Installation Guide

Doble Partial Discharge Couplers

Introduction

NOTE: Doble recommends that coupler installation be done by qualified Doble personnel. At the very least, if you are installing couplers on more than one machine, the first installation should be done by Doble personnel as a training session.

Figure 1 PDDC-17 and PDDC-24

Doble Partial Discharge (PD) couplers are permanently mounted devices that are installed when a machine is out of service. Coupler installation typically takes one day per machine, if all required parts are ready on site.

Audience

This installation guide is intended for technicians or engineers who may be required to install a Doble PD coupler. It is assumed that the reader is qualified to handle high voltage equipment, knows industry standards, and is familiar with safety practices. The installation of couplers should not compromise the electrical integrity of the system.

Contents of PD Coupler Shipment

The PDDC-17 and PDDC-24 coupler shipment includes these items:

- Coupler
- High voltage lead (red)
- Grounding cable (copper)
- Plastic bag containing hardware necessary for:
  - Coupler installation
  - Cable and lead connection to the coupler
- Installation Guide

Select a Location

Keep these requirements in mind as you select a location:

- Three couplers must be electrically connected to a generator or a motor terminal/bus, one per phase. You may wish to install a fourth coupler at the machine neutral.
- A location close to a machine terminal is preferable.
- The coupler location and the routing of the coaxial cable must both meet HV clearance requirements.
- The grounding cables of all couplers must connect to the same machine grounding point.
- Because of its weight, the PDDC-24 should be installed vertically (standing upright, as in Figure 1 on page 1). A horizontal or suspended installation is not recommended.

HV Clearance Requirements

The coupler location you select must meet HV clearance requirements.

WARNING! It is critically important that your PD Coupler installation meet these clearance requirements. If they are not met, a short circuit and severe damage to the machine may occur.

Clearance is required between the following elements:

- HV lead and the ground (and other conductors)
- Individual HV leads
- HV leads and neutral cable, if a coupler is installed at the machine neutral

Table 1 lists recommended minimum HV clearances.

Table 1 Minimum HV Clearances

Machine-rated phase-to-phase voltage	Phase-to-ground distance	Between-phases distance
6-7 kV	7.6 cm (3 in)	15.2 cm (6 in)
12-15 kV	15.2 cm (6 in)	30.4 cm (12 in)
21-24 kV	21.9 cm (8.5 in)	43.1 cm (17 in)

If your machine has a rated voltage not shown in the table, estimate clearances based on those given in the table. If you have any questions, please contact your Doble representative.

Typical Locations

Couplers are usually installed in metal enclosures that meet HV clearance requirements. Typical locations are:

- Generator phase bus ducts
- Machine terminal boxes
- Potential transformer (PT) cubicles
- Breaker cubicles
- Surge arrestor cubicles

Installing the Couplers

WARNING! Follow all relevant safety standards while installing Doble PD couplers!

Essential Considerations

Keep these considerations in mind as you plan coupler installation:

- The insulation of the HV lead is rated at 600 V. When you consider HV clearances, treat it as a bare conductor.
- Use the HV lead to connect the coupler to the HV connection point that is connected to the machine line terminal.
- Keep the HV lead as short as possible. The full length of the lead must meet the HV clearance requirements.

Preliminary: Manufacture Plates If Necessary

It is sometimes necessary to use plates to place a coupler at an ideal location. Have such plates manufactured and ready before coupler installation. Figure 2 shows an example of custom plates being used in a horizontal installation of PDDC-17.

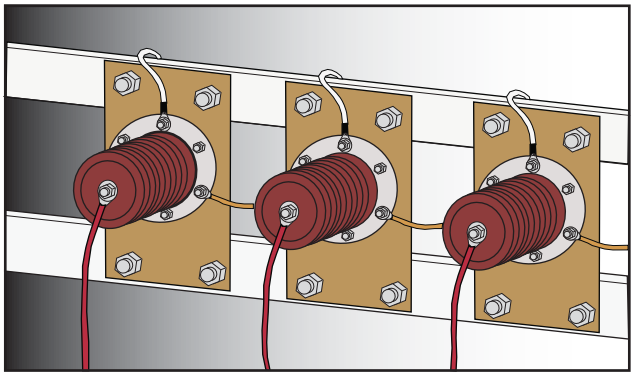
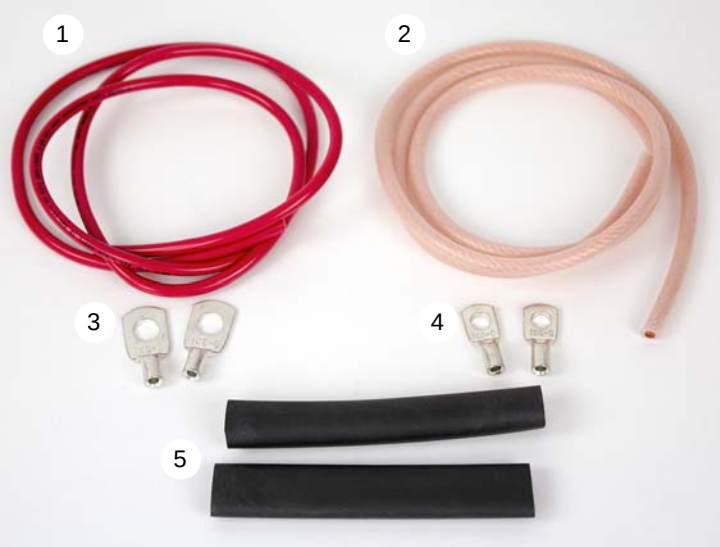


