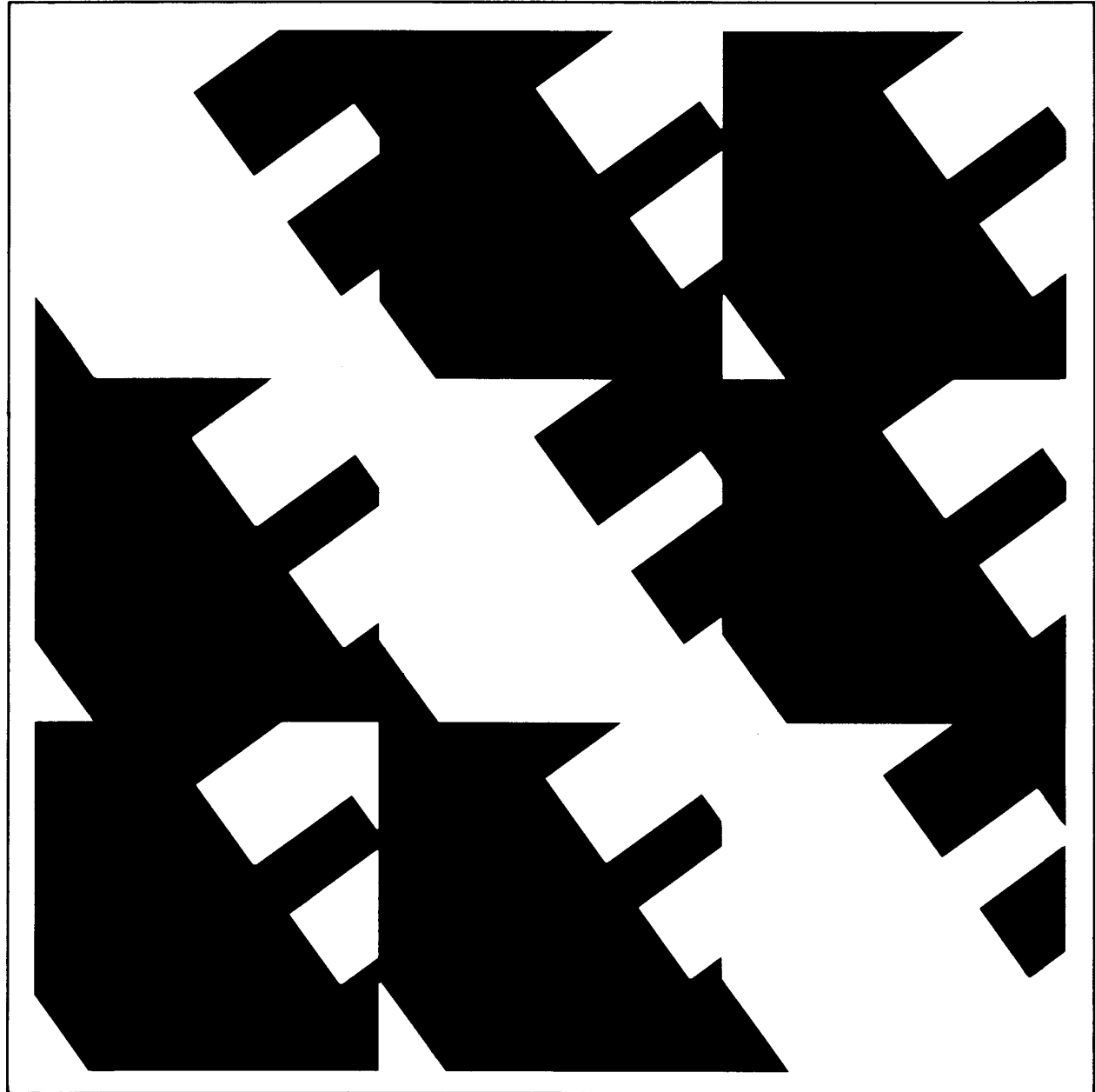


IEEE Standard for Electric Couplings

Part I - General, Rating, Performance Characteristics

Part II - Test Procedures

IEEE Std 290-1980



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Part I — General, Rating, Performance Characteristics

1. Scope

This standard covers the more generally applicable performance characteristics and conducting and reporting of the tests for determining the performance characteristics of electric couplings. Electric couplings referred to are defined in Section 2. It is not intended that this standard cover all possible tests, or tests of a research nature. This standard shall not be interpreted as requiring the making of any or all of the tests described herein in any given transaction.

