

Installation Instructions
FOR THREE-CORE 33 KV GAS TRANSITION JOINT

The following procedures for for Installation and cable preparation for the Three Core 33kV Gas Transition Joint

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Required Prints to be attached with Instructions:

D5080 0317 000	Cable End preparation
B5024 0473 D00	35kV 3/C Size 3 Transition Joint Shipping Assy
D5050 0087 A00	35kV, 3/C Size 3 Transition Joint from 350mm2 HPGF Cable to 750 KCMIL XLPE Cable

SECTION 1: INTRODUCTION

1.1 General

The following procedures are for installation and cable preparation for the 33kV Gas Transition Joint.

Read these Instructions	Read and understand the contents of this document and follow all approved procedures and safety practices for installing, operating or maintaining this equipment. Be sure to read and understand any Safety Information.
Keep these Instructions	This document is a permanent part of your equipment. Keep it in a safe location where it can be readily available and referred to as necessary.
How to Contact Groove Associates	By Phone: 01420 88776 By Fax: 01420 88777 e-mail: sales@groove-ltd.com Mail: 2 Alton Business Centre, Omega Park, ALTON, Hampshire GU34 2YU Internet: www.groove-ltd.com

1.2 Qualified Persons

Warning

The equipment covered by this document is intended to be installed, operated and maintained by qualified persons who are trained in the installation, operation and maintenance of electric power distribution equipment along with the associated hazards.

A qualified person has been trained and is competent:

- To de-energise, clear and tag circuits and equipment in accordance with established safety procedures.
- To distinguish between live parts from non-live parts of the equipment.
- In the proper use of insulated tools, wears protective equipment such as rubber gloves, hard hat, safety glasses, flash-clothes, etc in accordance with established safety practices and is trained in the care of such equipment.
- As in certified in rendering first aid, especially in the technique of removing a person in contact with a live circuit and in applying cardiopulmonary respiration.

1.3 Storage

Joints which will not be installed immediately should be suitably stored in a clean, dry location. Possible replacement of shelf life material should be investigated. Make certain Joint is protected from potential damage.

SECTION 2: SAFETY INFORMATION AND PRECAUTIONS

2.1 Safety Alert Messages

The following is important safety information. For safe installation and operation, be sure to read and understand all danger, warning and caution information. The various types of safety alert messages are described below:

DANGER

DANGER – Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury

WARNING

WARNING – Indicates a potentially hazardous situation which, if not avoided, could result in serious death or serious injury.

CAUTION

CAUTION – Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. May also be used to alert against unsafe practices.

2.2 Following Safety Instructions

Carefully read all safety messages in this manual and on your equipment. Keep safety signs in good condition. Replace missing or damaged safety signs.

Keep your equipment in proper working condition. Unauthorised modifications to the equipment may impair the function and/or safety and effect equipment life.

If you do not understand any part of these safety instructions and need assistance, contact Groove Associates Ltd.

CAUTION

G & W 33 kV Gas Transition Joint is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing safety and operating procedures. Joints must be de-energised during operation or maintenance. Visible break and adequate grounding must be provided before work proceeds. Ensure that Joint is rated for the intended application before it is installed. Joints should be installed and serviced only by personnel familiar with good safety practice and the handling of hi-voltage electrical equipment.

SECTION 3: INSTALLATION

3.1 General

This transition joint connects one three-core paper cable to three single phase extruded cables. Typically, first step is to splice the paper cable and install joint housing with pre-installed bushings for plug-in terminations. Second step (that is independent from the first step and may be done at later time) is to terminate extruded cables and install plug-in terminations in the bushings. These instructions outline the installation steps for splicing three-core high-pressure nitrogen filled oil-impregnated paper cable and do not cover installation of the plug-in terminations for extruded cable side which is covered by Manufacturer's instructions. These instructions are intended to be used by qualified personnel and jointers that are trained and experienced in building similar products in the field. Specifically, jointers have to understand basics of electrical field shaping and be skilled in paper taping, connector soldering and building wiping sleeve for high pressure.

3.2 Safety & Other Precautions

Jointers and other personnel performing the installation are responsible for following all safety procedures and guidelines typically required for this type of field work and any additional specific requirements at particular job site. Wherever in the instructions caution is advised or "make sure" statement is present, failing to do as instructed can result in cable's or joint's underperformance during the operation, including a failure. During building of a joint, cleanliness is essential. Any contamination, moisture and foreign materials trapped in the paper cone or at the cable surface could lead to the cable or joint failure. It is assumed that the oil-impregnated cable is in good operating condition. Jointers' responsibility is to check and confirm that this is the case. Examples of unacceptable cable condition include cable insulation that has dried out, damaged cable screen, or wrinkled paper.

