



شرکت ملی گاز ایران
مدیریت پژوهش و فناوری
امور تدوین استانداردها

IGS

مشخصات فنی خرید

اتصال عایقی

INSULATING JOINT



تاریخ: ۱۳۹۵/۱۱/۲۶

شماره: ی/۰/دب/۰-۳۲۵-۱۷۸۳۷



شرکت ملی گاز ایران



دفتر مدیر عامل



ابلاغ مصوبه هیأت مدیره



مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۷۱۸ مورخ ۱۳۹۵/۱۱/۱۰ هیأت مدیره، نامه شماره گ/۹۰۰/۱۵۴۷۱۸ مورخ ۹۵/۱۱/۶ مدیر پژوهش و فناوری در مورد تصویب نهایی استاندارد تحت عنوان "مشخصات فنی خرید اتصال عایقی" به شماره استاندارد (3) IGS-M-PL-006 مطرح و مورد تصویب قرار گرفت:

این مصوبه در حکم مصوبه مجمع عمومی شرکت‌های تابعه محسوب و برای کلیه شرکت‌های تابعه لازم الاجرا می‌باشد.

الهام ملکی

دبیر هیأت مدیره



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FOREWORD

This standard is intended to be mainly used by NIGC and contractors, and has been prepared based on interpretation of recognized standards, technical documents, knowledge, backgrounds and experience in natural gas industry at national and international levels.

Iranian Gas Standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC Standardization division and submitted to the NIGC's "STANDARDS COUNCIL" for approval.

IGS Standards are subject to revision, amendment or withdrawal, if required. Thus the latest edition of IGS shall be checked/ inquired by NIGC employees and contractors.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation from normative references and/or well-known manufacturer's specifications must be reported to Standardization Division.

The technical standard committee welcomes comments and feedbacks about this standard, and may revise this document accordingly based on the received feedbacks.

GENERAL DEFINITIONS:

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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1. SCOPE

This specification covers minimum NIGC's requirements of design, material selection, fabrication, inspection and testing for butt weld end, monolithic insulating joints used for electrical insulation between sections of non-sour natural gas pipelines with pressure class rating 150, 300 and 600 as per ASME B16.5 , service temperature range from -29 °C to +60 °C. The insulating joint is intended to be girth welded between two pipeline sections under or above ground.

2. REFERENCES

Throughout this standard specification the following standard and codes are referred to. The applicability of changes in standards and codes that occur after the date of this standard that referred shall be mutually agreed upon by the purchaser and supplier and / or manufacturer.

ASME B16.5 (2013) "Pipe Flanges and Flanged Fittings"

ASME B31.8 (2012) "Gas Transmission and Distribution Piping Systems"

ASME sec V (2013) "Nondestructive Examination"

ASME sec VIII (2013) "Division 1: Rules for Construction of Pressure Vessels"

ASME sec IX (2013) "Qualification Standard for Welding and Brazing Procedures Welders, Brazers and Welding and Brazing Operators"

ASTM A 105.(2012) "Standard Specification for Carbon Steel Forgings for Piping Application"

ASTM A 370 (2012) "Standard Test Method and Definitions for Mechanical Testing of Steel Products"

ASTM A 694.(2003) "Standard Specification for Forgings, Carbon and Alloy Steel for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service"

ASTM D 709 (2001) "Standard Specification for Laminated Thermosetting Materials"

ASTM D 2000 (2006)"Standard Classification System for" Rubber Products in Automotive Applications"

API-5L.(2012) "Specification for Line Pipe"

API-1104.(2013) "Welding of Pipe Lines and Related Facilities"

MSS-SP-75 (2008) “Specification for High Test Wrought Butt-welding Fittings”

ISO 8501-1 (2007) “Preparation of Steel Substrates before Application of Paints and Related Products-Visual Assessment of Surface Cleanliness”

ISO TS 29001 (2007) “Petroleum, Petrochemical and Natural Gas Industries-Sector Specific Requirements-Requirements for Product and Service Supply Organization”

BS EN 10204 (2004) “Metallic Products-Types of Inspection Documents”

IGS-M-TP-027(2013) “External Liquid Epoxy Coating for Rehabilitation and Repair of Buried Steel Pipe Line, Bends, Field Joints, Valves and Fittings”

