SHIELD™
Trusted Worldwide

# PE Gas

## PIPING SOLUTION

Comply With ISO 4437 & BS EN 1555 Standards

# INTRODUCTION

At SHIELD, we are dedicated to serving the needs of the fire protection and building services industries. We have a comprehensive range of quality products designed to the highest local and international standards.

Our commitment to continued research and development ensure that we remain at the forefront of innovative products to bring to the marketplace.

Our worldwide manufacturing facilities are some of the most advanced in the industry. Our experienced and professional staff provide the highest levels of service across engineering, quality, manufacturing, and after-sales support.

With our highly responsive and customer-focused network of distribution centres around the world, we excel at providing outstanding levels of service to our customers.

With offices and facilities in the UK and the Middle East, we can cater to the specific needs of your region and we are justifiably proud of our global client base.

At our manufacturing facility, in the UAE, we produce UL Listed, FM Approved, WRAS approved, and Bureau Veritas approved PE Pipes and fittings for use across a wide range of industries and applications in the region.

* Refer to UL, FM, WRAS & Bureau Veritas certificates for more information.

# PE Certifications

BUREAU VERITAS Certification

Certificate of Conformity

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office:
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

Bureau Veritas Italia S.p.A. certifies that the following products:

**Polyethylene pipes (PE)**

| Designation | SDR | from DN | to DN |
|---|---|---|---|
| PE 80 | 11 | 20 | 630 |
| PE 80 | 17 | 20 | 630 |
| PE 100 | 11 | 20 | 630 |
| PE 100 | 17 | 20 | 630 |

Commercial Brand:
**SHIELD**

Compound code:
**N24 (PE100 orange), N23 (PE100 black), N08 (PE80 black), N05 (PE80 yellow)**

Have been evaluated and found in accordance with the requirements of the standard:

**EN 1555-2:2010**
Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) – Part 2: Pipes

Certificate issued in conformity to: RG-01-05 ACCREDIA Rev.01 – Regulation for the accreditation of Products / Servic
Certification Bodies, IT-QHSE-REG-02_ENG.TQR Bureau Veritas Rev. 05 – Regulation for the certification of product
process / service and IND-REP-49_CP Particular regulation for the certification of plastic fluid conduction systems - Flexib
scope.

Original Emission date: 11/06/2020
Current Emission date: 11/06/2020
Expiration date: 10/06/2023

The validity of this certificate is subject to a constant periodical surveillance and it can be checked on the following websit
**www.bureauveritas.it** - Further clarifications regarding the scope of this certificate and the applicability of standard
requirements may be obtained by consulting the organisation.

(Eng. Francesco Sutera – Technical Director)

Certificate N°: **1161/001**





BUREAU VERITAS Certification

Certificate of Conformity

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

Bureau Veritas Italia S.p.A. certifies that the following products:

**Fittings in (PE)**

| Designation | Description | SDR | S | From DN | To DN |
|---|---|---|---|---|---|
| See Annex n. 1/1 | | | | | |

Commercial Brand:
**SHIELD**

Compound code:
**N24 (PE100 orange), N23 (PE100 black), N08 (PE80 black), N05 (PE80 yellow)**

Type of fitting:
**Spigot end fitting**

Have been evaluated and found in accordance with the requirements of the standard:

**EN 1555-3:2010 + A1:2012**
Plastics piping systems for the supply of gaseous fuels
Polyethylene (PE) – Part 3: Fittings

Certificate issued in conformity to: RG-01-05 ACCREDIA Rev.01 – Regulation for the accreditation of Products / Servic
Certification Bodies, IT-QHSE-REG-02_ENG.TQR Bureau Veritas Rev. 05 – Regulation for the certification of product
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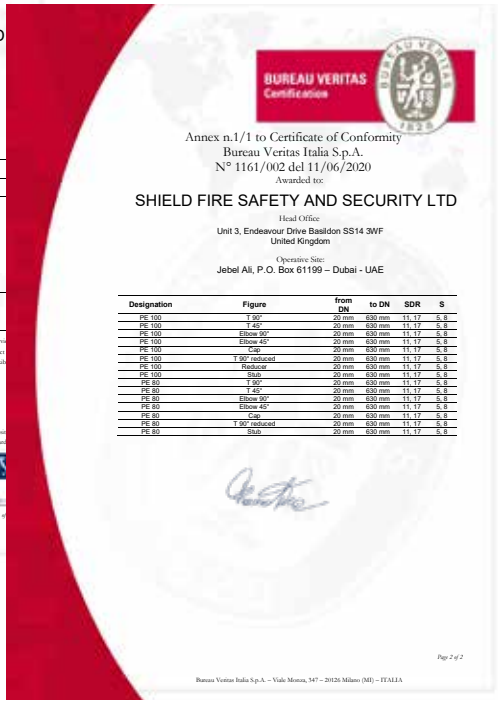
(Ing. Francesco Sutera – Direttore Tecnico)

Certificato N°: **1161/002**







BUREAU VERITAS Certification

Annex n.1/1 to Certificate of Conformity
Bureau Veritas Italia S.p.A.
N° 1161/002 del 11/06/2020

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

| Designation | Figure | from DN | to DN | SDR | S |
|---|---|---|---|---|---|
| PE 100 | T 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | T 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Elbow 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Elbow 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Cap | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | T 90° reduced | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Reducer | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Stub | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Elbow 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Elbow 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Cap | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 90° reduced | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Stub | 20 mm | 630 mm | 11, 17 | 5, 8 |





BUREAU VERITAS Certification

Certificate of Conformity

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office:
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

Bureau Veritas Italia S.p.A. certifies that the following products:

**Polyethylene pipes (PE)**

| Designation | SDR | from DN | to DN |
|---|---|---|---|
| PE 80 | 11 | 20 | 630 |
| PE 80 | 17 | 20 | 630 |
| PE 100 | 11 | 20 | 630 |
| PE 100 | 17 | 20 | 630 |

Commercial Brand:
**SHIELD**

Compound code:
**N24 (PE100 orange), N23 (PE100 black), N08 (PE80 black), N05 (PE80 yellow)**

Have been evaluated and found in accordance with the requirements of the standard:

**ISO 4437-2:2014**
Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) – Part 2: Pipes

Certificate issued in conformity to: RG-01-05 ACCREDIA Rev.01 – Regulation for the accreditation of Products / Servic
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requirements may be obtained by consulting the organisation.

(Eng. Francesco Sutera – Technical Director)

Certificate N°: **1161/003**





BUREAU VERITAS Certification

Certificate of Conformity

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

Bureau Veritas Italia S.p.A. certifies that the following products:

**Fittings in (PE)**

| Designation | Description | SDR | S | From DN | To DN |
|---|---|---|---|---|---|
| See Annex n. 1/1 | | | | | |

Commercial Brand:
**SHIELD**

Compound code:
**N24 (PE100 orange), N23 (PE100 black), N08 (PE80 black), N05 (PE80 yellow)**

Type of fitting:
**Spigot end fitting**

Have been evaluated and found in accordance with the requirements of the standard:

**ISO 4437-3:2014**
Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings

Certificate issued in conformity to: RG-01-05 ACCREDIA Rev.01 – Regulation for the accreditation of Products / Servic
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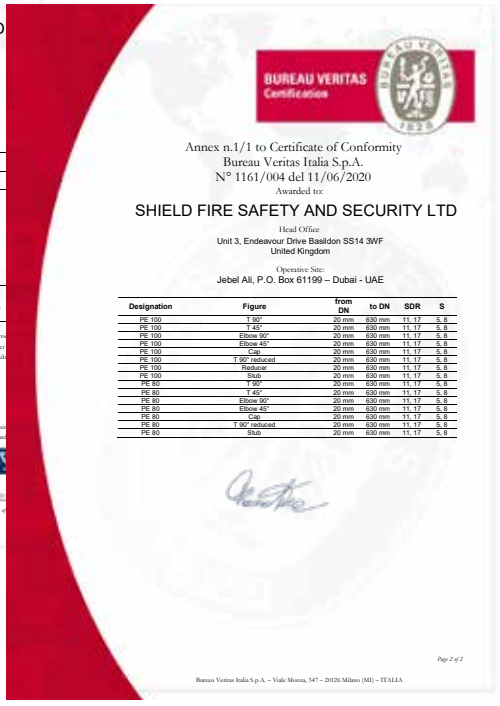
(Ing. Francesco Sutera – Direttore Tecnico)

