15 Short-Circuit Current Test

15.1 Sufficient short-circuit current tests, as described in 15.2 – 15.7, with a minimum peak current of 30,000 amperes shall be conducted to represent each meter socket construction, including those with test blocks, and multiple meter socket constructions with bus bars.

Exception: Constructions having a short-circuit current rating of 10,000 amperes rms symmetrical need not be tested.

15.2 In choosing representative samples, the following factors shall be considered:

a) Bracing structure, if different, for each rating.

b) Material and cross-sectional configuration of each structure.

c) Weakest bus bar structure that could result in bus bar distortion.

d) Strongest bus bar structure that could transmit the maximum forces to the bus support or bracing.

e) A tested 4-jaw construction may represent 5- or 6-jaw meter sockets of similar construction and ratings. A tested 7-jaw construction may represent 6- or 8-jaw meter sockets of similar construction and ratings.

f) A line voltage bus or a neutral bus of a single or multiple meter socket shall be subjected to a separate short-circuit current test if it has a smaller cross-section, uses different supports, is face-to-face with a phase bus while the phase buses are edge-to-edge, or has supports spaced farther apart than the line voltage buses that were tested.

g) A meter socket having a different base or bus support need not be subjected to a short-circuit current test if, in comparison with the test constructions, the alternative base or bus support:

1) Has the same shape,

2) Is of material having equivalent mechanical strength, and

3) Is rated for an equal or lesser short-circuit current.

15.3 Either a simulated meter as used during the Heating Test, Section 14, or a commercially available watthour meter is to be in place during the short-circuit current test.

15.4 The line connections are to be made with convenient lengths of aluminum wire having an ampacity, in accordance with Table 7.1, not less than the rating of the meter socket. The load connections are to be made with 10 inch (254 mm) lengths of aluminum wire of the size used for the line connections brought to a common point and shorted.

Exception: Copper wire is to be used if the meter socket is marked for use with copper wire only.

15.5 The meter socket enclosure is to be connected through a 30-ampere, non-time delay type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. This connection is to be made on the load side of the limiting impedance by a 10 AWG (5.3 mm^2) copper wire 4 – 6 feet (1.2 – 1.8 m) long.

15.6 The test circuit voltage, power factor, closing angle, available current, or time of current flow are not specified, but the required peak current must flow through the meter socket.

15.7 After a meter socket has been tested under the short circuit conditions described in 15.1– 15.6, the results are acceptable if the meter socket is in substantially the same mechanical condition as prior to the test, and it complies with all of the following conditions:

a) There is no permanent distortion or displacement of a meter jaw, bus bar, or strap that would affect the intended functioning of the meter socket or reduce an electrical spacing to less than the value specified in Table 8.1.

b) An insulator or support has not been broken or cracked to such extent that the integrity of the mounting of a live part is impaired.

c) The fuse mentioned in 15.5 has not opened.

d) The enclosure or a part of the enclosure has not been damaged nor displaced to the extent that a live part is accessible.

e) There is no arcing damage.

f) No conductor pulls out of a terminal connector, and there is no damage to the conductor insulation or the conductor.

g) The meter socket complies with the Dielectric Voltage-Withstand Test, Section 20.

15.8 Based on the test program covered in 15.1 – 15.7, a meter socket may be assigned short-circuit current ratings in accordance with Table 15.1. The meter socket shall be marked in accordance with 27.12.3 or 27.12.4, as appropriate.

Table 15.1
Maximum assigned short-circuit current values

Meter socket continuous ampere rating	Maximum rms symmetrical amperes (x1000)	Volts, maximum	Number of phases	Maximum overcurrent protection, amperes
Units using fuse protection				
0 – 320	100	600	1 and 3	400 Class J or T
0 – 200[a]	42	480	1 and 3	200 Class RK1
0 – 200[a]	200	600	1 and 3	200 Class J or T
0 – 100	100	600	1 and 3	100 Class RK5
0 – 320	50	300	1 and 3	600 Class T (300 Volt)
Units using circuit breaker protection				
0 – 320	14[b]	600	1 and 3	Any
0 – 320	18[b]	240	1	400
0 – 200[a]	18[b]	240	1 and 3	200
0 – 200[a]	22[b]	240	1	125
0 – 100	25[b]	240	1 and 3	100

[a] This rating may also be assigned to a meter socked for a Class 320 meter.