3.3 General Installation & Application Guidelines

Jointing bay or a manhole where the joint is installed has to be protected from the weather elements, with all materials stored in a dry and clean conditions. Oil-impregnated paper tapes that are provided in the oil filled cans should be heated up between 50°C and 60°C before the application. Use one paper roll at a time to prevent contamination and moisture ingress. Although nitrogen pressurizing procedures may vary between different customers, after the joint is built it is recommended to apply vacuum for moisture evacuation before pressurization (e.g. 500 microns (0.5 Torr) for 4 hours then perform 1 hour vacuum drop test; drop shall not exceed 500 microns (0.5 Torr)). During pressurization the nitrogen should be applied slowly and gradually (e.g., 15 psi / 10 minutes) until system is fully pressurized to prevent paper wrinkles. Joint casing assembly is designed to hold in permanent operation maximum nitrogen pressure of 200 psi (14 bar). G&W provides earthing materials and instructions for earthing the joint to both paper cable and extruded cable sides. Customer is responsible for final system earthing. If fiberglass coffin is supplied with the joint, joint is suited for direct burial with galvanic insulation from the surrounding ground. Installation of the fiberglass coffin is covered by additional instructions.

3.4 Recommended Tools & Materials

All common jointing tools
Piano wire
Propane torch
Melting pot and ladle
Thermal gloves and rags for shaping wiping sleeve
Soldering iron
Pipe cutter
Wire brush
Straps for lifting joint casing

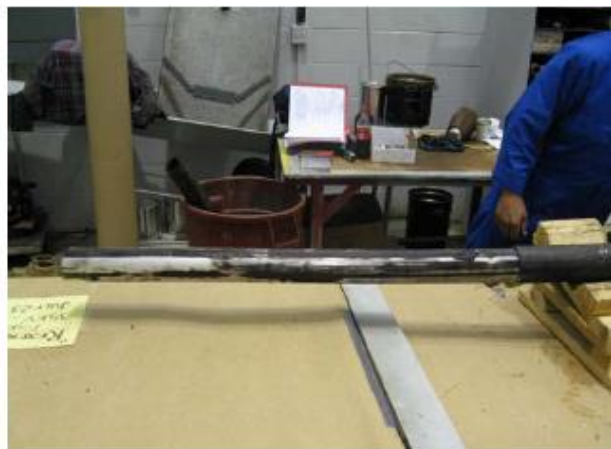
3.5 Preparation

3.5.1 Disassemble transition joint shipping assembly (refer to the attached drawing) by removing bushing interface plate assembly and body assembly from the stainless steel casing. Save the hardware, discard the O-rings and remove and discard tack-soldered cap from the body sleeve. Do not disassemble bushings from the interface plate. Exercise caution not to scratch or otherwise damage epoxy bushings and sealing surfaces. Install bushing interface plate assembly on the Interface Support Kit (refer to drawing provided with the kit) with provided hardware and temporarily store in a safe, dry and clean position.

3.5.2 Train 3 core paper cable into the final position it will assume after connection to extruded cable bushings, with conductors cut straight.

3.5.3 Slide over the 3-core paper cable in sequence the following parts (refer to attached Bill of Material drawing): RS entrance assembly with gasket, stainless steel casing (with larger opening facing towards cable end) and replacement O-ring (seal between casing and body assembly).

3.5.4 Mark the cable jacket per Dimension 1 shown in the attached Cable end preparation drawing and cut the jacket straight. Exercise caution not to cut underlying aluminum sheath.



3.5.5 Clean the aluminum sheath and slide over the cable the body assembly with copper sleeve facing towards cable end. Mark aluminum sheath per dimension 2 shown in the cable end preparation drawing and cut it straight. If the cable is fitted with a small bore gas carrying tube then this should be terminated 150mm in front of the sheath cut and formed vertically to avoid cable compound blockage. Exercise caution not to scratch or cut underlying cable cores.



3.5.6 Disassemble bushing connectors from solder lugs (refer to connector kit drawing supplied with connectors) and install the bushing connectors onto all 3 epoxy bushings with provided hardware and torque to 35 Ft-Lb (47Nm). Bring in bushing interface plate assembly with installed bushing connectors and position it securely to face the cable cores. Spread the cable cores evenly and measure the Dimension 3 in the Cable end preparation drawing (mounting surface to the cable aluminum sheath) and adjust bushing interface plate assembly accordingly and secure it in that position. Bushing interface plate assembly will maintain its position throughout the installation with its mounting surface being the reference surface for measurements.



3.5.7 (This step can be done in advance of the installation.) Open up the pilot hole in all 3 of the provided solder lugs so they fit tight over the conductor of the paper cable. Drill the holes for solder application on all 3 solder lugs' ferrules. Make sure that solder holes are properly oriented when lugs are assembled onto the bushing connectors.

