Checking the physical dimensions, galvanize, label and warranted characteristics.

3.3. Acceptance Tests and Sampling

For the acceptance tests, samples shall be randomly selected by the Directorate's representatives from the line traps that are grouped in accordance with frequency band, rated current and rated voltage at the time of each delivery. Unless otherwise specified, the sample number shall be compliant with the following table. The tests indicated in the routine tests shall be performed on each sample that is taken in accordance with the batch size.

Batch Size	Sample Number
1-10	2
11-15	3
16-25	4
26-50	6
51-100	8

4. MATTERS RELATED WITH TESTS AND ACCEPTANCE CRITERIA

4.1. Type Tests

The Bidder/ Contractor shall submit the type test reports belonging to the tests indicated under the heading “3.1 Type Tests” of the Technical Specifications, which shall be performed within the last 10 (ten) years unless otherwise specified, in compliance with the latest editions of IEC 60353 and relevant standards by a laboratory accredited by Turkish Accreditation Institution or by the accreditation institutions included in the scope of International Laboratory Accreditation Cooperation Mutual Recognition Agreement or by a laboratory to be approved by the Directorate under the supervision of the representatives of the Directorate.

The type tests reports submitted to the Directorate shall belong to the tests performed on line traps that are of the same type and characteristics with the proposed line traps.

In relation with those type test reports, a table showing the factory where the type tested line traps are produced, the type and characteristics of the line traps, to which they belong, the laboratory that performed the type tests and the date of such tests and the documents related with the laboratory, where the type tests are performed, shall be submitted to the Directorate in detail by making the necessary explanations.

In order to be able to assess the submitted type tests, it shall be explained whether there is any difference between the type tested line trap and proposed line trap in structural and electrical points of view being supported with documents approved by the laboratory, which performed the tests and relevant drawings and documents shall be submitted and the Purchaser shall perform the assessment in accordance with this.

If the submitted type tests are performed by the accredited laboratory of the manufacturer/ vendor, they shall be performed under the supervision of the Directorate’s representatives.

If the producer is producing the line traps under a license, it shall perform the type tests of such line trap. The type tests of the licenser firm shall not be accepted.

In case of goods purchase tenders, if the type test reports are not submitted together with the bid and/or the proposed line trap does not have the same characteristics (is not covered by such tests) and/or if they are incompletely submitted, the Contractor shall be able to submit the type test reports together with the approval documents after signing the contract and in case of failure in such submission, the type tests shall be performed in the scope of the order before the first acceptance test, under the supervision of the Directorate’s representative, at an accredited laboratory or a laboratory to be approved by the Directorate and the price for such tests shall be borne by the contractor.

In case of construction work tenders, the Contractor shall submit all type test reports together with the approval documents after signing the contract. Failure in submitting all type tests, their incomplete submission or in case of inappropriateness of the tests,

approval documents shall not be approved unless those tests are completed. Furthermore, application shall not be made for acceptance tests unless the approval operation is completed. (The submitted type tests shall be performed as indicated above.)

The type tests, which the directorate wants to be repeated in the tender file, shall be performed without bringing any expense to the Directorate, even if they were performed and their type test reports were accepted by the Directorate before.

4.2. Routine Tests

The tests included under the heading “3.2. Routine Tests” of the Technical Specifications shall be applied by the Manufacturer on each line trap ordered in the scope of the contract in compliance with the latest editions of IEC 60353 standard and other relevant standards and the routine test reports shall be prepared in 2 (two) copies in CD/DVD medium.

4.3. Acceptance Tests

The tests included under the “3.2. Routine Tests” heading of the Technical Specifications shall be performed on samples to be selected in appropriate amounts in compliance with the section “3.3. Sampling” at the Manufacturer’s laboratory or a laboratory to be approved by the Directorate in compliance with the latest editions of IEC 60353 standard and relevant standards at the time of delivery of each batch of line traps under the supervision of TEİAŞ representatives.

The calibrations of devices to be used in the tests shall be performed by an accredited organization. Calibration certificates and routine test reports shall be submitted to the Directorate or Directorate representative/ representatives before starting the acceptance tests. Otherwise, test and acceptance operations shall not be commenced.

4.4. Acceptance Criteria

- a) The calibrations of the devices to be used in the tests shall be performed by an accredited organization and their calibration certificates shall be submitted to the Inspection and Acceptance Commission before the commencement of the tests.
- b) Positive results shall be obtained from all type tests to be performed. If a negative result is obtained from a type test, the disconnector or ceramic insulator belonging to the drawing/ type that gave a negative result shall be rejected. However, in case of request of the Contractor and confirmation of the Directorate, the repetition of the tests belonging to the new product that is produced by making the necessary changes within a reasonable period can be accepted without giving any period extension, provided that all expenses are borne by the Contractor and that the authority to decide belongs only to the Directorate. If the tests to be performed for the second time result negatively, all of the order belonging to the failed drawing/ type shall be rejected.