[b] This value is not to exceed the interrupting rating of the circuit breaker with which the meter socket is used. A higher rating may be assigned if tested and marked for use with specified circuit breakers as covered in the Short-Circuit Current Test with Specific Circuit Breaker, Section 16.

16 Short-Circuit Current Test with Specific Circuit Breaker

16.1 General

16.1.1 A meter socket to be marked for use with a specific circuit breaker as covered in 27.12.5 and having a short-circuit current rating higher than specified in Table 15.1 for circuit breaker protection shall, in addition to the Short-Circuit Current Test, Section 15, be subjected to a short-circuit current test with the specific circuit breaker in accordance with 16.1.2 – 16.5.2.

16.1.2 Sufficient tests shall be conducted to represent each construction to be marked as covered in 27.12.5, using the criteria of 15.2 and also representing the construction having the least electrical impedance to current flow.

16.1.3 In addition to samples of meter sockets, samples provided for tests are to include, as necessary:

a) A watthour meter as covered in 16.3.2;

b) Wire and conduit as covered in 16.3.4;

c) A fuse as covered in 16.3.3; and

d) A circuit breaker as covered in 16.3.5.

16.2 Test circuit calibration

16.2.1 The available rms symmetrical current and power factor at the test station terminals are to be determined in accordance with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, UL 489. The power factor is to be in accordance with Table 16.1.

Exception: If the physical arrangement in the test station requires leads longer than specified in 16.3.4, the additional length of leads is to be included in the test circuit calibration.

Table 16.1
Power factor of test circuits

Test circuits in rms symmetrical amperes		Maximum power factor
More than	Not more than	
10,000	20,000	0.3
20,000	200,000	0.2

16.2.2 A 3-phase test circuit having an open-circuit voltage at the supply connections of 100 – 105 percent of rated voltage for the test being conducted is to be used. The supply frequency is to be in the range of 48 – 60 hertz.

Exception No. 1: With the concurrence of those concerned, a voltage higher than 105 percent may be employed.

Exception No. 2: A 4-jaw meter socket that has no provision for a fifth jaw may be tested on a single-phase test circuit.

Exception No. 3: A 7-jaw meter socket may be tested with a single-phase test circuit having an open-circuit voltage not less than 115.5 percent of the meter socket voltage rating using adjacent pairs of jaws if the rms symmetrical short circuit current available at the test station terminals at this voltage is also at

least 115.5 percent of the meter socket short circuit rating. Such a test would use two poles of a 3-pole circuit breaker.

16.3 Sample preparation

16.3.1 The meter socket is to be mounted and supplied as in an intended installation.

16.3.2 A commercially-available watthour meter with a class rating not less than the continuous current rating of the meter socket is to be in place during the short circuit test.

16.3.3 The meter socket enclosure is to be connected through a 30-ampere, non-time delay type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. This connection is to be made on the load side of the limiting impedance by a 10 AWG (5.3 mm^2) copper wire 4 – 6 feet (1.2 – 1.8 m) long.

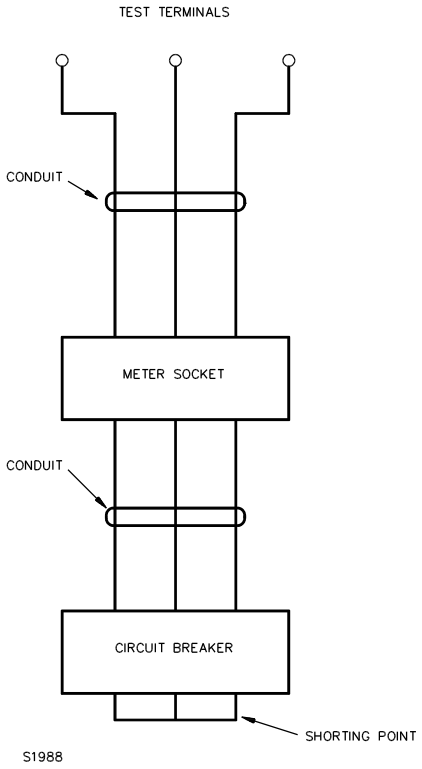
16.3.4 As shown in Figure 16.1, the meter socket is to be connected by up to 9 feet (2.7 m) of aluminum wire per phase, the length to be divided between the line and load terminals of the meter socket and the load side of the fuse or circuit breaker as desired. The wire is to have an ampacity as shown in Table 7.1 based on the 75° C (167° F) insulation nearest to but not less than the rating of the meter socket. The terminals are to be tightened to the torque specified by the meter socket manufacturer in accordance with 27.10.3. Line and load wires may enter the enclosure through 24 inch (610 mm) or shorter lengths of rigid steel conduit. There is to be no bracing of the cable inside the enclosure unless the construction includes instructions for such bracing. The provision for bracing may or may not be provided as part of the meter socket. Bracing hardware not provided as part of the meter socket shall be available to the installer. A cable may be braced as it leaves the enclosure.

