Model # _____

Isolator/Surge Protector (ISP)

Operating and Installation Instructions

GENERAL

The Isolator/Surge Protector (ISP) is a solid-state, logic-controlled device which provides DC isolation and AC grounding/coupling of cathodically protected systems. The system on which this product is installed should be compatible with the product ratings checked below.

AMBIENT OPERATING TEMPERATURE:

-40ºF to +150º F
(-40ºC to + 65ºC)

RATINGS

The code letters in the following ratings tables refer to the model number position. See product nameplate.

Lightning Current Rating (8 x 20 waveform)

"A" Code	Peak Amperes
50	50,000
75	75,000
100	100,000

This unit:

50 kA ☐
75 kA ☐
100 kA ☐

Voltage Blocking Rating

"B" Code	Volts Peak
12.5	12.5
20	20

This unit:

12.5 ☐
20 ☐
Other:_____ ☐

AC Fault Current Ratings (Amps AC-RMS Symmetrical)

60 Hz "C" Code

Cycles	7	24	35	68A
1	7,000	24,000	35,000	68,000
3	5,300	18,000	28,000	55,000
10	4,200	14,000	21,000	40,000
30	3,700	11,000	14,000	30,000

50 Hz "C" Code

Cycles	6.7	23	33	65A
1	6,700	23,000	33,000	65,000
3	5,000	17,000	27,000	52,000
10	4,000	13,000	20,000	38,000
30	3,600	10,000	13,000	28,000

This unit:

7 ☐ 6.7 ☐
24 ☐ 23 ☐
35 ☐ 33 ☐
68A ☐ 65A ☐
Other:____ Other:____

Steady-State Current Ratings (Amps AC-RMS Symmetrical)

60 Hz "D" Code	Amperes
30	30
60	60
90	90

50 Hz "D" Code	Amperes
25	25
50	50
75	75

This Unit:

30 A ☐ 25 A ☐
60 A ☐ 50 A ☐
90 A ☐ 75 A ☐

If there is DC voltage across the ISP that is above normal cathodic protection voltages, the steady-state current must be derated from the above values as illustrated in the ISP technical literature.

Enclosure

"E" Code	Type
NS	Non-submersible
S	Submersible

This unit:

NS ☐
S ☐

The non-submersible enclosure is rain tight and equivalent to a NEMA 4X or IP66. The submersible enclosure is equivalent to a NEMA 6P or IP67.

The enclosure is not internally bonded to either terminal, and the user must exter-

nally bond the enclosure to a grounding system.

FACTORY STANDARD OPTIONS

Model Code "F"

Any options provided with this unit will be identified with a check mark in the appropriate box.

☐ RPB = Round Pole Bracket adaptors. Attaches to the ISP to improve rigidity when mounting to a round pole. If this option has been selected, assemble the adaptors to the brackets on the ISP enclosure.

☐ TCS = Tamperproof Cover Screws.

☐ TP = Test Point. When specified, the ISP is furnished with a multi-pin connector through which the unit can be comprehensively tested in-situ with a field tester that can be purchased or rented from DEI.

CS# = Factory assigned Customer Special Number for:

☐ Consolidating above options into one code number

☐ An approved product variation: ☐

INSTALLATION INSTRUCTIONS

Mounting

Mounting is to be made as close as possible to the connection points, using two 1/2" (≈ 12mm) diameter bolts (user furnished), particularly if the ISP is also used to provide over-voltage protection from lightning. The ISP may be mounted in any orientation. Refer to Figure 1A or Figure 1B for outline dimensions.

Polarity

The positive terminal (+) of the ISP is to be connected to ground. The negative terminal (-) is to be connected to the structure to be protected. The basic criterion for any application is that the polarity of the steady-state DC voltage between connection points be the same as the polarity marks on the ISP.

Lead Connections

The leads should be cut to the shortest possible length and should run in the most direct manner to the points of connection. (This is required to minimize the voltage developed between the connection points due to lead inductance when subject to lightning and/or switching transients.) Before connecting the leads, it is recommended that the user become familiar with the field testing procedure described in the Appendix, which follows. Measurements should be taken before and after installation and recorded. This will make it easier to verify field operability at a later time.

Field-Testing

ISPs with the "Test Point" option may be comprehensively tested in situ with a custom designed field tester available from Dairyland Electrical Industries. Contact DEI for more information.

APPENDIX TO INSTALLATION INSTRUCTIONS

ISP Installation Measurements – Optional

Measurements may be taken at the time of installation to:

1) become familiar with the ISP, or

2) verify that the appropriate model number (i.e., ratings) was selected.

This information will help to assure that the ISP is applied within its intended ratings under steady-state operating conditions.