3.5.8 Using 50 mm long M8 screws from the connector kit temporarily install solder lugs onto the bushing connectors with provided Teflon strips in between the two as a heat barrier for later soldering operation.

3.5.9 Expose the cable conductors on all 3 cables per Cable end preparation drawing by removing paper insulation. (See view “HV Electrode Semi-Con Tape Application”) Leave cable’s copper tapes layer over the remaining cable insulation to protect the insulation during soldering operation.



3.6 Fitting Solder Lugs

3.6.1 If the paper cable has an oval conductor, round it to fit in the solder lug ferrule by using hose clamp or rounding hydraulic device. Make sure that the cable strands are clean from any contaminants (oil, foreign particles, etc.) and clean the conductor strands with wire brush. Install all 3 cable conductors into the solder lugs. Cable conductor should fit tight into the lug ferrule. Re-check the dimension 3 in the Cable end preparation drawing (mounting surface to the cable aluminum sheath).



3.6.2 Solder the conductors into the lugs. Exercise caution not to overheat cable insulation during this process. After the solder cools down polish the soldered surface to make it smooth. Make sure there are no protrusions or sharp edges. The transition from ferrule to cable conductor must be gradual and smooth without a step.



3.6.3 Unbolt the solder lugs from the bushing connectors on all 3 cables, discard the Teflon strips and reassemble lugs to the connectors by using 35 mm long M8 screws with Belleville washers from the connector kit.

3.6.4 Mark the cable copper tapes layer per dimension 4 in the Cable end preparation drawing and remove the copper tapes to that point. Make sure that copper tapes' edge is free from protrusions and that it is securely adhered to underlying cable insulation with no gap. Transition from copper tapes to cable insulation must be as seamless as possible leaving no step for later application of the oil impregnated tapes.



3.6.5 Using piano wire (preferably) or a sharp knife create the taper on the cable insulation per dimension shown in Cable end preparation drawing. Tapered section of the cable insulation should be smooth with fine stepping increments.



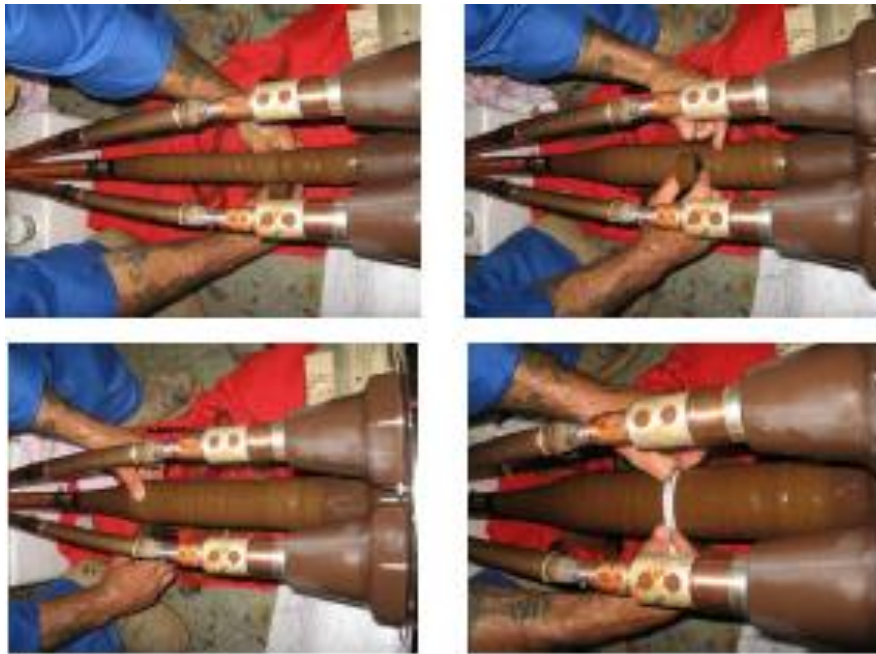
3.6.6 Fill the bolt holes on the connectors and gap between the bushing and connector with provided epoxy filler putty. Clean the surfaces from excess of the putty with dry, lint-free cloth.



3.7 Cable End Preparation

3.7.1 Build the HV electrode over the connector, lug and exposed cable conductor per “HV Electrode Semi-Con Tape Application” on Cable end preparation drawing by applying semi-con oil impregnated tape. Semi-con tape buildup has to be shaped smoothly to provide gradual transition from the top of the bushing to the cable. Use multiple tape layers as necessary to achieve this shape. No protrusions, gaps between layers, paper tears and wrinkles or sharp edges are acceptable in the final outer shape.