3. TERMS AND DEFINITIONS

DFT (Dry Film Thickness)

The thickness of a coating remaining on the surface when the coating has hardened

NPS

Nominal Pipe Size (in)

PSL

Product Specification Level

Pup

A transition piece of pipe, API 5L grade, with specified nominal wall thickness used for fabricating of Insulating joint, with welded end preparation suitable for adjoining pipe as specified in the purchase order. No girth weld is permitted along to the pup piece

Purchaser /End user

National Iranian Gas Company or subsidiaries or its approved representative that buys the insulating joint

Routine Test

Types of test are done during production performed by the manufacturer which has to be satisfied the products are in accordance with the requirements

SAWL

Tubular product having one longitudinal / straight seam produced by double submerged-arc welding

SMLS

Pipe without any weld seam, produced by a hot-forming process, which can be followed by cold sizing or cold finishing to produce the desired shape, dimension and properties

Type Test

Testing performed on typical sample to prove that material, design, manufacturing and etc is capable of conforming to the requirements given in the relevant standard. Type

test certificate is valid until the material, designation or production methods remain unchanged.

4. SYMBOLS AND ABBREVIATED TERMS

4.1. NDT. : Non-Destructive Test

4.2. NBR: Nitrile Butyl Rubber

4.3. HNBR: Hardened Nitrile Butyl Rubber with Recommended Shore Hardness of 75.

4.4. FKM: Fluoro Elastomers Materials Like Viton

4.5. PT: Dye Penetrate Test

4.6. UT: Ultrasonic Test

4.7. RT: Radiographic Test

4.8. MT: Magnetic Particle Test

5. ORDERING INFORMATION

For each insulation joint, the following information shall be specified in the Purchase Order for quotation:

- a) Nominal outside diameter (inch)
- b) Design pressure
- c) Class rating
- d) Pipeline wall thickness
- e) Pipeline grade
- f) Above ground or buried installation
- g) Insulating joint specification (IGS-M-PL-006)
- h) Additional inspection requirements (If any)
- i) Quantity

6. TECHNICAL REQUIREMENTS

6.1. Material

6.1.1. The carbon equivalent of forged parts and pups calculated with the following formula shall not exceed 0.42% based on ladle analysis.

$$CE=C+ (Mn/6)+((Cr+Mo+V)/5)+((Ni+Cu)/15)$$

Type and size of the pups and Material quality shall be the same as those of the pipe to be connected (matching pipe) as per table 1 and 2.

Table 1 - Pup Piece Type

Pup piece size	Pup Piece Type
NPS ≤ 4	SMLS (API 5L)
4 < NPS	*API 5L, PSL2.
*: Manufacturer's certificate or test reports shall be submitted.	

Table 2 - Forged Parts and Pups Material

Pups Material	Forged Material
API 5L B	ASTM A 105 N(normalized)
API 5L × 42	ASTM A 694 F 42/F52
API 5L × 52	ASTM A 694 F 52/ F 60
API 5L × 60	ASTM A 694 F 60/ F 65
API 5L × 65	ASTM A 694 F 65/ F 70
API 5L × 70	ASTM A 694 F 70

6.1.2. Insulating materials shall be made of age resisting laminated epoxy resin reinforced with glass fiber conforming to ASTM specification D 709 Type IV Group G 10/G 11 or equivalent.

6.1.3. The ring seals shall be made of HNBR/NBR or FKM(Viton) or equivalent according to ASTM D 2000.

6.2. Design and Fabrication

6.2.1. All insulating joints shall be of boltless, mono block type fabricated by welding with pups on either side, without a maintenance pit when installed either on a buried or above ground pipeline. The internal diameter of the joint shall not deviate by more than

$\pm 2\%$ from the nominal internal diameter of the pipeline. The design of the insulating joint(s) shall be in accordance with ASME VIII Division 1, compatible with ASME B31.8.

6.2.2. Any of the following processes may be used but before fabrication, the welding process shall be approved by Purchaser.

- a) Shielded metal arc welding (SMAW)
- b) Gas tungsten-arc welding (GTAW)
- c) Gas metal-arc welding (GMAW)
- d) Submerged arc welding (SAW)
- e) Combinations of above processes.

