

TUNNELLING ACCESSORIES

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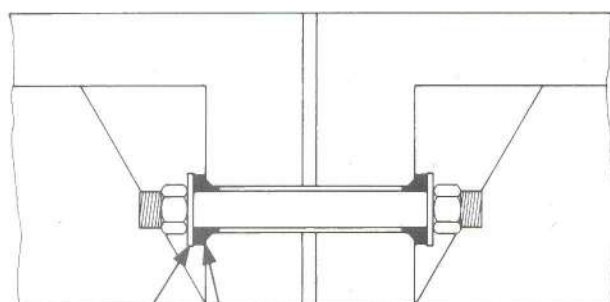


Product Data

Oyster Grummets

Description and use

Oyster Grummets are manufactured from low density polyethylene. They are used for waterproofing the bolt holes in cast iron and steel bolted segmental tunnel linings.



Washer

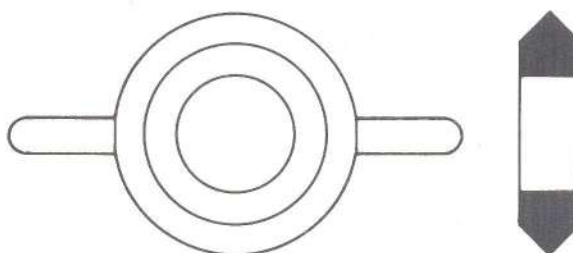
Grummets

All joints – bolted segments

Sizes

Oyster Grummets are normally supplied to suit metric bolts.

Nominal size and bolt diameter mm	Overall diameter mm	Overall thickness mm	Bolt hole diameter mm
20	44	12	26
24	49	13	30
30	56	13	36
36	64	14	42



Section and elevation of typical Oyster Grummet

Method of use

Oyster Grummets are fitted on the bolts next to the metal washer. On tightening the nut the grummet material flows into the bolt hole and around the bolt. Oyster Grummets are suitable for sealing circular or elongated bolt holes and are capable of accommodating a greater degree of bolt hole misalignment than traditional materials.

Performance

They make an absolute and permanent seal to the ingress of water. They are resistant to acid and alkalis found in ground water.

Storage

No particular precautions.

Handling

No particular precautions.



Cert. No. 6790



Ancillary materials, equipment & fittings
For all types of tunnelling

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HYDROSTATIC PRESSURE TEST ON M30 OYSTER GRUMMETS

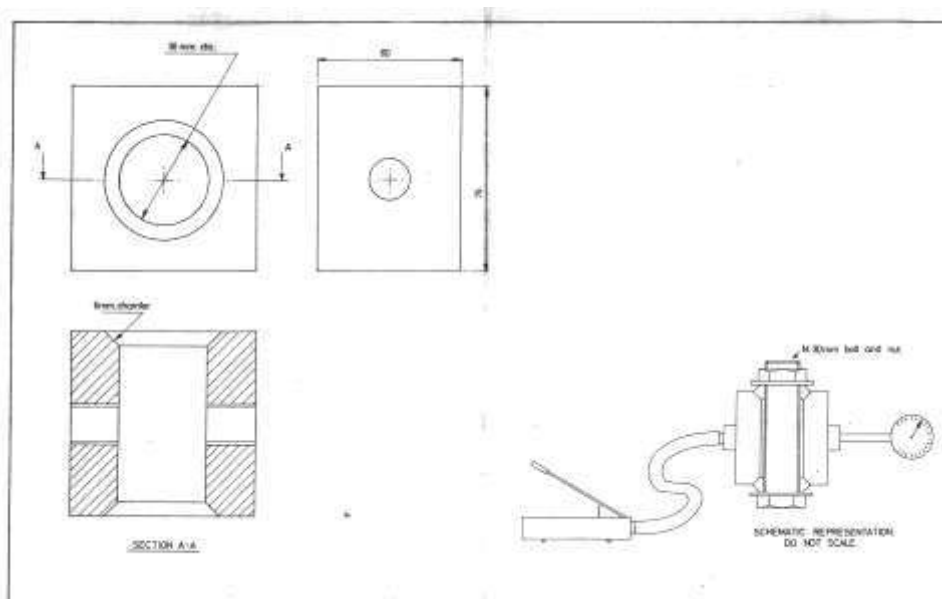
Date of Test - 03.01.12 to 05.01.12

Object of Test – to check the watertightness of a bolted connection when fitted with an Oyster Grummet.