Certificato N°: **1161/004**







BUREAU VERITAS Certification

Annex n.1/1 to Certificate of Conformity
Bureau Veritas Italia S.p.A.
N° 1161/004 del 11/06/2020

Awarded to:

SHIELD FIRE SAFETY AND SECURITY LTD

Head Office
Unit 3, Endeavour Drive Basildon SS14 3WF
United Kingdom

Operative Site:
Jebel Ali, P.O. Box 61199 – Dubai - UAE

| Designation | Figure | from DN | to DN | SDR | S |
|---|---|---|---|---|---|
| PE 100 | T 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | T 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Elbow 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Elbow 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Cap | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | T 90° reduced | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Reducer | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 100 | Stub | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Elbow 90° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Elbow 45° | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Cap | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | T 90° reduced | 20 mm | 630 mm | 11, 17 | 5, 8 |
| PE 80 | Stub | 20 mm | 630 mm | 11, 17 | 5, 8 |

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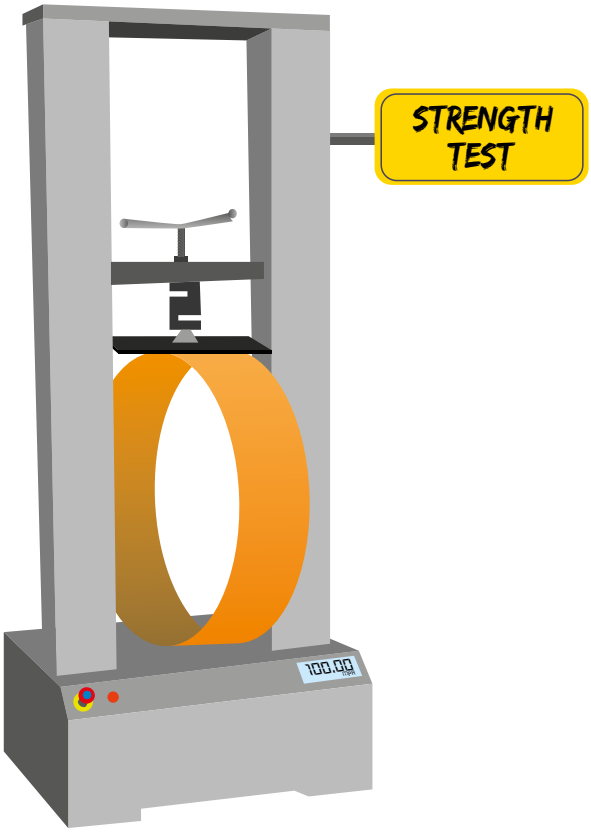
# PE System

## Physical Properties of PE:

| Characteristics | Units | PE 80 | PE 100 | Test Standards |
|---|---|---|---|---|
| Density | gm/cm³ | ≥ 0.93 | ≥ 0.95 | BS EN ISO 1183 |
| Minimum Required Strength (MRS) | MPa | 8 | 10 | ISO 4437, BS EN 1555 |
| Design Stress | MPa | 4 | 5 | ISO 4437, BS EN 1555 |
| Tensile Strength At Yield | N/mm² | 18 - 23 | 23 - 25 | BS EN ISO 527 |
| Flexural Modules (Bend Creep) | N/mm² | 650 - 850 | 1000 - 1200 | BS EN ISO 527 |
| Elongation At Break | % | > 600 | > 600 | ISO 527 |
| Crystallite Melt Range | °C | 128 - 132 | 128 - 132 | DIN 53736 |
| Surface Resistance | Ohm | $10^{13}$ | > $10^{14}$ | ASTM D 257, DIN IEC 167 |
| Coefficient Of Linear Expansion | mm/m*k | 0.2 | 0.13 | DIN 53752 |
| Heat Conductivity At 20 °C | W/m*K | 0.43 | 0.38 | BS EN 12664, DIN 52612 |
| Impact Strength At 23 °C | Kj/m² | 110 | 83 | BS EN ISO 179 |
| Brittleness Temperature | °C | < -70 | < -70 | ASTM D746 |
| Shore Hardness | D | 65 | 62 | ISO 868 |
| Melt Flow Rate (Melt Flow Index - Mfi) | g/10min | 0.2 - 1.4 | 0.2 - 1.4 | ISO 1133 |
| Water Absorption | % | 0.01 - 0.04 | 0.01 - 0.04 | BS EN ISO 62, DIN 53495 |

NOTE: Above values are general & based on compound manufacturers.




## Minimum Required Strength (MRS):

Polyethylene pipes and fittings materials are evaluated based on their Minimum Required Strength.

When PE 100 pipes are hydro-statically tested at 20°C, ISO 1167 specify a Minimum Required Strength at 50 years of 10 Mpa (100bar) - MRS100.

When PE 80 pipes are hydro-statically tested at 20°C, ISO 1167 specify a Minimum Required Strength at 50 years of 8 Mpa (80bar) - MRS80.

The MRS value for PE 100 compound is 10MPa. PE 100 pipe has enhanced toughness, higher permissible design strength and improved resistance to rapid crack propagation in addition to benefits in efficiency and economy. This allows the design engineers to use PE 100 pipes at substantially higher operating pressures than PE 80 pipes with equivalent SDR rating i.e. allows PE 100 pipes to be produced with thinner walls than PE 80 pipes of equivalent SDR rating.

NOTE: Drawings are for illustration purpose only.

# PE System

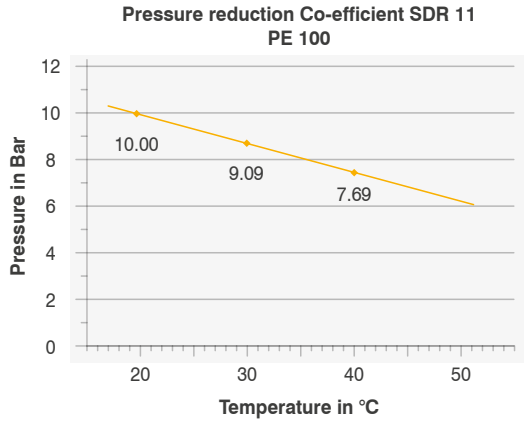
## Pressure Reduction Co-Efficient for PE 100 & PE 80 as Per ISO 4437:

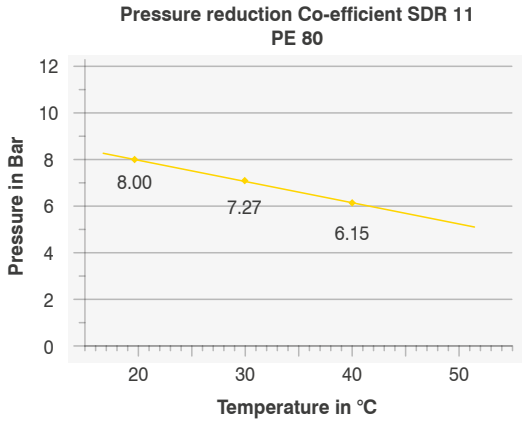
When a PE piping system is operated at a continuous constant temperature higher than 20°C, a pressure reduction co-efficient as given in the below tables are applicable.

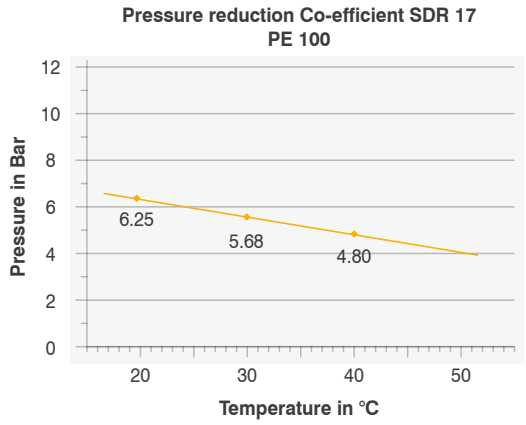
From the below table, the Pressure rating of different SDRs at various level of temperature can be determined, therefore pipe selection can be made early at the design stage.