Electrodes, filler wires and fluxes shall conform to AWS A5. Through AWS A5.30 as applicable.

6.2.3. All joints shall be butt welded and have full penetration except for the final closure weld. The final closure weld shall be so designed to dominate possible damage to the seals and insulating rings due to generated heat.

6.2.4. Welding procedure, welder's qualification, weld repair and NDT examination shall be in accordance with ASME sec. IX and ASME sec. V respectively and approved by purchaser prior fabrication.

6.2.5. Primary and secondary sealing system against possible leak is required for Class 300 and 600.

6.2.6. The minimum overall length of insulating joints for specific pipe diameters and pressure rating shall be as listed in table 3.

6.2.7. The annular space between the Insulating material and forging parts shall be filled with an epoxies or silicones material. The insulating and filler materials shall be made of an age resisting of high dielectric characteristics materials suitable for the long-term exposure to the natural gas at the design pressure and temperature conditions.

6.2.8. Insulating joint(s) shall be free of injurious defect specified on Para. 14.5.2 of MSS-SP-75 and the other defects shall be removed according to Para. 14.5.3 of MSS-SP-75.

6.2.9. Heat-treatment for insulating joint(s) shall be performed according to ASME VIII, Division I and record chart shall be submitted to purchaser.

6.2.10. The steel parts and butt welds shall have a maximum hardness of 280 HV10.

Table 3 - Minimum Overall Length of Insulating Joints

Size (NPS)	ASME PRESSURE CLASS RATING		
	150	300	600
	Minimum overall length (mm)		
Up to 14	700	700	1000
16 to 24	1000	1000	1500
26 to 36	1500	1500	2000
40 to 48	2000	2200	2500
52 to 56	2500	2800	3000

Note: For pipelines with a wall thickness exceeding 1.25 inch, the manufacturer/supplier shall confirm that the length of the joint is suitable for post weld heat treatment of the field welds, i.e. the heat generated by the treatment is not detrimental to the isolating and filler materials and the internal coating. If this is not the case, the length of the joint shall be increased accordingly.

6.2.11. The end connections shall be beveled for welding in accordance with ASME B31.8 and ultrasonically tested for lamination.

6.2.12. For 100 mm distance of the ends, the internal diameter shall not deviate by more than ± 1.5 mm from the nominal internal diameter of the pipeline.

6.2.13. The height of internal weld beads shall not be more than 2 mm.

6.3. Coating

After assembling and testing, insulating joints shall be thoroughly cleaned and blasted to remove rust and impurities. Surface preparation shall comply with Sa 2½ in accordance with the requirements of ISO 8501-1. For insulating joints in sizes 4" and smaller, surface preparation can be achieved by water jet cleaning.

Following to achieving acceptable criteria in surface preparation, insulating joints shall be externally and internally coated with phenolic epoxy (Amin cured) in accordance with IGS-M-TP-027 to a minimum DFT of 500 microns. For insulating joints in sizes 4" and smaller, the thickness of internal coating may be reduced to DFT of 300 microns.

Notes:

- The coating application shall be carried out in strict accordance with the coating material manufacturer's recommendations.
- For above ground, a top coat of two-component aliphatic polyurethane, with min thickness (DFT) of 70 μ m shall be applied.
- Beveled ends of insulating joints shall be left uncoated as bellow and subsequently coated with a temporary rust preventive paint.

Table 4-Bevel end cut –back length

Valve size (NPS)	Uncoated bevel end (mm)
$2 \leq \text{NPS} \leq 6$	25
$8 \leq \text{NPS} \leq 12$	50
$16 \leq \text{NPS}$	100

7. INSPECTION AND TESTING

General

The manufacturer/supplier shall be responsible for carrying out all the tests and inspections required by this specification and shall maintain complete records of all tests and inspections. Such records shall be available for review by the Purchaser. Certified tests and inspection reports shall be properly identified with all products. The manufacturer shall afford the Purchaser's inspector all reasonable facilities necessary to satisfy him that the insulating joint(s) are fabricated in accordance with the provisions of this specification.