Test Apparatus - as shown on the attached drawing

Test Method – The test was set up as shown on the drawing, with the bolt assembled, and tightened, through the test block. The bolt was tightened to a torque of 300 N m. Water was then pumped into the test block, and this applied a pressure to the underside of the Oyster Grummet in the bolted connection. The pressure was taken up in increments of 0.5bar (at 5 minute intervals) to a maximum of 5.0bar.

Test Result – The pressure of 5.0bar was held for 72 hours, and at the end of this period, on inspection there was no sign of any water leakage on the outside of the test block from either the ends of the bolt or the Oyster Grummets.





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CHEMICAL RESISTANCE OF LOW DENSITY POLYETHYLENE OYSTER GRUMMETS

Oyster Grummets are manufactured from Low Density Polyethylene, and the following tables show the level of resistance they have to attack by a comprehensive range of chemicals.

Overview of Chemical Resistance of Resins to Chemical Categories at 20°

- E** 30 Days of constant exposure causes no damage. Plastic may tolerate for years.
- G** Little or no damage after 30 days of constant exposure to the reagent.
- F** Some effect after 7 days of constant exposure to the reagent. The effect may be crazing, cracking, loss of strength or discoloration.
- N** Not recommended. Immediate damage may occur. Depending on the plastic, the effect may be severe crazing, cracking, loss of strength, discoloration deformation, dissolution or permeation loss.

	ETFE	FEP/TFE/PFA	FLPE	FLPP	HDPE	LDPE	PC	PETG	PP	PVC	TPE**
Acids, dilute or weak	E	E	E	E	E	E	E	G	E	E	G
Acids,** strong / concentrated	E	E	G	G	G	G	G	N	G	G	F
Alcohols, aliphatic	E	E	E	E	E	E	G	G	E	G	E
Aldehydes	E	E	G	G	G	G	G	G	G	G	G
Bases/Alkali	E	E	F	E	E	E	N	N	E	E	F
Esters	G	E	G	G	G	G	N	G	G	N	N
Hydrocarbons, aliphatic	E	E	E	G	G	F	G	G	G	G	E
Hydrocarbons, aromatic	G	E	E	N	N	N	N	N	N	N	N
Hydrocarbons, halogenated	G	E	G	F	N	N	N	N	N	N	F
Ketones, aromatic	G	E	G	G	N	N	N	N	N	F	N
Oxidizing Agents, strong	E	E	F	F	F	F	F	F	F	G	N

*not for tubing chemical resistance (except pvc)

**except for oxidizing acids (see Oxidizing Agents, strong)

*** TPE gaskets

Directors: P.J.Benford, D.J Morgan, S.J.Benford (Secretary)

Registered in England No. 2102715 Registered office. Sidney Little Road, St.Leonards-on-Sea, East Sussex