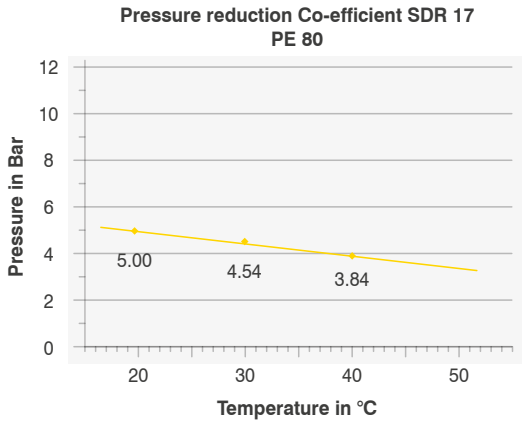
| PE 100 | | | |
|---|---|---|---|
| **Temperature °C** | **20** | **30** | **40** |
| **Pressure Reduction Co-efficient** | **1** | **1.1** | **1.3** |
| **SDR** | **Pressure in Bar** | | |
| 11.0 | 10.00 | 9.09 | 7.69 |
| 17.0 | 6.25 | 5.68 | 4.80 |

| PE 80 | | | |
|---|---|---|---|
| **Temperature °C** | **20** | **30** | **40** |
| **Pressure Reduction Co-efficient** | **1** | **1.1** | **1.3** |
| **SDR** | **Pressure in Bar** | | |
| 11.0 | 8.00 | 7.27 | 6.15 |
| 17.0 | 5.00 | 4.54 | 3.84 |



# PE System

## Manufacturing Process:

SHIELD manufactures Polyethylene Pipes and Fittings with a combination of advanced technologies, tested and proven materials and efficient factory production techniques. The facilities are equipped with state of the art technologies, operated by a team of highly skilled technicians & engineers.

The manufacturing facilities are inspected regularly and pass both scheduled and unscheduled inspections. Strict Quality Control procedures are conducted on a routine basis throughout the entire production cycle, from the inspection of the raw materials to the storage of the finished goods, to ensure product compliance with the relevant standards.

SHIELD's high-tech laboratory consists of modern calibrated machines to meet stringent quality standards.

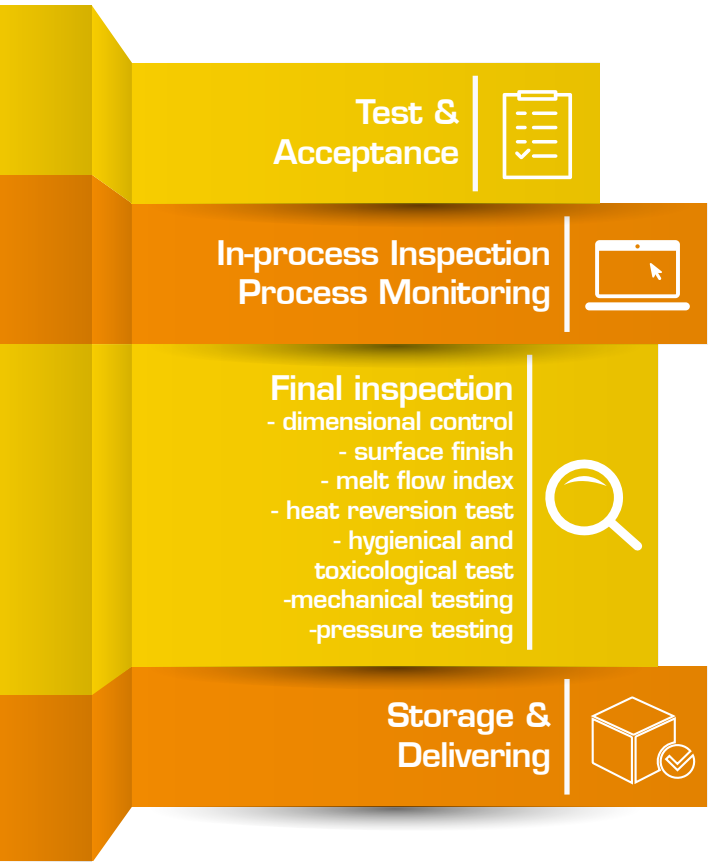
# PE System

## Quality Control:

SHIELD facilities are equipped with latest tools and technologies which can handle all the related processes of strict quality control which are routinely conducted throughout the production process from the inspection of raw materials to the finished goods.

As well as the manufacturing process, SHIELD also provides on-site engineering, technical and installation assistance.

## Quality Control Procedure:




1 Raw Materials

2 Production

3 In-process Inspection

4 Final Inspection

5 Storage, Packaging & Dispatch

# PE System

## Automated Quality Control System:

The production of plastic pipes is largely determined by the high demands on quality control, economic efficiency and productivity. These demands are achieved with the most up-to-date automation concepts.

The Automated Quality Control product line runs measuring, automation and documentation tasks for single-layer pipes while offering customized process solutions for very specific pipes. The ease of operation of the software, the temperature-independent measuring principle and the automatic centring of the measuring mechanics ensure the production of products at the highest quality..

Automated Quality Control system with its electronically rotating sensors covers a broad product spectrum. Process-oriented automatically centring measuring mechanics combined with gravimetry, thermal centring and other modules provide an affordable complete solution for the automation of pipe extrusion lines. Designed especially for the gas pipe and pressure pipe production, the portable is designed for a fast direct measurement independent of pipe temperatures. It can carry out a 100 % wall thickness measurement of pipe diameters.

## Benefits:

- Comprehensive product information (wall thickness, diameters, eccentricity, ovality)
- Absolute measurement Automatic centring
- Independent of pipe temperatures
- Maintenance-free
- Material savings of 5% or more through s-min control or thin points control, improved centring process and a systematic start-up of the extrusion line
- Documentation for submission to the customer
- Proven control principles
- Easy connection to extruder control
- Easy to use, thus low training need


# Gas Line

## PE Pipe Technical Data as per ISO 4437 & BS EN 1555:

SHIELD Polyethylene is the ideal choice for your Gas applications. Its characteristics such as strength, flexibility, inertness, quality, lightweight and ease of installation make this the perfect product for gas application. SHIELD PE pipes are maintenance-free with a design life of over 50 years under normal operating conditions.

SHIELD manufactures PE pipes for Gas service as per ISO 4437 & BS EN 1555 standards which undergo rigorous quality checks throughout the entire production process to ensure their reliability and effectiveness for gas transportation. The preferred series of pipes are SDR 11 and SDR 17 for gas applications.

Pipes are available in coils of 50 and 100 meters for sizes up to 160mm to reduce the number of joints to make a cost-effective choice for contractors and clients. Pipes are also available in straight lengths of 6 or 12 meters. The jointing can be done by Butt-Fusion or Electro-Fusion methods, providing a completely homogeneous leak-free system.