7.1. Routine Tests

7.1.1. Visual inspection and dimensional check

General appearance shall show good workmanship. Weld surfaces shall show a smooth contour. Surface shall be free of gouging, pitting, cutting and injurious defects such as, notches, scabs, laps, tears, etc.

Dimensions and tolerances shall be checked against the specifications, purchase order description and/or approved manufacturer drawings.

7.1.2. Holiday test

The thickness of coating at inside and outside of insulating joints shall be checked and it shall not be below the values indicated in Clause 6.3. The coating appearance shall be even on the whole surface.

The coating of inside and outside of insulating joints shall be subjected to holiday detection high voltage spark test a voltage of 6 volts per micron (6V/ μm).

7.1.3. Chemical analysis

Chemical analysis shall be performed by the ladle analysis for each heat of steel used and shall conform to the requirements of the chemical composition for the respective materials as per relevant standard.

7.1.4. Mechanical test

Tensile test and hardness is performed for each lot after heat-treatment. The same charged, shaped and heat-treated products are considered one lot.

7.1.4.1. Forging parts

The tensile test shall be performed according to ASTM A 370 corresponding to equivalent material and the results shall comply with the mechanical requirements in this Part of specification.

7.1.4.2. Pups

The tensile tests shall be performed according to Mechanical Properties of API 5L.

7.1.4.3. Steel parts

The base material and welds shall have a maximum hardness of 280 HV10. Hardness test shall be performed according to ASTM A 370.

7.1. 5. Electric and dielectric test**a) D.C. Resistance test (Megger Test)**

Each insulating joint shall be megger tested with 1000 V(D.C) . Minimum resistance shall be 60 Mega ohms.

b) Dielectric strength test

Each insulating joint shall also be dielectric tested at 5000 V (A.C, 50 Hz) for 1 minute. Maximum allowable leakage is 5 mill amperes on size up to 24 inch nominal pipe size and 10 milliamperes on size 30 inch and larger nominal pipe size.

7.1. 6. Hydrostatic test

The insulating joint shall be hydrostatically tested, in an unrestrained condition, using water with a low surface tension, at 1.5 times of ASME class rating.

The maximum test pressure shall be maintained for at least three hours. No leaks or unacceptable deformation shall occur during the test.

The dielectric and megger tests stated in clause 6.1.5. shall be conducted before and after hydrostatic test. The readings before and after the hydrostatic test shall be acceptable.

7.1. 7. Air leak tightness test

After hydrostatic test, a low pressure leakage test shall be carried out on each insulating joint. The joint shall be filled with air and will be pressurized up 90 psig and held at that pressure for 10 minutes. No leakage or pressure drops shall be permitted during the test.

7.1.8. Radiographic test

All welds, except the final closure weld, shall be fully radiographically tested.

7.1.9. Magnetic particle and ultrasonic test

The final closure weld shall be inspected by MT on the root pass and UT on final welds. All finished bevel ends shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from each end in accordance with ASME Section VIII.

Note: The magnetic particle examination may be made only after completion of bevel edge preparation.

7.1.10. Dye penetrate test

Dye penetrant test shall be performed on the machined surface according to ASME Section VIII, DIV. I. Appendix 8.

7.2. Performance Test by Hydro-Bend Type Test

7.2.1. Manufacturer shall submit the Hydro-bend type test certificate from an independent certifying body.

7.2.2. Selection of Samples

In any of the size range A through C listed below, the largest produced size in each pressure rating class, shall be tested as a typical Sample.

A=2 ~ 12 inch

B=16 ~ 36 inch

C = 40~ 56 inch

If the Hydro-bend type test has been carried out on a insulating joints with higher class rating, the lower classes at the same size range is acceptable.

7.2.3. Bending Test at Class Rating Pressure

7.2.3.1 Each prototype insulating joint shall be subjected to electric and dielectric test as per clause 7.1.5 and results shall be acceptable.

7.2.3.2. A bending test at rated pressure shall be carried out on each prototype insulating joint before being cut to final length and with both ends capped. The specimen shall be freely supported as a simple beam on two supports such that the center of the larger diameter portion is centered between the supports. The distance between supports centers shall be 10 times the nominal pipe size.