Equipment Required

- A multimeter with AC/DC amperes, volts, ohms.
- A clamp-on AC ammeter
- A Hall Effect clamp-on DC ammeter with mA resolution

Prior to Installation: ISP Test

It is suggested that a user become familiar with the ISP's response to a DC ohmmeter connected across its terminals. Knowing this characteristic of the ISP can prove useful in future field testing. Proceed with this test as follows:

- Set the multimeter on the lowest DC ohms scale. Momentarily provide a short-circuit between the two ISP terminals to assure that there is no residual charge in the capacitor in the ISP. While observing the meter, connect it across the ISP terminals; positive meter lead to (+) terminal, negative meter lead to (-) terminal.
- For a functional unit, the DC resistance upon initial contact will begin at essentially zero ohms and then gradually increase to a value of several thousand ohms or more (if necessary, adjust the ohms scale to observe).
- For a non-functional unit, the DC resistance is typically about one ohm or less.

This check may be repeated several times if desired, if between each test the two terminals of the ISP are momentarily "short circuited" to remove any residual charge on the internal DC blocking/AC by-pass capacitor.

Testing for System Characteristics Before ISP Installation

It is desirable to know the system characteristics to assure that the steady-state conditions that will be imposed on the ISP are within the rating selected. To make this determination, measure the following parameters between the two points to which the ISP will be connected.

- Measure "open circuit" voltage:

The "open circuit" voltage is the voltage measured between the two points

to which the ISP will be connected.

V_{DC} = ☐ Volts

$V_{AC\text{-}RMS}$ = ☐ Volts

- Measure "short circuit" current:

The "short circuit" current is the current that will flow through a solid bond between the two points to which the ISP will be connected.

I_{DC} = ☐ Amperes

$I_{AC\text{-}RMS}$ = ☐ Amperes

- Calculate the peak AC current through the ISP, and the peak AC voltage across the ISP after it will be installed, using the following formulas:

I_{AC} peak = $I_{AC\text{-}RMS}$ x 1.414

= ☐ Amperes

V_{AC} peak = I_{AC} peak x X_C

= ☐ Volts

For 60 Hz systems:

X_C = 0.265 ohms if "D"Code = 30
X_C = 0.133 ohms if "D" Code = 60
X_C = 0.088 ohms if "D" Code = 90

For 50 Hz systems:

X_C = 0.318 ohms if "D"Code = 25
X_C = 0.160 ohms if "D" Code = 50
X_C = 0.106 ohms if "D" Code = 75

$V_{(TOTAL)} = V_T = V_{DC} + V_{AC}$ peak

= ☐ Volts

Verifying ISP Ratings for Application

To verify that the ISP has been properly selected and installed, compare the above measured/calculated values against the model number as follows:

- If position B of the model number is 12.5, then V(TOTAL) should be less than 10 volts and if position B is 20, then V(TOTAL) should be less than 17 volts.

Maximum Steady-State Current Allowable

The maximum steady-state AC current flowing thorough the ISP should always be less that the value shown for the "D" Code position in the nameplate model number and as identified in the ratings section of these instructions.

After Installation

Assuming that the ISP is connected to a system compatible with its steady-state ratings, the following information will be helpful in "after installation" analysis.

- The ISP should be completely silent (noise free). If an audible clicking sound is heard, the ISP is being subject to an AC current that is above its rating for the DC voltage applied. This sound is caused by a magnetic effect of certain solid-state components and is not any form of electrical arcing. In addition, a red indicator on the cover of the ISP will flash intermittently. (Indicator is furnished with non-submersible enclosures only.) Should this occur, consult Dairyland Electrical Industries as a higher steady-state current rating is required for this application.

A partial test to verify that the ISP is functioning properly is to compare the $V_{AC\text{-}RMS}$ measured after installation to the calculated $V_{AC\text{-}RMS}$. These values should be approximately equal.

$V_{AC\text{-}RMS}$ (measured) =
☐ Volts

NOTE: The value of "$V_{AC\text{-}RMS}$ (measured)" may be significantly lower than the open-circuit $V_{AC\text{-}RMS}$ measured before the ISP was installed (as recorded above), this is an intended effect of the ISP's low impedance to AC.

$V_{AC\text{-}RMS}$ calculated = $I_{AC\text{-}RMS}$ (measured) x X_C

$I_{AC\text{-}RMS}$ = ☐ Amperes

XC = ☐ Ohms

$V_{AC\text{-}RMS}$ calculated
= ☐ Volts

Example

For ISP-75-12.5-24-30-S

Assume I_{AC} (measured) = 10.0 Amperes AC-RMS

V_{AC} (calculated) = 10.0 x 0.265
= 2.65 Volts AC-RMS

Assume V_{AC} (measured) = 2.60 Volts

Therefore, since V_{AC} (measured) is approximately equal to V_{AC} (calculat ed), the unit is functional. For this same model unit in the failed mode,

V_{AC} (measured) = 0.02 Volts would be a typical value.