Pipe Sizes & Corresponding Wall Thickness as per **ISO 4437 & BS EN 1555:**

SD-PEPG

| Nominal Outside Diameter | PE 100 - MRS 10 MPa | | PE 80 - MRS 8 MPa | |
|---|---|---|---|---|
| | SDR 17 PN 6.25 | SDR 11 PN 10 | SDR 17 PN 5 | SDR 11 PN 8 |
| mm | Wall Thickness mm | | Wall Thickness mm | |
| 20 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 25 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 32 | 2.3 - 2.7 | 3.0 - 3.5 | 2.3 - 2.7 | 3.0 - 3.5 |
| 40 | 2.4 - 2.8 | 3.7 - 4.2 | 2.4 - 2.8 | 3.7 - 4.2 |
| 50 | 3.0 - 3.5 | 4.6 - 5.2 | 3.0 - 3.5 | 4.6 - 5.2 |
| 63 | 3.8 - 4.3 | 5.8 - 6.5 | 3.8 - 4.3 | 5.8 - 6.5 |
| 75 | 4.5 - 5.1 | 6.8 - 7.6 | 4.5 - 5.1 | 6.8 - 7.6 |
| 90 | 5.4 - 6.1 | 8.2 - 9.2 | 5.4 - 6.1 | 8.2 - 9.2 |
| 110 | 6.6 - 7.4 | 10.0 - 11.1 | 6.6 - 7.4 | 10.0 - 11.1 |
| 125 | 7.4 - 8.3 | 11.4 - 12.7 | 7.4 - 8.3 | 11.4 - 12.7 |
| 140 | 8.3 - 9.3 | 12.7 - 14.1 | 8.3 - 9.3 | 12.7 - 14.1 |
| 160 | 9.5 - 10.6 | 14.6 - 16.2 | 9.5 - 10.6 | 14.6 - 16.2 |
| 180 | 10.7 - 11.9 | 16.4 - 18.2 | 10.7 - 11.9 | 16.4 - 18.2 |
| 200 | 11.9 - 13.2 | 18.2 - 20.2 | 11.9 - 13.2 | 18.2 - 20.2 |
| 225 | 13.4 - 14.9 | 20.5 - 22.7 | 13.4 - 14.9 | 20.5 - 22.7 |
| 250 | 14.8 - 16.4 | 22.7 - 25.1 | 14.8 - 16.4 | 22.7 - 25.1 |
| 280 | 16.6 - 18.4 | 25.4 - 28.1 | 16.6 - 18.4 | 25.4 - 28.1 |
| 315 | 18.7 - 20.7 | 28.6 - 31.6 | 18.7 - 20.7 | 28.6 - 31.6 |
| 355 | 21.1 - 23.4 | 32.2 - 35.6 | 21.1 - 23.4 | 32.2 - 35.6 |
| 400 | 23.7 - 26.2 | 36.4 - 40.1 | 23.7 - 26.2 | 36.4 - 40.1 |
| 450 | 26.7 - 29.5 | 40.9 - 45.1 | 26.7 - 29.5 | 40.9 - 45.1 |
| 500 | 29.7 - 32.8 | 45.5 - 50.1 | 29.7 - 32.8 | 45.5 - 50.1 |
| 560 | 33.2 - 36.7 | 50.9 - 56.1 | 33.2 - 36.7 | 50.9 - 56.1 |
| 630 | 37.4 - 41.3 | 57.3 - 63.2 | 37.4 - 41.3 | 57.3 - 63.2 |


NOTE:
- SDR 11 & SDR 17 are the series commonly used for a gas application.
- Other SDRs are also available upon request.
- Outer diameter & Wall thickness is according to ISO 11922-1.
- For applications above 20 Deg C – suitable de-rating factors apply.
- PE 100 Minimum Required Strength (MRS) is 10 Mpa.
- PE 80 Minimum Required Strength (MRS) is 8 Mpa.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).
- Please contact us for more information.

SHIELD™
Trusted Worldwide

# PE GAS
## Moulded Fittings

SHIELD moulded fittings are the best solution for PE gas piping system.

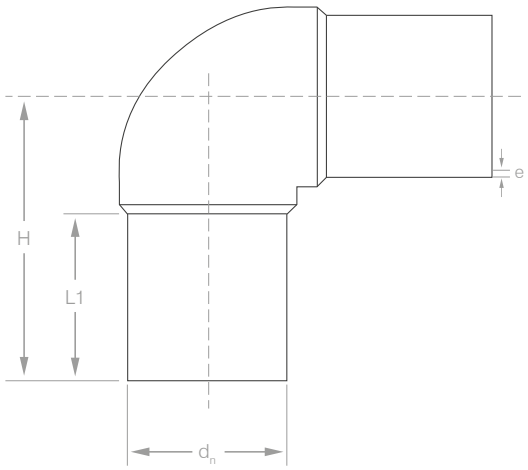
NOTE: Please contact us for more information.

ShieldGlobal.com

# Moulded Fittings

(Metric)

## 90°Elbow (ISO 4437 & BS EN 1555):




90° Elbow

SD-PEM90E

| $d_n$ | D (Min - Max) | H | L1 | PE 100 Wall Thickness - e | | PE 80 Wall Thickness - e | |
|---|---|---|---|---|---|---|---|
| | | | | SDR 17 PN 6.25 | SDR 11 PN 10 | SDR 17 PN 5 | SDR 11 PN 8 |
| mm | mm | mm | mm | mm | mm | mm | mm |
| 20 | 20.0 - 20.3 | 75 | 49 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 25 | 25.0 - 25.3 | 80 | 53 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 32 | 32.0 - 32.3 | 89 | 59 | 2.3 - 2.7 | 3.0 - 3.5 | 2.3 - 2.7 | 3.0 - 3.5 |
| 40 | 40.0 - 40.4 | 89 | 59 | 2.4 - 2.8 | 3.7 - 4.2 | 2.4 - 2.8 | 3.7 - 4.2 |
| 50 | 50.0 - 50.4 | 89 | 60 | 3.0 - 3.5 | 4.6 - 5.2 | 3.0 - 3.5 | 4.6 - 5.2 |
| 63 | 63.0 - 63.4 | 115 | 65 | 3.8 - 4.3 | 5.8 - 6.5 | 3.8 - 4.3 | 5.8 - 6.5 |
| 75 | 75.0 - 75.5 | 130 | 75 | 4.5 - 5.1 | 6.8 - 7.6 | 4.5 - 5.1 | 6.8 - 7.6 |
| 90 | 90.0 - 90.6 | 145 | 80 | 5.4 - 6.1 | 8.2 - 9.2 | 5.4 - 6.1 | 8.2 - 9.2 |
| 110 | 110.0 - 110.7 | 165 | 88 | 6.6 - 7.4 | 10.0 - 11.1 | 6.6 - 7.4 | 10.0 - 11.1 |
| 125 | 125.0 - 125.8 | 180 | 95 | 7.4 - 8.3 | 11.4 - 12.7 | 7.4 - 8.3 | 11.4 - 12.7 |
| 160 | 160.0 - 161.0 | 215 | 110 | 9.5 - 10.6 | 14.6 - 16.2 | 9.5 - 10.6 | 14.6 - 16.2 |
| 180 | 180.0 - 181.1 | 230 | 115 | 10.7 - 11.9 | 16.4 - 18.2 | 10.7 - 11.9 | 16.4 - 18.2 |
| 200 | 200.0 - 201.2 | 250 | 125 | 11.9 - 13.2 | 18.2 - 20.2 | 11.9 - 13.2 | 18.2 - 20.2 |
| 225 | 225.0 - 226.4 | 285 | 135 | 13.4 - 14.9 | 20.5 - 22.7 | 13.4 - 14.9 | 20.5 - 22.7 |
| 250 | 250.0 - 251.5 | 310 | 140 | 14.8 - 16.4 | 22.7 - 25.1 | 14.8 - 16.4 | 22.7 - 25.1 |
| 280 | 280.0 - 281.7 | 265 | 120 | 16.6 - 18.4 | 25.4 - 28.1 | 16.6 - 18.4 | 25.4 - 28.1 |
| 315 | 315.0 - 316.9 | 290 | 110 | 18.7 - 20.7 | 28.6 - 31.6 | 18.7 - 20.7 | 28.6 - 31.6 |
| 355 | 355.0 - 357.2 | 365 | 155 | 21.1 - 23.4 | 32.2 - 35.6 | 21.1 - 23.4 | 32.2 - 35.6 |
| 400 | 400.0 - 402.4 | 375 | 155 | 23.7 - 26.2 | 36.3 - 40.1 | 23.7 - 26.2 | 36.3 - 40.1 |
| 450 | 450.0 - 452.7 | 425 | 175 | 26.7 - 29.5 | 40.9 - 45.1 | 26.7 - 29.5 | 40.9 - 45.1 |
| 500 | 500.0 - 503.0 | 445 | 170 | 29.7 - 32.8 | 45.4 - 50.1 | 29.7 - 32.8 | 45.4 - 50.1 |
| 560 | 560.0 - 563.4 | 435 | 100 | 33.2 - 36.7 | 50.9 - 56.1 | 33.2 - 36.7 | 50.9 - 56.1 |
| 630 | 630.0 - 633.8 | 470 | 100 | 37.4 - 41.3 | 57.3 - 63.2 | 37.4 - 41.3 | 57.3 - 63.2 |

NOTE:

- The tolerance limit for the dimensions (H & L1) will be ±5 mm.
- e = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- Other SDRs are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

