

Stud Weld

Technical Terms of Delivery



IRAN TRANSFO **D**ISTRIBUTION TRANSFORMERS **S**TANDARD
Iran Transformer Research Institute

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FOREWORD

Iran TransfoDistribution Transformer Standard consists of a series of standards which are prepared on the basis of valid International standards, in conformity with Iran TransfoDistribution's technical requirements.

The initial draft has been prepared in Transformer Research Institute of Iran (ITRI) which is also responsible to issue the final documents approved by professional committees in the form of IDS standards. It should be mentioned that all departments of Zangan Distribution Transformer Co. are obligated to apply the issued IDS Standards.

All users must be assured that the latest edition of this standard will be used. The latest edition of IDS standards is also available on the ITRI web site:

<http://filer.irantransfo.com>

About this standard:

The present standard has been approved in Zangan Distribution Transformer Co.'s Chemical Committee by:

- | | | |
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All users should ensure that they have the latest edition of this publication.

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1 Scope

The purpose of this standard is to determine the characteristics of stud weld (threaded stud) used for welding to metal parts of the body and the tank of distribution and medium power oil transformers.

Stud weld with ceramic ferrule (ceramic ring) is connected to the body of the transformer (tank, cover and conservator) by its own welding machine and gun by electric arc welding method. Ceramic ferrule acts as a protector and insulator, keeping the molten metal in the welding zone and preventing it from oxidizing.

After welding, the ceramic ferrule (according to IDS-MCO12-02) is easily broken by impact and separated from the stud weld.

This standard has been developed to provide technical specifications for the purchase, testing and inspection of stud weld.

2 Designation

In order, the dimensions, material, cover type and IDS standard number must be specified. For example:

Stud Weld - IDS-MCO12-01 - M10×55 – St - A4G

It should be noted in the designation code of the above example:

- Outer diameter of the thread: 10mm (parameter d1 according to table 1)
- Approximate height after welding: 55mm (L parameter as shown in Figure 1)
- Stud material: St-carbon steel St 37-3K (according to paragraph 3-2)
- Coating of material: A4G-galvanized (according to paragraph 3-2)

3 Specifications

3.1 Dimensions

Dimensional specifications of stud weld are based on Figure 1 and Table 1.

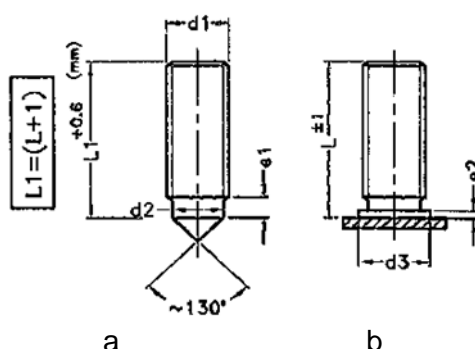


Figure 1. Display of dimensional parameters a) Before welding b) After welding

L: The approximate length is after welding and determined according to the values of ISO 13918 or the order of Zangan Distribution Transformer Co.

Table 1. Dimensions of stud weld

d ₁	M6	M8	M10	M12	M16	M20	M24
d ₂	5.35	7.18	9.02	10.85	14.55	18.37	22.05
d ₃	8.5	10.0	12.5	14.5	18.5	23.0	27.5
e ₁	9.0	5.5	6.0	7.5	13.5	13.0	23.0
e ₂	3.0	3.5	4.0	5.0	6.0	7.5	10.0
<ul style="list-style-type: none"> • Dimensional tolerances according to DIN ISO 2768-M • Thread according to DIN 13-1 • All Dimensions are in mm. 							

3.2 Material and Coating

3.2.1 Material

The material used in stud weld is as follows:

- St: St37-3K carbon steel according to DIN 1652 standard
- A2-70: Stainless steel according to ISO 3506-1
- A4-80: Stainless steel according to ISO 3506-1

3.2.2 Coating

The coating used in stud weld is as follows:

- A3G or A4G Galvanized coating according to EN ISO 4042 and with minimum corrosion resistance in salt spray test for 144 hours according to ASTM B 117-07
- Dacromet: Zinc Flake Coating or flZn / nc / 600h coating with Dacromet brand according to ISO 10683 standard with minimum corrosion resistance in salt spray test for 600 hours according to ASTM B 117-07 standard

4 Technical requirements

The stud weld in this standard is PD type according to ISO 13918 and in terms of appearance, corrosion resistance, weldability and strength after welding, must be in accordance with ISO 13918, ISO14555 and ISO 4042.