7.2.3.3. Two equal, centrally located point loads shall be applied. The distance between the load centers shall be 2 times the nominal pipe size or more if required to clear the larger diameter portion of the joint.

7.2.3.4. The magnitude of the point loads shall be calculated such that the resulting moment between the loads will produce a longitudinal stress equal to 75 % of the minimum specified yield strength in pup pipe based on nominal wall thickness. The loads shall be applied gradually. The full load shall be maintained for not less than 10 minutes

7.2.3.5. During the loading the specimen shall be maintained at an internal pressure equal to the class rating pressure as per ASME B16.5 at locally ambient temperature.

7.2.3.6. The relative deflection at the center of the larger diameter portion shall be measured before and after loading and during application of the maximum load. These deflections shall be recorded and compared with the theoretical deflection of an equally specified pipe spool without the insulating joint under the same loading conditions.

7.2.3.7. There shall be no permanent deformation and no signs of any leakage during the test period.

7.2.3.8. The electric and dielectric tests stated in clause 7.1.5 shall be repeated. The results before and after shall be acceptable.

Note: The calculation book and test procedure shall be forwarded to the purchaser's representative for evaluation.

8. MARKING

All insulating joints furnished under this Part of Standard specification shall be clearly identified with the information marked with low stress die stamps or interrupted dot –peen stamps on the outside of each completed insulating joint or/ and name plate as follows:

- a)** Manufacturer's name or tread mark
- b)** Manufacturing standard
- c)** Purchase order No.
- d)** Joint serial number
- e)** Size (NPS)
- f)** Thickness of pup's end
- g)** Pup's material grade
- h)** Pressure class rating
- i)** Hydro test pressure
- j)** Working temperature rating
- k)** Year of manufacture
- l)** Weight
- m)** Above ground/Under ground installation

9. QUALITY ASSURANCE PROVISIONS

It is the responsibility of the manufacturer to establish quality assurance by quality control procedures which shall ensure that the product will meet the requirements of this specification.

The quality control at the manufacturing plant shall include control systems on the following:

- Raw materials, i.e. checking of documentation and/or testing for conformity with the specification.
- Production equipment and process.
- Testing during and after fabrication.

- Checking of dimensions.
- Documentation (material certificates).

As alternative to above control system the manufacturer can have quality assurance system in accordance with ISO TS 29001.

10. DOCUMENTS AND CERTIFICATES

The manufacturer/supplier shall submit following certificates or reports as a minimum. All documents shall be in the English language.

- a) Test certificates relevant to the chemical and mechanical properties of the materials used for construction as per this specification and relevant standards.
- b) Test certified reports for:
 - Visual and dimensional test
 - Non-destructive examination
 - Hydrostatic and air tightness test
 - Electric and dielectric test
 - Internal and external coating test
- c) Stress relieves and heat treatment certificates. (if any)
- d) Hydro-bend type test certificates, calculation book and procedure.
- e) User manual detailing the requirements for installation and inspection in service.

Inspection certificates shall be provided by the manufacturer in accordance with the following:

- EN 10204 Type 3.1 for chemical analysis, mechanical properties, heat treatment, non-destructive examination.
- EN 10204 Type 3.2 for other tests, e.g. dimensional checks, Hydraulic or air tightness test, electric and dielectric test, coating inspection.

11. PACKING AND SHIPMENT

Only those insulating joints which have been inspected and certified by Purchaser's inspector shall be shipped.

- Both ends of each insulating joint shall be closed with slip-on recessed end caps to protect the internal parts and also the beveled ends from any possible damage. Care shall be taken to prevent damage to the external and internal coatings.
- Insulating joints shall be suitably packed and protected against all damages or defects which may occur during transit (sea shipment to the port and rough road haulage to site), and extended tropical open air storage up to 24 months.

Note: Tack welding of protectors to the joints is not permitted.

APPENDIX A- Data Sheet

After receiving enquiry, following data sheet shall be filled, signed and sealed by manufacturer authorized person and sent to NIGC for primary evaluation. If there is any clarification /deviations which not mentioned in following data sheet, please specify and submit us as remarks or supplementary clarification.