3.7.2 Build the insulating cone per Cable end preparation drawing by applying insulating oil impregnated crepe paper tape. In this critical operation, make sure that paper tapes and cone itself are not exposed to contamination and moisture. No gaps or wrinkles are allowed. Final shape should be per provided dimensions, with smooth finish and transition to the cable insulation.



3.7.3 Begin the ground electrode over the paper cone per Cable end preparation drawing by tightly applying one half-lapped layer of semi-con oil impregnated crepe paper tape. End the tape on cable copper tapes and secure from unraveling.

3.7.4 Repeat steps 16 and 17 for all 3 phases.



3.7.5 Apply provided tinned copper braid over the semi-con tape and cable copper tapes per Cable end preparation drawing. Detail A. End the braid by overlapping the semi-con tape by 20mm onto cable copper tapes. Tack solder the braid to itself and to cable copper tapes. Exercise caution not to overheat oil impregnated paper or cable insulation.



3.7.6 Group all 3 braids and crimp them together in the provided crimp eye lug. Connect the lug to the earthing hole on the interface plate with provided earthing screw and lock washer.



3.8 Fitting Wiping Sleeve

3.8.1 Position the Body assembly onto the exposed cable aluminum sheath per reference dimension provided in the Cable end preparation drawing. Fill in the gap between the Body and aluminum sheath with provided lead wedge from wiping sleeve kit.



3.8.2 Wire brush the exposed cable aluminum sheath and body copper sleeve for later application of the wiping sleeve between the two. Make sure surfaces are oil-free and clean from any contaminants.

3.8.3 Install the installation fixture: Install two half moons on the body flange and four threaded rods with spacers between the half moons and bushing interface plate. Adjust the nuts and position of the body assembly until spacers are butted with both interface surfaces. This fixture will be used to hold parts in place at required positions during wiping operation. Confirm reference dimension from the Cable end preparation drawing since correct position before the wiping operation is essential.



3.8.4. Build a lead wipe between the body copper sleeve and exposed cable aluminum sheath. Make sure that both surfaces are clean (if necessary, wire brush both surfaces again). Protect the cable cores and during wiping operation exercise caution not to overheat or otherwise damage cable cores or paper cones. For easier application it's suggested to first "tack-wipe" sleeve to the sheath with all 4 spacers in place, then to remove 2 top spacers to gain more space and complete the wiping.



3.9 Assembly

3.9.1 Remove the installation fixture: Disassemble rods with spacers and half moons from the Body flange and store parts for future use.

3.9.2 Apply self-fusing silicone tape over the entire length of tinned copper braid, from bushing to copper tapes. Stretch silicone tape while applying for proper self-fusing. Refer to Cable end preparation drawing. "Ground Electrode Application" and "Detail A".

3.9.2 Install the stainless steel Casing using provided hardware. Make sure two O-rings, one in Bushing interface plate and one in Body flange are securely put in the grooves. Exercise caution not to damage cable cores, paper cones or bushings during this operation.



3.9.3 After casing installation is complete, make sure that the 3 epoxy bushings are clean and protected for later installation of the plug-in terminations for extruded cables. Disassemble Interface Support Kit from the Bushing interface plate and save it for future use.

3.9.4 Clean and slightly sand cable jacket outside of the casing and install RS Entrance housing with gasket and provided hardware. Compress the internal gaskets by tightening the brass nut.



3.10 Fitting Plug-in Termination (Pfisterer)

3.10.1 Final steps

Last step in previous section concludes the installation of the gas pressurized cable side of the transition joint.

Before the circuit can be energized, three extruded cables will be spliced and provided plug-in terminations installed per Manufacturer's instructions.

If plug-in terminations for extruded cables will be installed at later time, system should be pressurized per customer's procedures and remain pressurized until ready to install plug-in terminations.

Although nitrogen pressurizing procedures may vary between different customers, after the joint is built it is recommended to apply vacuum for moisture evacuation before pressurization (e.g. 500 microns (0.5 Torr) for 4 hours then perform 1 hour vacuum drop test; drop shall not exceed 500 microns (0.5 Torr)). During pressurization the nitrogen should be applied slowly and gradually (e.g., 15 psi / 10 minutes) until system is fully pressurized to prevent paper wrinkles.

Prior or as a part of pressurization procedure, it is advised to leak-test the system to make sure that all O-ring seals and wiping sleeve are holding pressure.

If fiberglass coffin is supplied, prior to energizing of the circuit coffin should be installed over the joint per installation instructions that will be supplied with the coffin.

3.12 Maintenance

There is no special maintenance requirements for the joint. Assembly should be checked for gas leaks during regular periodical maintenance of the cable system.

SECTION 4: ATTACHMENTS

Bill of Material drawing: D5050 0087 000

Transition Joint Shipping Assembly drawing: B5024 0473 D00

Cable end preparation drawing: D5080 0317 000

Coffin