Note: If the steady-state AC current through the ISP exceeds its steady-state current rating, the above field test procedure will not apply; consult DEI.

- The ISP presents a low impedance to AC under steady-state conditions. Therefore, the AC current flowing through the ISP will be about equal to the steady-state "short circuit" current available before installation (i.e., based on using the ISP to mitigate induced AC voltage.)

- The ISP presents a virtual "open circuit" to DC; therefore, the DC current will be too small to measure with most readily available field test instruments. The normal DC leakage current is nominally 0.25 milliamperes per volt DC. The DC leakage current should be approximately: 0.25 mA/V x V_{DC}-(measured). Therefore, if a higher DC current is measured, consult Dairyland Electrical Industries.

I_{DC} = ☐ ma @ ☐ V_{DC} Volts

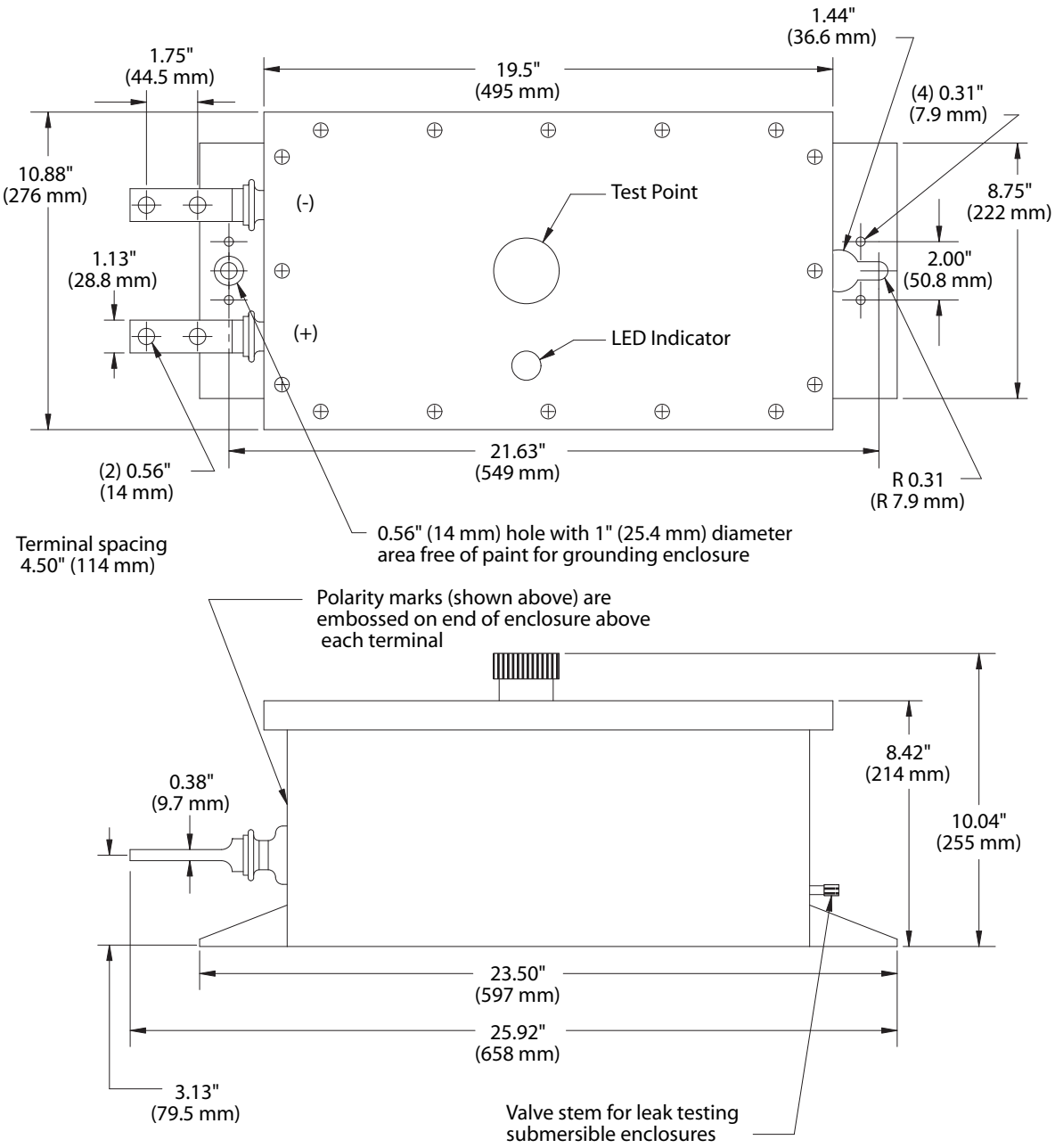
- Since the ISP presents a virtual "open circuit" to DC, the DC voltage measured across the ISP terminals should be the same as that measured under open circuit conditions before the ISP was installed.