INSULATING JOINT DATA SHEET

Manufacturer Name and Address:		Tel and Fax:		
Inquiry No.:		Item No.:		
Date:	Project title:	Purchaser:		
DRWG. No.:		Quantity:		
Pup Outside Diameter (inch):		Pup Wall Thickness (inch):		
Class Rating: <input type="radio"/> 150 <input type="radio"/> 300 <input type="radio"/> 600		Pipeline Design Code: <input type="radio"/> ASME B31.8		
<input type="radio"/> Above Ground <input type="radio"/> Buried	Conveyed Fluid:	Matching Pipeline: Grade: Wall Thickness:		
Single Weld Closure: <input type="radio"/> Yes <input type="radio"/> No		Mono Block Design: <input type="radio"/> Yes <input type="radio"/> No		
Design Pressure:		Design Temperature:	Design Factor:	
Standards	Design: <input type="radio"/> ASME Sec. VIII		Other:	
	Welding and NDT: <input type="radio"/> ASEME Sec. V & IX <input type="radio"/> PWHT:		Other:	
	Class Rating: <input type="radio"/> ASME B16.5		Other:	
	Coating: <input type="radio"/> IGS-M-TP-027		Other:	
	insulating joint length :(mm)			
Materials	Forging Parts		ASTM: <input type="radio"/> A105 <input type="radio"/> A694 <input type="radio"/> Other : CE=	
	Pups		API5L (PSL2) <input type="radio"/> SMLS <input type="radio"/> SAWL Other: CE=	
	Insulating		<input type="radio"/> Laminated Epoxy Resin Reinforced with Glass Fiber Other:	
	Filler Material		<input type="radio"/> Epoxy <input type="radio"/> Silicon Other :	
	Sealing	Primary	<input type="radio"/> HNBR <input type="radio"/> NBR <input type="radio"/> FKM (Viton) Other :	
		Secondary	<input type="radio"/> HNBR <input type="radio"/> NBR <input type="radio"/> FKM (Viton) Other :	
	Coating	Internal	<input type="radio"/> Liquid Epoxy Other:	
External		<input type="radio"/> Liquid Epoxy Other:		

INS P.	Routine Tests	Dim.	Overall length: <input type="checkbox"/> IGS Other:	
			<input type="checkbox"/> End Preparation as per ASME B31.8	
		N.D.T	Welds	Closure: <input type="checkbox"/> UT Other:
				Butt welds: <input type="checkbox"/> RT Other:
			Bevel Ends	<input type="checkbox"/> UT Other:
		Hydrostatic	Before	<input type="checkbox"/> 1000 V.DC: <input type="checkbox"/> R ≥ 60 MΩ, Other:
				<input type="checkbox"/> 5000 V.AC, 1 min: Leak ≤ <input type="checkbox"/> 5mA <input type="checkbox"/> 10mA Other:
			<input type="checkbox"/> 1.5 × Class Rating, 3hr: <input type="checkbox"/> No Leak/Deformation	
			After	<input type="checkbox"/> 1000 V.DC: <input type="checkbox"/> R ≥ 60 MΩ, Other:
		<input type="checkbox"/> 5000 V.AC, 1 min: Leak ≤ <input type="checkbox"/> 5mA <input type="checkbox"/> 10mA Other:		
	Air Leak	<input type="checkbox"/> 90 psi, 10 min: <input type="checkbox"/> No Leak/Pressure Drop		
	Coating	External: DFT 500 μm Holiday, 6 V/μm Other:		
		Internal: DFT 500 μm Holiday, 6 V/μm Other:		
	Type Test Certificate	Hydro-Bend	<input type="checkbox"/> 75 % of SMYS Adjacent Pipe Pup: <input type="checkbox"/> No Leak/Deformation	
<input type="checkbox"/> 1000 V.DC: <input type="checkbox"/> R ≥ 60 MΩ, Other:				
<input type="checkbox"/> 5000 V.AC, 1 min: Leak ≤ <input type="checkbox"/> 5mA <input type="checkbox"/> 10mA Other:				

Note:

- The above data sheet shall be filled for each item.
- Deviation from IGS-M-PL-006 shall be specified by manufacturer / supplier.
- This data sheet shall be signed and sealed by manufacturer's authorized person