Figure 2 Plates Used in Installation of PDDC-17

Requirements

For this procedure, you need the following tools:

- Crimper
- Wire cutter
- Scissors
- Heat gun
- Doble-supplied ring washers and nuts
- Doble-supplied cable and lead connection materials shown in Figure 3



1	HV lead	3	Large ring lugs	5	Shrink wrap tubing
2	Ground cable	4	Small ring lugs		

Figure 3 Cabling Hardware

Procedure

1. Select a location for the couplers.
2. Mount the couplers.

3. Cut each shrink wrap tube in half (Figure 4).

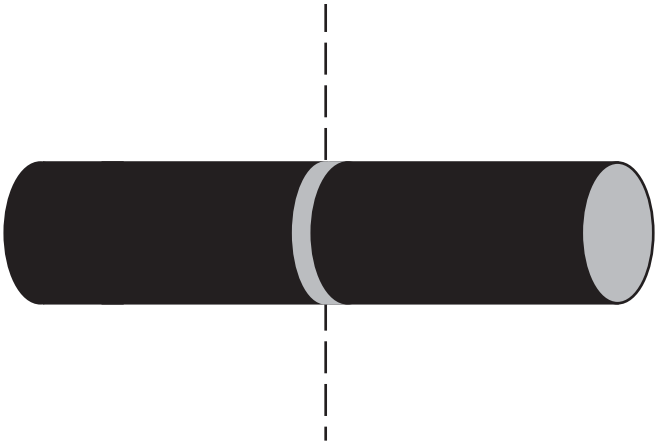


Figure 4 Cut the Shrink Wrap Tubing in Half

4. Slide a piece of the cut tubing to the end of the HV lead.
5. Crimp one of the large ring lugs to the lead (Figure 5).

Figure 5 Installed Ring Lug

6. Use a heat gun to seal the shrink wrap tube over the joint between the lead and the lug (Figure 6).

Figure 6 Sealed Tubing and Ring Lug

7. Connect the ring lug to the connector on the top of the coupler with the supplied washers and nuts (Figure 7).

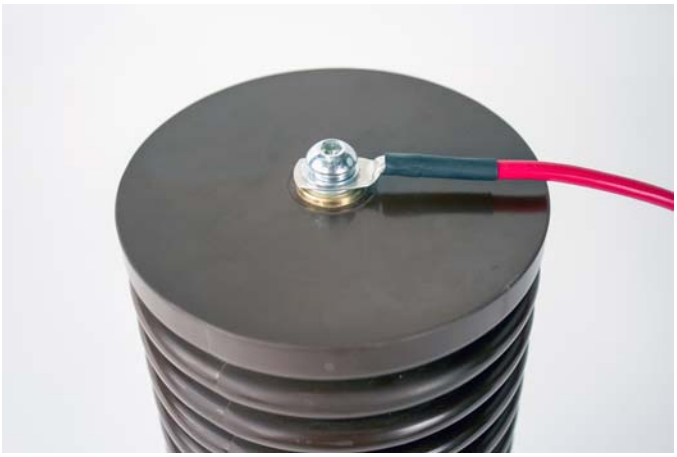


Figure 7 Ring Lug Attached to Coupler

8. Repeat step 4 through step 7 for each remaining coupler.
9. Connect the coupler to the machine line terminal and cut the HV lead to the appropriate length to eliminate extra cabling. Figure 8 shows an example of a good lead length.

Figure 8 HV Lead of Appropriate Length

10. Attach a larger ring lug to the cut end of the HV lead and seal it with shrink wrap tubing. Refer to step 3 through step 7. Do this for all the HV leads.

11. Attach the remaining small ring lugs to both ends of the grounding cables. Seal each joint with shrink wrap tubing.
12. Connect one ring lug of each grounding cable to the ground of the coupler.
13. Connect the other ring lug of each grounding cable to a machine ground near the coupler. All grounding cables must be connected to this same machine ground.

Installing the Coaxial Cables

The coaxial cables connect the coupler and the connection box.

WARNING! Do not run the coaxial cables over the top of an HV object. If the cables were to fall onto the HV equipment, damage could occur.

1. Label the cable box connectors with phase identifiers.

CAUTION! Be sure to label the connectors with the phase identifiers you use such as A, B, C, N; or L1, L2, L3, N; or U, V, W, N. These identifiers prevent confusion when test results are analyzed.

Figure 9 shows the connection box labeled A, B, C, N.

Figure 9 Connector Box Labeled A, B, C, N

2. Connect cables #1, #2, #3 to the couplers for the three phases as labeled in the connection box.
3. (Optional) Use cable #4 to connect a coupler installed at the machine neutral.
4. Fasten the coaxial cables to a grounded conductor all the way from the coupler to the connection box.
5. Run the coaxial cable outside the metal enclosure where it cannot easily be reached by personnel.

Installing the Connection Box

1. Mount the connection box where it can be easily accessed for PD testing.
2. If extra cable remains after the connections are made, do one of the following:
   - Cut the cable to the length you need and ***carefully*** solder on a TNC connector. ***Be sure to do a high-quality soldering job.*** Crimp the connector.
   - Wrap the extra cables and fasten them near the connector box.

Maintenance

Keep the coupler surface clean of foreign materials to prevent tracking. If there is surface contamination, clean the couplers with alcohol.