Exception No. 1: The length of the supply wires may exceed 9 feet per phase if the excess length is included in the test circuit calibration as covered in the Exception to 16.2.1.

Exception No. 2: Copper wire is to be used if the meter socket is marked for use with copper wire only.

Figure 16.1

Line connection for tests



16.3.5 The load side of the meter socket shall be wired to a molded case circuit breaker of the manufacturer, type, and rating, as marked in accordance with 27.12.5. A circuit breaker having adjustable trip features is to have all adjustments set at the maximum current and time setting. Separate tests are required for each type of circuit breaker to be shown in the marking.

Exception: A 3-phase test with a 7-jaw meter socket and 3-pole circuit breaker may represent a 4-, 5-, 6-, or 8-jaw single phase construction for use with a 2-pole circuit breaker having the same maximum voltage rating, maximum ampere rating, and the same manufacturer and type.

16.4 Closing

16.4.1 Controlled closing is to be employed in a single-phase test. Closing is to occur within 10 electrical degrees of the zero point of the supply voltage wave. Random closing is to be employed in each 3-phase test. All tests are to be performed by closing the test circuit onto the series combination of meter socket and circuit breaker. The circuit breaker is to be in the closed position with its load terminals shorted together.

16.5 Peak let-through current

16.5.1 The maximum peak let-through current is to be measured during the short-circuit current testing of the meter socket. The short circuit rating of the meter socket shall be such that the measured value does not exceed 30,000 amperes.

16.5.2 In addition to the criteria specified in 16.5.1, the results shall be as specified in 15.7.

17 Rain Test

17.1 To determine if an enclosure complies with the rain test specified in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, a complete enclosure with conduit connections (without pipe thread compounds) is to be mounted as in actual service and subjected to the rain test. The simulated rain shall be directed only at the front of a semi-flush meter socket enclosure. If any test results in the entrance of water above the lowest terminal lug, including a neutral or grounding connection or other live part within the enclosure, the enclosure is considered not to be acceptable. The equipment is to be mounted in its intended operating position, and for an enclosure marked only as Type 3R the meter opening is to be sealed so as to prevent entrance of water during the tests.

18 Concentric Knockout Rain Test

18.1 Three samples of an enclosure containing a concentric knockout located above live parts are to be tested as described in 18.2.

18.2 The meter socket enclosures containing a concentric knockout located above live parts are to have the inner knockout removed using a hammer and punch. The inner knockout is to be fitted with conduit secured by a Type 3R fitting. The samples are to then be subjected to the Rain Test, Section 17.

19 Insertion and Withdrawal Force Test for Meter Jaws

19.1 Five meter socket samples that have not been conditioned or lubricated shall be subjected to the insertion and withdrawal of a simulated meter as described in 19.3. During and after the test:

a) No operation shall require a force greater than 100 pounds (445 N) and

b) The base shall not fracture or become permanently deformed.

Exception No. 1: A meter socket employing jaws of the release type shall be investigated in accordance with 19.2.

Exception No. 2: Lubrication may be employed if usually supplied with the meter socket.

19.2 For jaw release sockets, the force required to remove the simulated meter from the clamped jaws of the meter socket shall be measured and recorded.

Exception: A force for withdrawal of greater than 40 pounds (178 N) per blade need not be applied.

19.3 The insertion and removal forces of 19.1 and 19.2 may be determined by either mechanized or manual equipment (tensile test equipment or spring scales) or by the application of dead weight. Rocking or manipulation of the meter in a vertical plane may be used to obtain insertion or removal of the blades.

19.4 The force required to remove a single blade from a jaw of the socket shall be determined. The removal force for each jaw of the socket is to be determined by inserting a single blade into the jaw and increasing the value of weight suspended from the blade until blade disengagement occurs. The removal forces are to be recorded.

Exception: The test is not applicable to jaw release sockets.

20 Dielectric Voltage-Withstand Test

20.1 General

20.1.1 A meter socket shall be subjected for a period of 1 minute to the application of a 60-hertz potential of 1000 volts plus twice the rated voltage of the device. There shall be no electrical breakdown.