- c) Positive results shall be obtained from all acceptance tests. If a negative result is obtained from any of the acceptance tests, the test/ tests shall be repeated by taking new samples in an amount that is twice the amount taken for the first test unless otherwise specified in the relevant standards. None of the samples selected for the test must fail. If defective units are found, the Directorate shall reject the entire batch or shall request the Contractor to replace the defective units and to perform the relevant tests in compliance with the type technical specifications conditions.

4.5. Acceptance Procedure

The Directorate or its representative is free to inspect and/or test the line traps during production in order to verify their compliance with the Technical Specifications. The Directorate shall provide written information to the Contractor on the identification of any representative assigned for this purpose.

Production control and tests shall be performed at the manufacturer's facilities, at the place of material delivery and/or at the final delivery location of the materials. Production control and tests shall be performed without any expenses for the directorate and any kind of necessary aid and facilitation shall be provided for the inspectors including permission to review drawing and production information.

The Contractor shall notify the test program to the Directorate after signing the Contract. The Contractor shall make a notification to notify the actual starting date of the tests to the directorate minimum 45 (forty five) days before the tests to be performed abroad and minimum 15 (fifteen) days before the tests to be performed in the country.

As the result of a successful test and inspection, the test reports shall be mutually signed and Shipment Order shall be given by the Directorate's representatives for shipment. The Contractor shall handover 2 (two) copies of the mutually signed test report to the Directorate's representatives. However, the Directorate may notify that it will not participate in the tests by calling in time.

In case the Directorate did not notify in writing that it will not participate in the tests 48 hours before the tests, the Contractor shall perform the tests and notify the results to the Directorate. The test reports, which are prepared and signed by the Contractor shall be sent to the Directorate in 3 (three) copies to be examined and approved. If the test reports are approved, the Directorate shall place a Shipment Order and 1 (one) approved copy of the test report shall be sent to the Contractor.

In case it is understood that the examined and tested materials are not compliant with the Technical Specifications, the directorate rejects them. If found appropriate by the Directorate, the Contractor shall replace the rejected materials with new ones bearing all relevant expenses or shall make the changes that will ensure compliance with the Technical Specifications.

**ANNEX-1
WARRANTED CHARACTERISTICS LIST FOR 170 KV LINE TRAP**

Order No:

Drawing No:

Buyer's Material Code No.:

TANIM	İSTENEN	GARANTİ EDİLEN
1) İmalatçı firma		
2) İmalatçının tip işareti		
3) Çalışma Koşulları ⁽¹⁾		
▪ Deniz seviyesinden yükseklik (m)		
▪ Ortam sıcaklığı (°C)		
➤ En yüksek		
➤ En düşük		
➤ 24 saatlik ortalama		
➤ Bir yıllık ortalama		
4) Uygulanan standartlar	T.Ş.madde 1.2'de belirtilmiştir.	
5) En yüksek sistem gerilimi (kV)	170	
6) Anma gerilimi (kV)	154	
7) Anma güç frekansı (Hz) (*) T.Ş. Madde 2.1 sağlanacaktır.	50 (*)	
8) Anma sürekli akımı (I _N) (A) ⁽²⁾		
9) Kısa süreli anma akımı (1 sn) (kA-rms)	50 (Değişiklik: 22/07/2020 - 246597 GM)	
10)Anma kısa devre tepe dayanım akımı (kA)	125 (Değişiklik: 22/07/2020 - 246597 GM)	
11)Taşıyıcı frekansı (kHz)	40-500	
12)Hat empedansı (Ω)	400	
13)Sıcaklık sınıfı	F	
14)RIV test gerilimi (kV)	113	
15)Acil aşırı yük akımı (60 dakika için)	1.2xI _N	