If the unit ever appears failed, contact Dairyland Electrical Industries

for assistance, and if necessary, for authorization to return unit to factory for test and/or repair. Repair under warranty is invalid if circuit has been disassembled, because disassembly sequence is important to prevent damage to components.

For assistance, please contact Dairyland Electrical Industries.

FIGURE 1 **ISP Outline Dimensions**



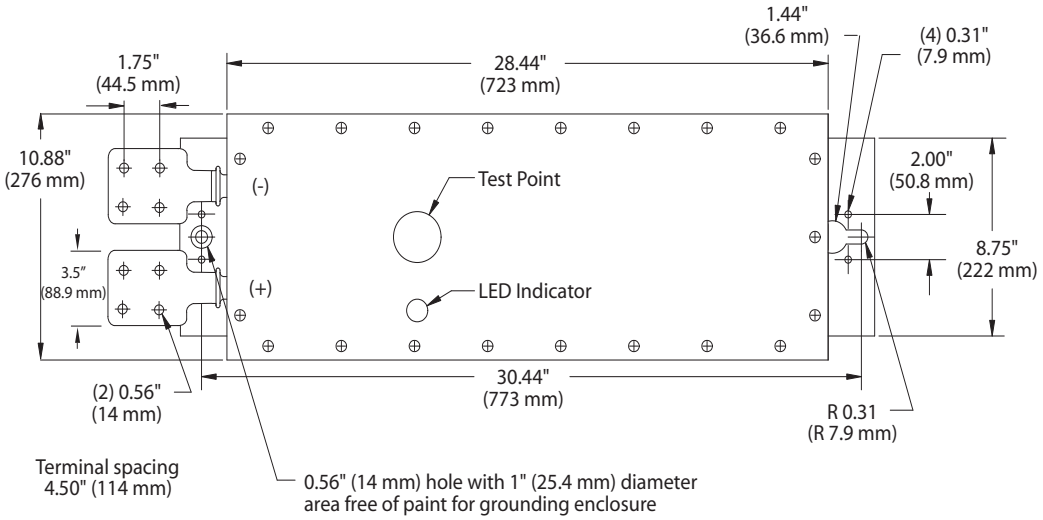
Notes:

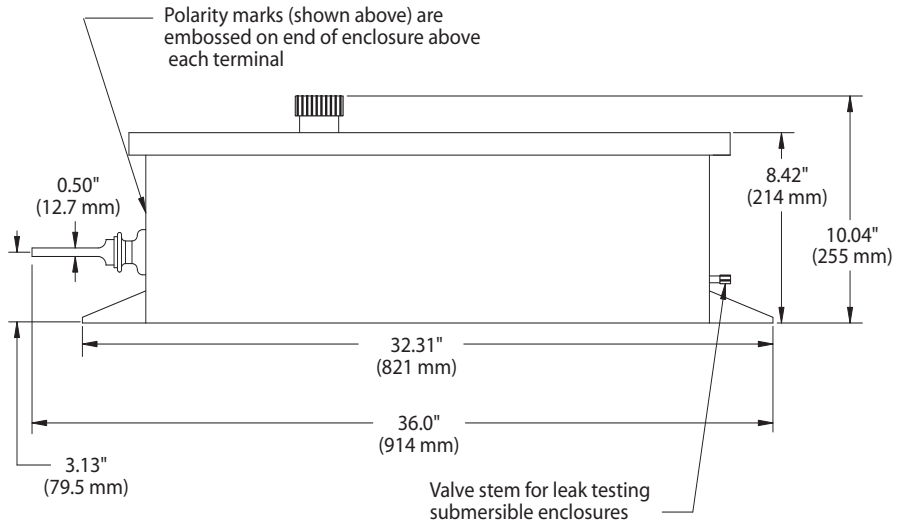
1. Test Point: An option only provided when specified.
2. The Test Point and LED indicator are only available with a non-submersible enclosure.

Applicable to:

ISP with "C" Code in Model # = 7 (60Hz) or 6.7(50Hz)

FIGURE 1B ISP Outline Dimensions





Notes:

1. Test Point: An option only provided when specified.
2. The Test Point and LED indicator are only available with a non-submersible enclosure.

Applicable to:

ISP with "C" Code in Model # = 24, 35, or 68A (60Hz)

ISP with "C" Code in Model # = 23, 33, or 65A (50Hz)