20.1.2 A meter socket incorporating reduced spacings in accordance with note a or b of Table 8.1 shall be subjected for a period of 1 minute to the application of a 60-hertz potential of 6000 volts.

20.1.3 To determine if a meter socket complies with 20.1.1 (and 20.1.2, if applicable), it is to be stressed by means of a transformer having a capacity of at least 500 volt-amperes, the output voltage of which can be varied and is essentially sinusoidal.

20.1.4 The test potential is to be applied between:

a) Live parts and the enclosure and

b) Poles or circuits of opposite polarity. During this test, jaws are to have meter blades installed to simulate jaw position when a meter is installed.

20.1.5 The applied potential is to be increased from zero until the required test value is reached and is to be held at that value for 1 minute. The increase in the applied potential is to be at a uniform rate and as rapid as consistent with its value being correctly indicated by the voltmeter.

20.2 Insulating barriers

20.2.1 With regard to 9.1.3 and 9.1.4, the barrier material is to be placed between two metal electrodes. The electrodes are to be cylindrical brass or stainless steel rods 1/4 inch (6.4 mm) in diameter with edges rounded to a 1/32 inch (0.8 mm) radius. The test potential is to be increased to the test value and is to be maintained for 1 second. There shall be no dielectric breakdown.

21 Clamped Insulating Joint Test

21.1 With respect to 8.6, a clamped joint between two insulators is to be tested using two samples.

a) The first sample is to have the clamped joint opened up to produce a space 1/8 inch (3.2 mm) wide. This may be accomplished by loosening the clamping means or by drilling a 1/8 inch diameter hole at the joint between the insulators at a point of minimum spacing between the metal parts on the opposite sides of the joint. The drilled hole shall not decrease spacings between the opposite polarity parts as measured through the crack between the insulators. The 60-hertz dielectric-breakdown voltage through this hole is then to be determined by applying a gradually increasing voltage (500 volts per second) until breakdown occurs.

b) The second sample with the clamped joint intact is to be subjected to a gradually increasing 60-hertz voltage until 110 percent of the breakdown voltage of (a) has been reached. If the breakdown voltage of (a) was less than 4600 volts rms, the voltage applied to the second sample is to be further increased to 5000 volts rms and held for 1 second. The clamped joint may be used if there is no dielectric breakdown of the second sample.

22 Bonding Continuity Test

22.1 To determine if a meter socket complies with the requirements of 4.8 and 12.6, and to determine if contact exists between the cover and the enclosure, a 120-volt circuit is to be established through the

cover and the enclosing case, in series with a 60-watt test lamp. The lamp shall provide a visible indication of the continuity of the contact. This determination is to be made with paint and similar coatings undamaged as well as after the cover has been removed and replaced several times; and risk of corrosion is to be taken into consideration.

22.2 The resistance of the connection between adjacent enclosures shall not be more than 0.005 ohm. The determination of resistance is to be made in accordance with 22.3.

22.3 The enclosures are to be joined and installed in the intended manner, and a direct current of 30 amperes is to be passed between adjacent sections. The resulting voltage drop is to be measured between a point (file mark) on each enclosure 1/16 inch (1.6 mm) from the connection. The resistance is to be calculated from the measured voltage drop and the current passing through the enclosures.

23 Test of Insertion and Withdrawal Force on Meter Base

23.1 To determine compliance with the requirements in 5.9 during meter insertion, one sample of the meter socket complete with cover shall be subjected to a 200 pound (91 kg) static load applied to any two jaws (not diagonally opposite) for a period of 1 minute. The load is to be applied to the center of a rigid bar on which two meter blades are mounted for alignment purposes. The meter blades are to be positioned in a parallel or in line configuration depending on the disposition of the jaws to be tested, and may extend so as to bottom in the jaws. The insulating base shall not fracture or become permanently deformed.

23.2 To determine compliance with the requirements of 5.9 during meter removal, one sample of the meter socket is to be supported with the meter opening facing down. A static load of 40 pounds (18.1 kg) is to be applied simultaneously to each of any two jaws (not diagonally opposite) for a period of 1 minute. The insulating base shall not fracture and no supporting member shall become permanently deformed.

23.3 To determine compliance with the requirements of 5.9, one sample of the meter socket is to be supported on a rigid surface. A watt-hour meter is to be inserted until the back of the meter rests squarely on the flange of the socket or to the maximum depth permitted by the blades and jaws. Upon removal of the insertion force, the back of the meter shall not move away from the socket flange more than 1/16 inch (1.6 mm).