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TANIM	İSTENEN	GARANTİ EDİLEN
16)Ana Sargı		
▪ Anma indüktansı ($\pm\%10$) (mH) ⁽³⁾		
▪ Öz salınım frekansı (kHz)		
▪ İyilik faktörü (Q)	≥ 30 (100 kHz'de)	
▪ DC direnci (20 °C'de) (Ω)		
▪ Doğrulanmış güç kaybı (75 °C'de) (kW) ⁽⁴⁾		
▪ Sıcaklık artışı (°C)	< 135	
▪ Ortalama sıcaklık artışı (°C)	< 115	
17)Ayar Ünitesi		
▪ Frekans bandı ⁽⁵⁾		
▪ Tıkama direnci (Ω)	≥ 570	
▪ Tıkama empedansı (Ω)	≥ 570	
▪ Tıkama kaybı (dB)	≤ 2.6	
▪ Darbe gerilim seviyesi (kV-tepe)		
18)Koruma Ünitesi		
▪ Üretici firma		
▪ Tip		
▪ Anma gerilimi (Ur) (kV)		
▪ Maksimum sürekli çalışma gerilimi (Uc) (kV)		
▪ Artık gerilim (kV-tepe)		
▪ Anma boşalma akımı (8/20 μ s) (kA-tepe)	10	
19)Terminaller		
▪ Malzeme	Al veya Al alaşımı	
▪ Ölçüler (mm)		
▪ Yük (Eksenel, Düşey, Yatay) (kg)		
20)Ölçüler (mm)		
21)Komple ünitenin net ağırlığı (kg)		
22)Taşıma ağırlığı (kg)		
Not: (1), (2), (3), (4), (5) parametreleri İdare tarafından belirlenecektir.		

EK-2
420 kV HAT TIKACI GARANTİLİ ÖZELLİKLER LİSTESİ

Sipariş No:

Poz No:

Alıcının Mlz. Kod. No:

TANIM	İSTENEN	GARANTİ EDİLEN
1) İmalatçı firma		
2) İmalatçının tip işareti		
3) Çalışma Koşulları ⁽¹⁾		
▪ Deniz seviyesinden yükseklik (m)		
▪ Ortam sıcaklığı (°C)		
➤ En yüksek		
➤ En düşük		
➤ 24 saatlik ortalama		
➤ Bir yıllık ortalama		
4) Uygulanan standartlar	T.Ş.madde 1.2'de belirtilmiştir	
5) En yüksek sistem gerilimi (kV)	420	
6) Anma gerilimi (kV)	400	
7) Anma güç frekansı (Hz)	50 (*)	
(*) T.Ş. Madde 2.1 sağlanacaktır.		
8) Anma sürekli akımı (I _N) (A) ⁽²⁾		
9) Kısa süreli anma akımı (1 sn) (kA-rms)	63	
10) Anma kısa devre tepe dayanım akımı (kA)	160	
11) Taşıyıcı frekansı (kHz)	40-500	
12) Hat empedansı (Ω)	400	
13) Sıcaklık sınıfı	F	
14) RIV test gerilimi (kV)	280	
15) Acil aşırı yük akımı (60 dakika için)	1.2xI _N	
16) Ana Sargı		
▪ Anma indüktansı (±%10) (mH) ⁽³⁾		
▪ Öz salınım frekansı (kHz)		

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TANIM	İSTENEN	GARANTİ EDİLEN
▪ İyilik faktörü (Q)	≥ 30 (100 kHz'de)	
▪ DC direnci (20 °C'de) (Ω)		
▪ Doğrulanmış güç kaybı (75 °C'de) (kW) ⁽⁴⁾		
▪ Sıcaklık artışı (°C)	< 135	
▪ Ortalama sıcaklık artışı (°C)	< 115	
17)Ayar Ünitesi		
▪ Frekans bandı ⁽⁵⁾		
▪ Tıkama direnci (Ω)	≥ 570	
▪ Tıkama empedansı (Ω)	≥ 570	
▪ Tıkama kaybı (dB)	≤ 2.6	
▪ Darbe gerilim seviyesi (kV-tepe)		
18)Koruma Ünitesi		
▪ Üretici firma		
▪ Tip		
▪ Anma gerilimi (Ur) (kV)		
▪ Maksimum sürekli çalışma gerilimi (Uc) (kV)		
▪ Artık gerilim (kV-tepe)		
▪ Anma boşalma akımı (8/20 μ s) (kA-tepe)	10	
19)Terminaller		
▪ Malzeme	Al veya Al alaşımı	
▪ Ölçüler (mm)		
▪ Yük (Eksenel, Düşey, Yatay) (kg)		
20)Ölçüler (mm)		
21)Komple ünitenin net ağırlığı (kg)		
22)Taşıma ağırlığı (kg)		
Not: (1), (2), (3), (4), (5) parametreleri İdare tarafından belirlenecektir.		

EK-3
170 VE 420 kV HAT TİKAÇLARI SAPMALAR (DEVIATION) LİSTESİ

Sipariş No:

Poz No:

Alıcının Mlz. Kod. No:

A- TEKNİK ŞARTNAMEDEN SAPMALAR (DEVIATION)

(Hangi maddelerde sapmalar olduğu ve sapmaların neler olduğu teklif sahibi tarafından açıkça belirtilecektir.)

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B- GARANTİLİ ÖZELLİKLER LİSTESİNDEKİ SAPMALAR (DEVIATION)

(Hangi maddelerde sapmalar olduğu ve sapmaların neler olduğu teklif sahibi tarafından açıkça belirtilecektir.)

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