LDPE / HDPE Resistance Chart by Chemical

LDPE & HDPE resistance listed by chemical	
1,4-dioxane	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50C° shows some effect after 7 days of constant exposure.
Acetaldehyde	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. HDPE at 50C° shows some effect after 7 days of constant exposure. LDPE - immediate damage may occur.
Acetic Acid 5 %	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Acetic Acid, glacial 50%	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50 C° - immediate damage may occur.
Acetone	LDPE / HDPE at 20C°-50C° - damage may occur. Not recommended for continuous use.
Allyl Alcohol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Aluminum salts	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Amino acids	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ammonia	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ammonium carbonate, saturated	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ammonium phosphate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ammonium sulphate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Amyl chloride	HDPE at 20C° shows some effect after 7 days of constant exposure. HDPE at 50C° & LDPE at 20C°-50C° - immediate damage may occur. Not recommended for continuous use.
Aniline	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. HDPE at 50C° shows some effect after 7 days of constant exposure.
Benzene	LDPE / HDPE at 20C°-50C° - damage may occur. Not recommended for continuous use.
Benzyl alcohol	LDPE / HDPE at 50C° - immediate damage may occur. HDPE at 20C° shows some effect after 7 days of constant exposure.
Boric acid	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Bromine	LDPE / HDPE at 50C° - immediate damage may occur. HDPE at 20C° shows some effect after 7 days of constant exposure.
Butyric acid	LDPE / HDPE at 50C° - immediate damage may occur. HDPE at 20C° shows some effect after 7 days of constant exposure.
Calcium chloride	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Calcium hydroxide saturated	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Calcium sulphate	No data is available at this time.
Carbon tetrachloride	HDPE at 20C° shows little or no damage after 30 days. LDPE at 20C° & HDPE at 50C° show some effect after 7 days of constant exposure. LDPE at 50C° not recommended.
Chlorobenzene	Immediate damage may occur. Not recommended for continuous use.
Chloroform	LDPE / HDPE at 20C° show some effect after 7 days. At -50C° - immediate damage may occur. Not recommended for continuous use.
Chlorine 10% in water	LDPE / HDPE at 20C° shows little or no damage after 30 days. LDPE at 50C° shows damage and is not recommended.
Chromic acid 10%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Chromic acid 50%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Citric acid 10%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Cresol	HDPE at 20C° shows some effect after 7 days. LDPE at 20C°-50C° & HDPE at 50C° show immediate damage -- not recommended for continuous use.
Cyclohexane	LDPE / HDPE at 50C° - immediate damage may occur. LDPE / HDPE at 20C° show some effect after 7 days of constant exposure.
Diethyl ketone	LDPE / HDPE at 20C°-50C° - damage may occur. Not recommended for continuous use.
Dimethylsulfoxide	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ethanol 95%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ethyl acetate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ethyl benzene	HDPE at 20C° shows some effect after 7 days. LDPE at 20C°-50C° & HDPE at 50C° show immediate damage -- not recommended for continuous use.
Ethylene glycol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Ethylene oxide	HDPE at 20C° shows little or no damage after 30 days of constant exposure. LDPE at 20C° and LDPE/HDPE at 50C° show some effect after 7 days.
Ferric chloride	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Fluoride	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Fluorine	HDPE at 20C° shows little or no damage after 30 days of constant exposure. LDPE at 20C° shows some effect after 7 days. Neither HDPE or LDPE are recommended at 50C°.
Formaldehyde 10%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Formaldehyde 40%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Glycerol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Heating oil	No further data is available at this time.
Hexane	HDPE at 20C° shows little or no damage after 30 days continuous use and at 50 C° shows some effect after 7 days. LDPE not recommended at any temperature.
Hydrochloric acid 5%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrochloric acid 20%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrochloric acid 35%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrocyanic acid	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrofluoric acid	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrofluoric acid 4%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrofluoric acid 48%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrogen peroxide 3%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Hydrogen peroxide 30%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Isobutyl alcohol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Isopropyl acetate	No data is available at this time.
Isopropyl alcohol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Kerosene	LDPE / HDPE at 20C° show some effect after 7 days. LDPE / HDPE not recommended at 50C°, as immediate damage may occur.
Lactic Acid 10 %	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Lactic Acid 90 %	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.