24 Strength Test of Insulating Base and Support

24.1 The insulating base shall not be damaged when:

a) Supporting a field wiring terminal where wire connectors securing short lengths of conductors of rated ampacity are torqued to 110 percent of the value marked on the meter socket.

b) With respect to 7.6 and 7.14, the hardware securing the wire connector is torqued to 110 percent of the value marked on the meter socket.

24.2 Damage is considered to have occurred if:

a) The base insulating material cracks or rotates such that spacings are reduced below the values specified in Spacings, Section 8;

b) Bosses, recesses, or other means to restrict turning do not perform their intended function;

c) Straps or bus bars bend or twist; or

d) Members move at electrical joints.

Minor chipping or flaking of brittle insulating material may occur if the performance is not otherwise impaired. Momentary flexing of metallic members without permanent deformation may occur.

25 Test of Torque and Force on Test Block

25.1 With respect to 6.3.3, one sample of a test block shall be subjected to the conditions described in 25.2 and 25.3. There shall be no damage to the insulating base or to the means restricting rotation of the disconnect nut stud, nor displacement of the disconnect stud greater than 1/8 inch (3.2 mm).

25.2 The test block disconnect nut assembly is to be tightened to a torque of 110 percent of the value marked in accordance with 27.11.1.

25.3 With the disconnect nut assembly removed from the securing stud, a 25-pound (111-N) force is to be applied inwardly and axially for 1 minute to the tip of the test block disconnect nut stud. Displacement of the stud is to be measured with the force applied.

RATINGS

26 Voltage and Current Ratings

26.1 Each meter socket shall be rated 300 or 600 volts alternating current and have a continuous ampere rating. A maximum ampere rating may also be provided in accordance with 27.3.5. No current rating of a single meter socket position shall be greater than 400 amperes.

Exception: A voltage rating less than, and in place of, 300 volts alternating current may be provided if the meter socket complies with the requirements applicable to a 300-volt rated meter socket.

26.2 A meter socket assembly with more than one meter position shall have an additional current rating for the assembly that denotes the continuous current rating of the line bus. This rating is to be:

a) Not less than the values shown in Table 26.1 and

b) Not more than the sum of the individual meter sockets, based on the continuous ampere rating used in accordance with 27.3.5.

Reference 27.3.4 and 27.3.6 for marking requirements for the line bus.

Table 26.1
Minimum ampere rating of assembly

Number of meter sockets assembled together	Percent of sum of ampere ratings[a]
2	50
3 – 5	45
6 – 7	44
8 – 10	43
11	42
12 – 13	41
14 or more	40

[a] Maximum ampere rating is used in accordance with 27.3.5.

MARKINGS

27 General

27.1 Location

27.1.1 A marking shall be located as shown in Table 27.1 and shall comply with Permanence of Marking, Section 28.

Table 27.1
Location of required markings

Markings	Reference paragraphs	Marking visible with:[a]	
		Cover removed	Cover and meter installed
Identification	27.2.1 a), c), and d)		X
Factory identification	27.2.2	X	
Ratings	27.2.1 b), 27.3.1– 27.3.7	X	
Enclosure	27.4.1		X
	27.4.2	b	b
	27.4.3	X	
Top (overhead) or bottom (underground) feed	27.5.1	X	
Accessories	27.6.1 – 27.6.3	X	
Circuit closers and disconnects	27.7.1		X
	27.7.2, 27.7.3	X	
Neutral	27.8.1	X	
Field installation	27.9.1	X	
Terminals	27.10.1 – 27.10.17	X	
Test blocks	27.11.1	X	
Short-circuit current	27.12.1 – 27.12.5	X	

[a] An "X" signifies that the marking is to be visible under the conditions specified.

[b] Marking is to be located on the flange as specified in 27.4.2.

27.2 Identification

27.2.1 A meter socket shall be marked with:

a) The manufacturer's name, trademark or other descriptive marking by which the organization responsible for the product may be identified;

b) The electrical rating;

c) An identifying designation such as a type or model number; and

d) Other appropriate markings as specified elsewhere in these requirements.

27.2.2 An open-type meter socket base shall be marked to specify that it shall be installed in an enclosure and used only with current transformers in commercial and industrial applications.

27.2.3 If a manufacturer produces or assembles meter sockets at more than one factory, each finished device shall have a distinctive marking, which may be in code, by which it may be identified as the product of a particular factory.