Stud weld must meet the following conditions:

- Spatter during welding is the minimum possible amount.
- Must have no welding defects such as porosity in the weld.
- M6 stud weld are mainly used for fixing of magnetic oil level indicator on the side wall of the conservator and should be suitable for welding on 1.5 mm thick steel plate.
- At the tip of the stud weld (conical end) should be inserted flux of aluminium
- All threads must be complete and free of any damage.
- There should be no coating on the e1 section and the conical end of the stud weld as shown in Figure 1 (threadless section). Also, the area should not be rusty.

5 Tests

5.1 Laboratory test

The laboratory test certificate must be presented by the manufacturer or supplier and verified by the following tests at the inspection department of Zangan Distribution Transformer Co.:

- Tensile test
- Hardness test
- Chemical analysis test
- Salt Spray test
- Torque test

5.1.1 Tensile test

According to ISO14555, this carries out according to Figure 2. After fracture in the weld, the defects in the area shall not exceed 10% of the total welding area.

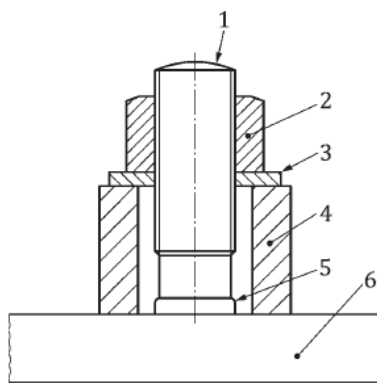


Figure 2: Tensile testing of threaded studs

Key:

- 1- Stud
- 2- Steel nut
- 3- Washer
- 4- Sleeve
- 5- Collar
- 6- Work piece

5.1.2 Hardness test

Hardness test is performed according to DIN EN ISO 6506-1.

5.1.3 Chemical analysis test

Chemical analysis test is performed according to ASTM E 1010.

5.1.4 Salt Spray test

Salt Spray test is performed according to ASTM B 117-07.

5.1.5 Torque test

According to ISO14555 and based on the Table 2, the required torque for testing the welding strength of the stud is as shown in Figure 3, so that there is no failure in the welding area.

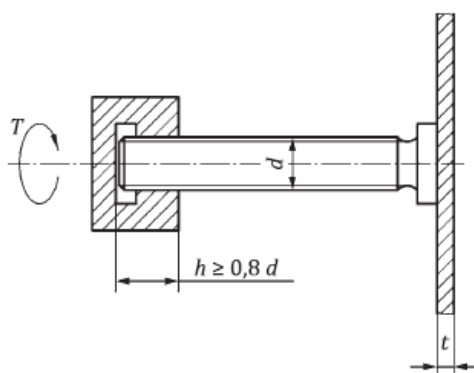


Figure 3: Torque test

Key:

- d: Stud diameter
- h: length of the threaded part of the nut
- t: thickness of plate
- T: torque

Table 1: Minimum values of required torque on

t Minimum thickness of the plate [mm]	d Stud diameter	T Torque [N.m]
1.5	M6	9
3	M8	24
	M10	46
	M12	80

5.2 Practical Test

A number of each size is delivered to the workshop for welding and use on the production line. After welding, the following are considered:

- spatter
- appropriate welding bead
- porosity
- The bending test according to ISO14555 must be carried out at a minimum angle of 60 °, so that no defect is caused to the weld or the stud.

6 Kind of Delivery

This product is packed in carton boxes (500 or 1000 pieces depending on the size of the Stud weld) and must be resistant to damage and transportation. It should be noted that to prevent moisture penetration, the product is covered with nylon. Cartons should be placed on a wooden pallet and portable by forklift. Maximum dimensions of the consignment should be (height: 90 cm, width: 85 cm, length: 120 cm).

Each packing should be identified by attached labeling and marked with following data:

- Dimensions
- Manufacturer name and factory mark.
- Order No.
- Number of standard.
- Heat number.
- Gross and net weight

7 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document applies.

SN 64128

Threaded bolts and ceramic rings for stud welding with stroke ignition

ISO 2768-1

General tolerances

ISO 14555

Welding - arc stud welding of metallic materials

ISO 4042

Fasteners - electroplated coating systems