Lead acetate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Metallic salts, dissolved	No data is available at this time.
Methanoic acid 100%	No data is available at this time.
Methanol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Methyl ethyl ketone	Immediate damage may occur. Not recommended for continuous use.
Methyl propyl ketone	HDPE at 20C° shows some effect after 7 days. LDPE at 20C°-50C° & HDPE at 50C° - Immediate damage may occur. Not recommended for continuous use.
Methylene chloride	HDPE at 20C° shows some effect after 7 days. LDPE at 20C°-50C° & HDPE at 50C° - Immediate damage may occur. Not recommended for continuous use.
Mineral oil	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50C° may show immediate damage and is not recommended.
n-amyl acetate	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50C° shows some effect after 7 days or constant exposure.
n-butyl alcohol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
n-octane	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Nitric acid 50 %	LDPE at 20C° shows little or damage after 30 days. HDPE at 20C° & LDPE at 50C° show effect after 7 days. HDPE at 50C° shows immediate damage and is not recommended.
Nitric acid 70 %	LDPE / HDPE at 20C° show some effect after 7 days. Both at 50C° show immediate damage -- not recommended.
Oleic acid	HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure. LDPE at 20C°-50C° shows immediate damage and is not recommended.
Oxalic acid	LDPE at 20C° shows some effect after 7 days. HDPE at 20C° and both LDPE / HDPE at 50C° show little or no damage after 30 days.
Ozone	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE / HDPE at 50C° show immediate damage -- not recommended.
Perchloric acid	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE / HDPE at 50C° show immediate damage -- not recommended.
Perchloric ethylene	LDPE / HDPE at 20C°-50C° show immediate damage -- not recommended.
Phenol	LDPE / HDPE at 20C°-50C° show immediate damage -- not recommended.
Phosphoric acid 10%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Phosphoric acid 85%	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50C° shows immediate damage and is not recommended.
Phosphorous trichloride	LDPE / HDPE at 20C° show little or no damage after 30 days of constant exposure. LDPE at 50C° has no data available. HDPE at 50C° shows some effect after 7 days.
Potassium acetate	No data is available at this time.
Potassium bromide	No data is available at this time.
Potassium carbonate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Potassium hydroxide 5 %	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Potassium hydroxide concentrated	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Potassium permanganate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Propylene glycol	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Pyridine	Immediate damage may occur. Not recommended for continuous use.
Salicylic acid, saturated	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Silver acetate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Silver nitrate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium carbonate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium chloride, saturated	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium dichromate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium hydroxide 1%	LDPE at 20C°-50C° shows little or no damage after 30 days of constant exposure. HDPE at 20C°-50C° shows some effect after 7 days.
Sodium hydroxide 50%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium hypochlorite 15%	HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure. LDPE at 20C° is suitable but at 50C° shows some effect after 7 days.
Sodium nitrate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sodium sulphate	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sucrose	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sulphide	No additional information is available at this time.
Sulfuric acid 6%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sulfuric acid 20%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sulfuric acid 60%	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Sulfuric acid 98%	LDPE at 20C°-50C° shows little or no damage after 30 days of constant exposure. HDPE at 20C° shows effect after 7 days -- not recommended for use at 50C°.
Tannic acid	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Tetrahydrofuran	LDPE / HDPE at 20C° show some effect after 7 day of constant exposure. LDPE / HDPE at 50C° show immediate damage -- not recommended.
Toluene	LDPE at 20C° show some effect after 7 day of constant exposure. HDPE at 20C°-50C° & LDPE at 50C° show immediate damage -- not recommended.
Trichloroacetic acid	LDPE / HDPE at 20C° show some effect after 7 day of constant exposure. LDPE / HDPE at 50C° show immediate damage -- not recommended.
Trichlorethane	Immediate damage may occur. Not recommended for continuous use.
Turpentine oil	LDPE / HDPE at 20C° show some effect after 7 day of constant exposure. LDPE / HDPE at 50C° show immediate damage -- not recommended.
Urea	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.
Xylene	HDPE at 20C° shows some effect after 7 day of constant exposure. LDPE at 20-50C° & HDPE at 50C° show immediate damage -- not recommended.
Zinc chloride	LDPE / HDPE at 20C°-50C° show little or no damage after 30 days of constant exposure.