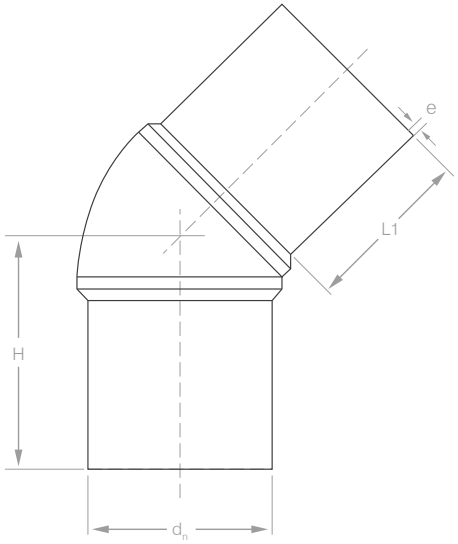
# Moulded Fittings

(Metric)

## 45°Elbow (ISO 4437 & BS EN 1555):

SD-PEM45E

| $d_n$ | D (Min - Max) | H | L1 | PE 100 Wall Thickness - e | | PE 80 Wall Thickness - e | |
|---|---|---|---|---|---|---|---|
| | | | | SDR 17 PN 6.25 | SDR 11 PN 10 | SDR 17 PN 5 | SDR 11 PN 8 |
| mm | mm | mm | mm | mm | mm | mm | mm |
| 20 | 20.0 - 20.3 | 40 | 55 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 25 | 25.0 - 25.3 | 45 | 60 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 32 | 32.0 - 32.3 | 50 | 64 | 2.3 - 2.7 | 3.0 - 3.5 | 2.3 - 2.7 | 3.0 - 3.5 |
| 40 | 40.0 - 40.4 | 59 | 71 | 2.4 - 2.8 | 3.7 - 4.2 | 2.4 - 2.8 | 3.7 - 4.2 |
| 50 | 50.0 - 50.4 | 60 | 74 | 3.0 - 3.5 | 4.6 - 5.2 | 3.0 - 3.5 | 4.6 - 5.2 |
| 63 | 63.0 - 63.4 | 90 | 65 | 3.8 - 4.3 | 5.8 - 6.5 | 3.8 - 4.3 | 5.8 - 6.5 |
| 75 | 75.0 - 75.5 | 103 | 75 | 4.5 - 5.1 | 6.8 - 7.6 | 4.5 - 5.1 | 6.8 - 7.6 |
| 90 | 90.0 - 90.6 | 112 | 80 | 5.4 - 6.1 | 8.2 - 9.2 | 5.4 - 6.1 | 8.2 - 9.2 |
| 110 | 110.0 - 110.7 | 125 | 88 | 6.6 - 7.4 | 10.0 - 11.1 | 6.6 - 7.4 | 10.0 - 11.1 |
| 125 | 125.0 - 125.8 | 140 | 95 | 7.4 - 8.3 | 11.4 - 12.7 | 7.4 - 8.3 | 11.4 - 12.7 |
| 160 | 160.0 - 161.0 | 160 | 110 | 9.5 - 10.6 | 14.6 - 16.2 | 9.5 - 10.6 | 14.6 - 16.2 |
| 180 | 180.0 - 181.1 | 180 | 115 | 10.7 - 11.9 | 16.4 - 18.2 | 10.7 - 11.9 | 16.4 - 18.2 |
| 200 | 200.0 - 201.2 | 200 | 125 | 11.9 - 13.2 | 18.2 - 20.2 | 11.9 - 13.2 | 18.2 - 20.2 |
| 225 | 225.0 - 226.4 | 215 | 135 | 13.4 - 14.9 | 20.5 - 22.7 | 13.4 - 14.9 | 20.5 - 22.7 |
| 250 | 250.0 - 251.5 | 230 | 140 | 14.8 - 16.4 | 22.7 - 25.1 | 14.8 - 16.4 | 22.7 - 25.1 |
| 280 | 280.0 - 281.7 | 185 | 119 | 16.6 - 18.4 | 25.4 - 28.1 | 16.6 - 18.4 | 25.4 - 28.1 |
| 315 | 315.0 - 316.9 | 195 | 110 | 18.7 - 20.7 | 28.6 - 31.6 | 18.7 - 20.7 | 28.6 - 31.6 |
| 355 | 355.0 - 357.2 | 265 | 165 | 21.1 - 23.4 | 32.2 - 35.6 | 21.1 - 23.4 | 32.2 - 35.6 |
| 400 | 400.0 - 402.4 | 260 | 150 | 23.7 - 26.2 | 36.3 - 40.1 | 23.7 - 26.2 | 36.3 - 40.1 |
| 450 | 450.0 - 452.7 | 280 | 160 | 26.7 - 29.5 | 40.9 - 45.1 | 26.7 - 29.5 | 40.9 - 45.1 |
| 500 | 500.0 - 503.0 | 320 | 180 | 29.7 - 32.8 | 45.4 - 50.1 | 29.7 - 32.8 | 45.4 - 50.1 |
| 560 | 560.0 - 563.4 | 265 | 100 | 33.2 - 36.7 | 50.9 - 56.1 | 33.2 - 36.7 | 50.9 - 56.1 |
| 630 | 630.0 - 633.8 | 280 | 100 | 37.4 - 41.3 | 57.3 - 63.2 | 37.4 - 41.3 | 57.3 - 63.2 |




45° Elbow

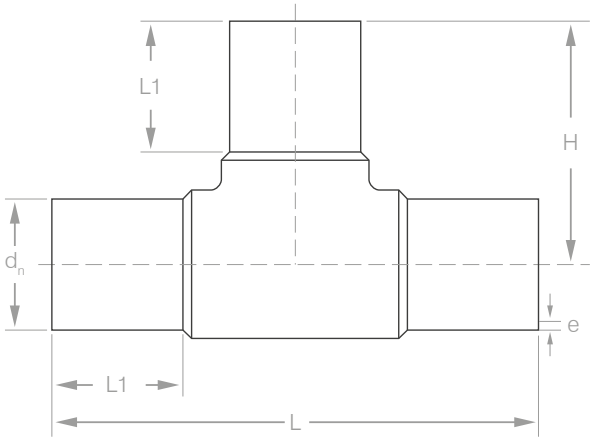
NOTE:

- The tolerance limit for the dimensions (H & L1) will be ±5 mm.
- e = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- Other SDRs are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

# Moulded Fittings

(Metric)