2. Definitions¹

2.1 Types of Electric Couplings

hysteresis coupling. An electric coupling in which torque is transmitted by forces arising from the resistance to reorientation of established magnetic fields within a ferromagnetic material.

induction coupling. An electric coupling in which torque is transmitted by the interaction of the magnetic field produced by magnetic poles on one rotating member and induced currents in the other rotating member.

NOTE: The magnetic poles may be produced by direct current excitation, permanent magnet excitation, or alternating current excitation. The induced currents may be carried in a wound armature or squirrel cage, or may appear as eddy currents.

¹ Definitions in accordance with ANSI/IEEE Std 100-1977, IEEE Standard Dictionary of Electrical and Electronics Terms.

magnetic friction clutch (coupling). A friction clutch (coupling) in which the pressure between the friction surfaces is produced by magnetic attraction.

magnetic particle coupling. An electric coupling which transmits torque through the medium of magnetic particles in a magnetic field between coupling members.

synchronous coupling. An electric coupling in which torque is transmitted by attraction between magnetic poles on both rotating members which revolve at the same speed. The magnetic poles may be produced by direct current excitation, permanent magnet excitation, or alternating current excitation, and those on one rotating member may be salient reluctance poles.

2.2 Electric Coupling Torque and Time Constants

dynamic torque. That torque of an electric coupling developed or transmitted at a specified value or range of speed differential between input and output members and at specified excitation and other applicable conditions.

incremental time constant. The time constant applicable for a small incremental change of excitation voltage about a specified operating value.

minimum input shaft torque. The minimum input torque required to drive an electric coupling with zero output torque load, either with or without rated excitation as specified.

output torque without excitation. The torque an electric coupling will transmit or develop with zero excitation.

peak torque. The maximum torque an electric coupling will transmit or develop for any speed relation on input and output members, with rated excitation and at specified operating conditions.

starting torque. The minimum torque of an electric coupling developed with the output member stationary and the input member rotating, with excitation applied.

NOTE: Starting torque is usually specified with rated speed of rotation and rated excitation applied.

static torque. The minimum torque an electric coupling will transmit or develop with no relative motion between the input and output members, with excitation applied.

NOTE: Static torque is usually specified for rated excitation.

torque buildup time constant. The time constant applicable when excitation voltage is changed from zero to full value.

torque decay time constant. The time constant applicable when the excitation voltage is changed from full value to zero.

torque time constants. Torque time constants define the time required for the coupling torque to reach 63.2% of its total excursion, whenever the magnitude of excitation voltage is instantly changed between specified values. This does not imply that the torque time constant of a given coupling under certain conditions of slip, speed, temperature, and environmental conditions will be the same under other conditions.

3. Service Conditions

3.1 General. Couplings conforming to this standard shall be suitable for carrying load in accordance with their ratings under usual service conditions.

3.2 Usual Service Conditions

3.2.1 Usual service conditions exist when and where the temperature of the cooling medium of an air-cooled coupling does not

exceed 40°C and is not less than 10°C, and when the altitude does not exceed 1000 m (3300 ft).

NOTE: It is recognized as good practice to use couplings of standard temperature rise at altitudes greater than 1000 m (3300 ft) in those locations where the decrease in the ambient cooling-air temperature compensates for the resultant increase in temperature rise, provided that the greater temperature rise will not adversely affect the operation of the coupling. For applications above 1000 m (3300 ft), the coupling manufacturer should be consulted.

3.2.2 When electric couplings are water cooled, the temperature of the supply water shall not exceed 30°C and shall not contain impurities injurious to the coupling.