## Equal Tee (ISO 4437 & BS EN 1555):




Equal Tee

SD-PEMET

| $d_n$ | D (Min - Max) | H | L | L1 | PE 100 Wall Thickness - e | | PE 80 Wall Thickness - e | |
|---|---|---|---|---|---|---|---|---|
| | | | | | SDR 17 PN 6.25 | SDR 11 PN 10 | SDR 17 PN 5 | SDR 11 PN 8 |
| mm | mm | mm | mm | mm | mm | mm | mm | mm |
| 20 | 20.0 - 20.3 | 80 | 160 | 59 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 25 | 25.0 - 25.3 | 81 | 162 | 60 | - | 2.3 - 2.7 | - | 2.3 - 2.7 |
| 32 | 32.0 - 32.3 | 82 | 164 | 60 | 2.3 - 2.7 | 3.0 - 3.5 | 2.3 - 2.7 | 3.0 - 3.5 |
| 40 | 40.0 - 40.4 | 84 | 168 | 60 | 2.4 - 2.8 | 3.7 - 4.2 | 2.4 - 2.8 | 3.7 - 4.2 |
| 50 | 50.0 - 50.4 | 89 | 178 | 60 | 3.0 - 3.5 | 4.6 - 5.2 | 3.0 - 3.5 | 4.6 - 5.2 |
| 63 | 63.0 - 63.4 | 115 | 230 | 65 | 3.8 - 4.3 | 5.8 - 6.5 | 3.8 - 4.3 | 5.8 - 6.5 |
| 75 | 75.0 - 75.5 | 130 | 260 | 75 | 4.5 - 5.1 | 6.8 - 7.6 | 4.5 - 5.1 | 6.8 - 7.6 |
| 90 | 90.0 - 90.6 | 145 | 290 | 80 | 5.4 - 6.1 | 8.2 - 9.2 | 5.4 - 6.1 | 8.2 - 9.2 |
| 110 | 110.0 - 110.7 | 165 | 330 | 88 | 6.6 - 7.4 | 10.0 - 11.1 | 6.6 - 7.4 | 10.0 - 11.1 |
| 125 | 125.0 - 125.8 | 180 | 360 | 95 | 7.4 - 8.3 | 11.4 - 12.7 | 7.4 - 8.3 | 11.4 - 12.7 |
| 160 | 160.0 - 161.0 | 215 | 430 | 110 | 9.5 - 10.6 | 14.6 - 16.2 | 9.5 - 10.6 | 14.6 - 16.2 |
| 180 | 180.0 - 181.1 | 245 | 490 | 115 | 10.7 - 11.9 | 16.4 - 18.2 | 10.7 - 11.9 | 16.4 - 18.2 |
| 200 | 200.0 - 201.2 | 260 | 520 | 120 | 11.9 - 13.2 | 18.2 - 20.2 | 11.9 - 13.2 | 18.2 - 20.2 |
| 225 | 225.0 - 226.4 | 285 | 570 | 125 | 13.4 - 14.9 | 20.5 - 22.7 | 13.4 - 14.9 | 20.5 - 22.7 |
| 250 | 250.0 - 251.5 | 310 | 620 | 130 | 14.8 - 16.4 | 22.7 - 25.1 | 14.8 - 16.4 | 22.7 - 25.1 |
| 280 | 280.0 - 281.7 | 283 | 570 | 125 | 16.6 - 18.4 | 25.4 - 28.1 | 16.6 - 18.4 | 25.4 - 28.1 |
| 315 | 315.0 - 316.9 | 285 | 570 | 110 | 18.7 - 20.7 | 28.6 - 31.6 | 18.7 - 20.7 | 28.6 - 31.6 |
| 355 | 355.0 - 357.2 | 360 | 725 | 160 | 21.1 - 23.4 | 32.2 - 35.6 | 21.1 - 23.4 | 32.2 - 35.6 |
| 400 | 400.0 - 402.4 | 380 | 730 | 155 | 23.7 - 26.2 | 36.3 - 40.1 | 23.7 - 26.2 | 36.3 - 40.1 |
| 450 | 450.0 - 452.7 | 450 | 810 | 140 | 26.7 - 29.5 | 40.9 - 45.1 | 26.7 - 29.5 | 40.9 - 45.1 |
| 500 | 500.0 - 503.0 | 480 | 860 | 155 | 29.7 - 32.8 | 45.4 - 50.1 | 29.7 - 32.8 | 45.4 - 50.1 |
| 560 | 560.0 - 563.4 | 515 | 900 | 180 | 33.2 - 36.7 | 50.9 - 56.1 | 33.2 - 36.7 | 50.9 - 56.1 |
| 630 | 630.0 - 633.8 | 575 | 920 | 195 | 37.4 - 41.3 | 57.3 - 63.2 | 37.4 - 41.3 | 57.3 - 63.2 |

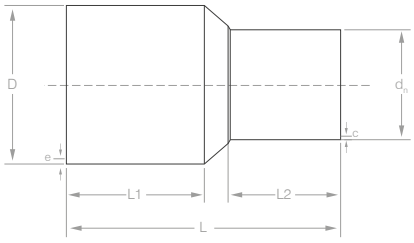
NOTE:

- The tolerance limit for the dimensions (L, H & L1) will be ±5 mm.
- e = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- Other SDRs are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

# Moulded Fittings

(Metric)

## Concentric Reducer (ISO 4437 & BS EN 1555):




Concentric Reducer

SD-PEMCR

| D x $d_n$ | D (Min - Max) | $d_n$ (Min - Max) | L | L1 | L2 | PE 100 SDR 17 PN 6.25 Wall Thickness | | PE 100 SDR 11 PN 10 Wall Thickness | | PE 80 SDR 17 PN 5 Wall Thickness | | PE 80 SDR 11 PN 8 Wall Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | e | c | e | c | e | c | e | c |
| mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm |
| 25 x 20 | 25.0 - 25.3 | 20.0 - 20.3 | 113 | 49 | 48 | - | - | 2.3 - 2.7 | 2.3 - 2.7 | - | - | 2.3 - 2.7 | 2.3 - 2.7 |
| 32 x 20 | 32.0 - 32.3 | 20.0 - 20.3 | 124 | 55 | 52 | - | - | 3.0 - 3.5 | 2.3 - 2.7 | - | - | 3.0 - 3.5 | 2.3 - 2.7 |
| 32 x 25 | 32.0 - 32.3 | 25.0 - 25.3 | 130 | 61 | 59 | - | - | 3.0 - 3.5 | 2.3 - 2.7 | - | - | 3.0 - 3.5 | 2.3 - 2.7 |
| 40 x 20 | 40.0 - 40.4 | 20.0 - 20.3 | 130 | 59 | 52 | - | - | 3.7 - 4.2 | 2.3 - 2.7 | - | - | 3.7 - 4.2 | 2.3 - 2.7 |
| 40 x 25 | 40.0 - 40.4 | 25.0 - 25.3 | 128 | 59 | 54 | - | - | 3.7 - 4.2 | 2.3 - 2.7 | - | - | 3.7 - 4.2 | 2.3 - 2.7 |
| 40 x 32 | 40.0 - 40.4 | 32.0 - 32.3 | 125 | 61 | 54 | 2.4 - 2.8 | 2.3 - 2.7 | 3.7 - 4.2 | 3.0 - 3.5 | 2.4 - 2.8 | 2.3 - 2.7 | 3.7 - 4.2 | 3.0 - 3.5 |
| 50 x 25 | 50.0 - 50.4 | 25.0 - 25.3 | 135 | 60 | 50 | - | - | 4.6 - 5.2 | 2.3 - 2.7 | - | - | 4.6 - 5.2 | 2.3 - 2.7 |
| 50 x 32 | 50.0 - 50.4 | 32.0 - 32.3 | 134 | 60 | 47 | 3.0 - 3.5 | 2.3 - 2.7 | 4.6 - 5.2 | 3.0 - 3.5 | 3.0 - 3.5 | 2.3 - 2.7 | 4.6 - 5.2 | 3.0 - 3.5 |
| 50 x 40 | 50.0 - 50.4 | 40.0 - 40.4 | 134 | 60 | 62 | 3.0 - 3.5 | 2.4 - 2.8 | 4.6 - 5.2 | 3.7 - 4.2 | 3.0 - 3.5 | 2.4 - 2.8 | 4.6 - 5.2 | 3.7 - 4.2 |
| 63 x 25 | 63.0 - 63.4 | 25.0 - 25.3 | 140 | 64 | 57 | - | - | 5.8 - 6.5 | 2.3 - 2.7 | - | - | 5.8 - 6.5 | 2.3 - 2.7 |
| 63 x 32 | 63.0 - 63.4 | 32.0 - 32.3 | 143 | 64 | 63 | 3.8 - 4.3 | 2.3 - 2.7 | 5.8 - 6.5 | 3.0 - 3.5 | 3.8 - 4.3 | 2.3 - 2.7 | 5.8 - 6.5 | 3.0 - 3.5 |
| 63 x 40 | 63.0 - 63.4 | 40.0 - 40.4 | 139 | 68 | 52 | 3.8 - 4.3 | 2.4 - 2.8 | 5.8 - 6.5 | 3.7 - 4.2 | 3.8 - 4.3 | 2.4 - 2.8 | 5.8 - 6.5 | 3.7 - 4.2 |
| 63 x 50 | 63.0 - 63.4 | 50.0 - 50.4 | 132 | 63 | 57 | 3.8 - 4.3 | 3.0 - 3.5 | 5.8 - 6.5 | 4.6 - 5.2 | 3.8 - 4.3 | 3.0 - 3.5 | 5.8 - 6.5 | 4.6 - 5.2 |
| 75 x 40 | 75.0 - 70.5 | 40.0 - 40.4 | 147 | 72 | 60 | 4.5 - 5.1 | 2.4 - 2.8 | 6.8 - 7.6 | 3.7 - 4.2 | 4.5 - 5.1 | 2.4 - 2.8 | 6.8 - 7.6 | 3.7 - 4.2 |
| 75 x 50 | 75.0 - 70.5 | 50.0 - 50.4 | 153 | 72 | 59 | 4.5 - 5.1 | 3.0 - 3.5 | 6.8 - 7.6 | 4.6 - 5.2 | 4.5 - 5.1 | 3.0 - 3.5 | 6.8 - 7.6 | 4.6 - 5.2 |
| 75 x 63 | 75.0 - 75.5 | 63.0 - 63.4 | 160 | 75 | 65 | 4.5 - 5.1 | 3.8 - 4.3 | 6.8 - 7.6 | 5.8 - 6.5 | 4.5 - 5.1 | 3.8 - 4.3 | 6.8 - 7.6 | 5.8 - 6.5 |
| 90 x 63 | 90.0 - 90.6 | 63.0 - 63.4 | 170 | 80 | 65 | 5.4 - 6.1 | 3.8 - 4.3 | 8.2 - 9.2 | 5.8 - 6.5 | 5.4 - 6.1 | 3.8 - 4.3 | 8.2 - 9.2 | 5.8 - 6.5 |
| 90 x 75 | 90.0 - 90.6 | 75.0 - 75.5 | 170 | 80 | 75 | 5.4 - 6.1 | 4.5 - 5.1 | 8.2 - 9.2 | 6.8 - 7.6 | 5.4 - 6.1 | 4.5 - 5.1 | 8.2 - 9.2 | 6.8 - 7.6 |
| 110 x 63 | 110.0 - 110.7 | 63.0 - 63.4 | 185 | 88 | 65 | 6.6 - 7.4 | 3.8 - 4.3 | 10.0 - 11.1 | 5.8 - 6.5 | 6.6 - 7.4 | 3.8 - 4.3 | 10.0 - 11.1 | 5.8 - 6.5 |
| 110 x 75 | 110.0 - 110.7 | 75.0 - 75.5 | 185 | 88 | 75 | 6.6 - 7.4 | 4.5 - 5.1 | 10.0 - 11.1 | 6.8 - 7.6 | 6.6 - 7.4 | 4.5 - 5.1 | 10.0 - 11.1 | 6.8 - 7.6 |
| 110 x 90 | 110.0 - 110.7 | 90.0 - 90.6 | 185 | 88 | 80 | 6.6 - 7.4 | 5.4 - 6.1 | 10.0 - 11.1 | 8.2 - 9.2 | 6.6 - 7.4 | 5.4 - 6.1 | 10.0 - 11.1 | 8.2 - 9.2 |
| 125 x 75 | 125.0 - 125.8 | 75.0 - 75.5 | 200 | 95 | 75 | 7.4 - 8.3 | 4.5 - 5.1 | 11.4 - 12.7 | 6.8 - 7.6 | 7.4 - 8.3 | 4.5 - 5.1 | 11.4 - 12.7 | 6.8 - 7.6 |
| 125 x 90 | 125.0 - 125.8 | 90.0 - 90.6 | 200 | 95 | 80 | 7.4 - 8.3 | 5.4 - 6.1 | 11.4 - 12.7 | 8.2 - 9.2 | 7.4 - 8.3 | 5.4 - 6.1 | 11.4 - 12.7 | 8.2 - 9.2 |
| 125 x 110 | 125.0 - 125.8 | 110.0 - 110.7 | 200 | 95 | 85 | 7.4 - 8.3 | 6.6 - 7.4 | 11.4 - 12.7 | 10.0 - 11.1 | 7.4 - 8.3 | 6.6 - 7.4 | 11.4 - 12.7 | 10.0 - 11.1 |
| 160 x 110 | 160.0 - 161.0 | 110.0 - 110.7 | 230 | 110 | 90 | 9.5 - 10.6 | 6.6 - 7.4 | 14.6 - 16.2 | 10.0 - 11.1 | 9.5 - 10.6 | 6.6 - 7.4 | 14.6 - 16.2 | 10.0 - 11.1 |
| 160 x 125 | 160.0 - 161.0 | 125.0 - 125.8 | 230 | 110 | 95 | 9.5 - 10.6 | 7.4 - 8.3 | 14.6 - 16.2 | 11.4 - 12.7 | 9.5 - 10.6 | 7.4 - 8.3 | 14.6 - 16.2 | 11.4 - 12.7 |
| 180 x 110 | 180.0 - 181.1 | 110.0 - 110.7 | 250 | 110 | 90 | 10.7 - 11.9 | 6.6 - 7.4 | 16.4 - 18.2 | 10.0 - 11.1 | 10.7 - 11.9 | 6.6 - 7.4 | 16.4 - 18.2 | 10.0 - 11.1 |
| 180 x 125 | 180.0 - 181.1 | 125.0 - 125.8 | 250 | 115 | 95 | 10.7 - 11.9 | 7.4 - 8.3 | 16.4 - 18.2 | 11.4 - 12.7 | 10.7 - 11.9 | 7.4 - 8.3 | 16.4 - 18.2 | 11.4 - 12.7 |
| 180 x 160 | 180.0 - 181.1 | 160.0 - 161.0 | 250 | 115 | 110 | 10.7 - 11.9 | 9.5 - 10.6 | 16.4 - 18.2 | 14.6 - 16.2 | 10.7 - 11.9 | 9.5 - 10.6 | 16.4 - 18.2 | 14.6 - 16.2 |
| 200 x 125 | 200.0 - 201.2 | 125.0 - 125.8 | 270 | 120 | 95 | 11.9 - 13.2 | 7.4 - 8.3 | 18.2 - 20.2 | 11.4 - 12.7 | 11.9 - 13.2 | 7.4 - 8.3 | 18.2 - 20.2 | 11.4 - 12.7 |
| 200 x 160 | 200.0 - 201.2 | 160.0 - 161.0 | 270 | 120 | 110 | 11.9 - 13.2 | 9.5 - 10.6 | 18.2 - 20.2 | 14.6 - 16.2 | 11.9 - 13.2 | 9.5 - 10.6 | 18.2 - 20.2 | 14.6 - 16.2 |
| 200 x 180 | 200.0 - 201.2 | 180.0 - 181.1 | 270 | 120 | 115 | 11.9 - 13.2 | 10.7 - 11.9 | 18.2 - 20.2 | 16.4 - 18.2 | 11.9 - 13.2 | 10.7 - 11.9 | 18.2 - 20.2 | 16.4 - 18.2 |
| 225 x 160 | 225.0 - 226.4 | 160.0 - 161.0 | 280 | 125 | 110 | 13.4 - 14.9 | 9.5 - 10.6 | 20.5 - 22.7 | 14.6 - 16.2 | 13.4 - 14.9 | 9.5 - 10.6 | 20.5 - 22.7 | 14.6 - 16.2 |
| 225 x 180 | 225.0 - 226.4 | 180.0 - 181.1 | 280 | 125 | 115 | 13.4 - 14.9 | 10.7 - 11.9 | 20.5 - 22.7 | 16.4 - 18.2 | 13.4 - 14.9 | 10.7 - 11.9 | 20.5 - 22.7 | 16.4 - 18.2 |
| 225 x 200 | 225.0 - 226.4 | 200.0 - 201.2 | 280 | 125 | 120 | 13.4 - 14.9 | 11.9 - 13.2 | 20.5 - 22.7 | 18.2 - 20.2 | 13.4 - 14.9 | 11.9 - 13.2 | 20.5 - 22.7 | 18.2 - 20.2 |
| 250 x 160 | 250.0 - 251.5 | 160.0 - 161.0 | 300 | 130 | 110 | 14.8 - 16.4 | 9.5 - 10.6 | 22.7 - 25.1 | 14.6 - 16.2 | 14.8 - 16.4 | 9.5 - 10.6 | 22.7 - 25.1 | 14.6 - 16.2 |
| 250 x 180 | 250.0 - 251.5 | 180.0 - 181.1 | 300 | 130 | 115 | 14.8 - 16.4 | 10.7 - 11.9 | 22.7 - 25.1 | 16.4 - 18.2 | 14.8 - 16.4 | 10.7 - 11.9 | 22.7 - 25.1 | 16.4 - 18.2 |
| 250 x 200 | 250.0 - 251.5 | 200.0 - 201.2 | 300 | 130 | 120 | 14.8 - 16.4 | 11.9 - 13.2 | 22.7 - 25.1 | 18.2 - 20.2 | 14.8 - 16.4 | 11.9 - 13.2 | 22.7 - 25.1 | 18.2 - 20.2 |
| 250 x 225 | 250.0 - 251.5 | 225.0 - 226.4 | 300 | 130 | 125 | 14.8 - 16.4 | 13.4 - 14.9 | 22.7 - 25.1 | 20.5 - 22.7 | 14.8 - 16.4 | 13.4 - 14.9 | 22.7 - 25.1 | 20.5 - 22.7 |