3.3 Unusual Service Conditions. There are unusual service conditions which may affect the construction or operation of machines. Such conditions, if they exist, should be brought to the attention of those responsible for the design, manufacture, application, and operation of the machines. Among such unusual conditions are:

- (1) Exposure to chemical fumes
- (2) Operation in damp or very dry places
- (3) Operation at speeds in excess of over-speed given in 7.2
- (4) Operation at relative speeds of input and output members in excess of rated speed
- (5) Exposure to combustible dust
- (6) Exposure to dusts of explosives
- (7) Exposure to gritty, conducting, or magnetic dust
- (8) Exposure to lint
- (9) Exposure to steam
- (10) Operation in poorly ventilated rooms
- (11) Operation in pits, or where entirely enclosed in boxes
- (12) Exposure to flammable gases
- (13) Exposure to ambient temperatures above 40 °C or below 10 °C
- (14) Exposure to oil vapor, except where oil environment is a required condition of coupling operation
- (15) Exposure to salt air
- (16) Exposure to abnormal shock or vibration from external sources
- (17) Where the departure from rated voltage or current is excessive (see 3.4.1, 3.4.2, and 3.4.3)
- (18) Where the alternating supply voltage is unbalanced
- (19) Where low values of radio or audible noise levels, or both, are required

(20) Exposure to external mechanical loads involving thrust or overhang

(21) Subject to operation in an inclined position

(22) Exposure to radioactivity

(23) Cooling water containing impurities injurious to the coupling

3.4 Variations From Rated Excitation

3.4.1 Variation From Rated Direct Current Excitation Voltage. Couplings shall operate successfully at rated torque with a variation in the direct current excitation voltage up to 10% above or below rated voltage. Performance within this voltage variation will not necessarily be in accordance with the standards established for operation at the rated voltage.

3.4.2 Variation From Rated Direct Current Excitation Current. Couplings shall operate successfully at rated torque with a variation in the excitation current up to 5% above or below the rated current. Performance within this current variation will not necessarily be in accordance with the standards established for operation at rated current. When excitation direct current and voltage are specified, excitation voltage is given for reference only.

3.4.3 Variations in Alternating Current Excitation Power. When alternating voltage and frequency are specified as input to excitation control, couplings shall operate successfully at rated torque with variations in voltage and frequency as follows:

(1) Voltage variation, at rated frequency, up to 10% above or below the rated voltage

(2) Frequency variation, at rated voltage, up to 5% above or below the rated frequency

(3) Combined variation in voltage and frequency not more than 10% (sum of absolute values) above or below the rated voltage and frequency, provided that the variations given in (1) and (2) above are not exceeded

Performance within the above voltage and frequency variations will not necessarily be in accordance with the standards established for operation at rated voltage and rated frequency.

3.5 Application of Short-Time Rated Couplings. Short-time rated couplings should be applied so as to ensure performance without injury. They should not be used (except on recommendation of the manufacturer) on any application requiring continuous operation.

4. Rating

4.1 Rating. The rating of an electric coupling shall consist of its torque transmitting capability together with other characteristics such as speed, slip speed, horsepower, thermal dissipating or absorption ability, or both, and excitation requirements. Various kinds of ratings are defined in the following paragraphs.

4.2 Continuous Rating. The continuous rating of an electric coupling is the torque that can be transmitted for an indefinitely long time under specified operating conditions.

4.3 Short-Time Rating. The short-time rating of an electric coupling is the torque that can be transmitted for a short and definitely specified time under specified operating conditions.

4.4 Continuous Rating Implied. In the absence of any specification as to the kind of rating, the continuous rating shall be implied.

4.5 Service Factor. Service factor for all electric couplings is 1.0.

4.6 Preferred Excitation Voltages for Electric Couplings

<i>Excitation Power</i>	<i>Rated* Direct Voltage, Average Values</i>
15 W and below	12, 28, 100
Over 15 W	100, 125, 250

*The rated voltages shown are those in use in the electric coupling industry. They are recommended for final approval by ANSI.

5. Temperatures and Temperature Rise

5.1 Limiting Observable Rise. The temperature rise of each of the various windings of the electric couplings above the temperature of the cooling medium when tested in accordance with the ratings shall not exceed the values given in Table 1. Temperatures shall be determined by the method specified.

6. Torque

6.1 Torque Characteristics. The torque characteristics of electric couplings shall be those of