NOTE:

- The tolerance limit for the dimensions (L, L1 & L2) will be ±5 mm.
- e & c = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- Other SDRs are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

# Moulded Fittings

(Metric)

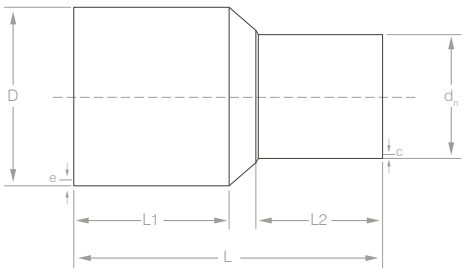
## Concentric Reducer (ISO 4437 & BS EN 1555):

SD-PEMCR

| D x $d_n$ | D (Min - Max) | $d_n$ (Min - Max) | L | L1 | L2 | PE 100 SDR 17 PN 6.25 Wall Thickness | | PE 100 SDR 11 PN 10 Wall Thickness | | PE 80 SDR 17 PN 5 Wall Thickness | | PE 80 SDR 11 PN 8 Wall Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | e | c | e | c | e | c | e | c |
| mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm |
| 280 x 200 | 280.0 - 281.7 | 200.0 - 201.2 | 320 | 150 | 150 | 16.6 - 18.4 | 11.9 - 13.2 | 25.4 - 28.1 | 18.2 - 20.2 | 16.6 - 18.4 | 11.9 - 13.2 | 25.4 - 28.1 | 18.2 - 20.2 |
| 280 x 225 | 280.0 - 281.7 | 225.0 - 226.4 | 320 | 150 | 150 | 16.6 - 18.4 | 13.4 - 14.9 | 25.4 - 28.1 | 20.5 - 22.7 | 16.6 - 18.4 | 13.4 - 14.9 | 25.4 - 28.1 | 20.5 - 22.7 |
| 280 x 250 | 280.0 - 281.7 | 250.0 - 251.5 | 320 | 150 | 150 | 16.6 - 18.4 | 14.8 - 16.4 | 25.4 - 28.1 | 22.7 - 25.1 | 16.6 - 18.4 | 14.8 - 16.4 | 25.4 - 28.1 | 22.7 - 25.1 |
| 315 x 200 | 315.0 - 316.9 | 200.0 - 201.2 | 350 | 150 | 150 | 18.7 - 20.7 | 11.9 - 13.2 | 28.6 - 31.6 | 18.2 - 20.2 | 18.7 - 20.7 | 11.9 - 13.2 | 28.6 - 31.6 | 18.2 - 20.2 |
| 315 x 225 | 315.0 - 316.9 | 225.0 - 226.4 | 350 | 150 | 150 | 18.7 - 20.7 | 13.4 - 14.9 | 28.6 - 31.6 | 20.5 - 22.7 | 18.7 - 20.7 | 13.4 - 14.9 | 28.6 - 31.6 | 20.5 - 22.7 |
| 315 x 250 | 315.0 - 316.9 | 250.0 - 251.5 | 350 | 150 | 150 | 18.7 - 20.7 | 14.8 - 16.4 | 28.6 - 31.6 | 22.7 - 25.1 | 18.7 - 20.7 | 14.8 - 16.4 | 28.6 - 31.6 | 22.7 - 25.1 |
| 315 x 280 | 315.0 - 316.9 | 280.0 - 281.7 | 350 | 150 | 150 | 18.7 - 20.7 | 16.6 - 18.4 | 28.6 - 31.6 | 25.4 - 28.1 | 18.7 - 20.7 | 16.6 - 18.4 | 28.6 - 31.6 | 25.4 - 28.1 |
| 355 x 200 | 355.0 - 357.2 | 200.0 - 201.2 | 350 | 150 | 150 | 21.1 - 23.4 | 11.9 - 13.2 | 32.2 - 35.6 | 18.2 - 20.2 | 21.1 - 23.4 | 11.9 - 13.2 | 32.2 - 35.6 | 18.2 - 20.2 |
| 355 x 225 | 355.0 - 357.2 | 200.0 - 201.2 | 350 | 150 | 150 | 21.1 - 23.4 | 13.4 - 14.9 | 32.2 - 35.6 | 20.5 - 22.7 | 21.1 - 23.4 | 13.4 - 14.9 | 32.2 - 35.6 | 20.5 - 22.7 |
| 355 x 280 | 355.0 - 357.2 | 280.0 - 281.7 | 350 | 150 | 150 | 21.1 - 23.4 | 16.6 - 18.4 | 32.2 - 35.6 | 25.4 - 28.1 | 21.1 - 23.4 | 16.6 - 18.4 | 32.2 - 35.6 | 25.4 - 28.1 |
| 355 x 315 | 355.0 - 357.2 | 315.0 - 316.9 | 350 | 150 | 150 | 21.1 - 23.4 | 18.7 - 20.7 | 32.2 - 35.6 | 28.6 - 31.6 | 21.1 - 23.4 | 18.7 - 20.7 | 32.2 - 35.6 | 28.6 - 31.6 |
| 400 x 280 | 400.0 - 402.4 | 280.0 - 281.7 | 400 | 160 | 160 | 23.7 - 26.2 | 16.6 - 18.4 | 36.4 - 40.2 | 25.4 - 28.1 | 23.7 - 26.2 | 16.6 - 18.4 | 36.4 - 40.2 | 25.4 - 28.1 |
| 400 x 315 | 400.0 - 402.4 | 315.0 - 316.9 | 400 | 160 | 160 | 23.7 - 26.2 | 18.7 - 20.7 | 36.4 - 40.2 | 28.6 - 31.6 | 23.7 - 26.2 | 18.7 - 20.7 | 36.4 - 40.2 | 28.6 - 31.6 |
| 400 x 355 | 400.0 - 402.4 | 355.0 - 357.2 | 400 | 160 | 160 | 23.7 - 26.2 | 21.1 - 23.4 | 36.4 - 40.2 | 32.2 - 35.6 | 23.7 - 26.2 | 21.1 - 23.4 | 36.4 - 40.2 | 32.2 - 35.6 |
| 450 x 315 | 450.0 - 452.7 | 315.0 - 316.9 | 400 | 180 | 180 | 26.7 - 29.5 | 18.7 - 20.7 | 40.9 - 45.1 | 28.6 - 31.6 | 26.7 - 29.5 | 18.7 - 20.7 | 40.9 - 45.1 | 28.6 - 31.6 |
| 450 x 355 | 450.0 - 452.7 | 355.0 - 357.2 | 400 | 180 | 180 | 26.7 - 29.5 | 21.1 - 23.4 | 40.9 - 45.1 | 32.2 - 35.6 | 26.7 - 29.5 | 21.1 - 23.4 | 40.9 - 45.1 | 32.2 - 35.6 |
| 450 x 400 | 450.0 - 452.7 | 400.0 - 402.4 | 400 | 180 | 180 | 26.7 - 29.5 | 23.7 - 26.2 | 40.9 - 45.1 | 36.4 - 40.2 | 26.7 - 29.5 | 23.7 - 26.2 | 40.9 - 45.1 | 36.4 - 40.2 |
| 500 x 355 | 500.0 - 503.0 | 355.0 - 357.2 | 450 | 200 | 200 | 29.7 - 32.8 | 21.1 - 23.4 | 45.5 - 50.2 | 32.2 - 35.6 | 29.7 - 32.8 | 21.1 - 23.4 | 45.5 - 50.2 | 32.2 - 35.6 |
| 500 x 400 | 500.0 - 503.0 | 400.0 - 402.4 | 450 | 200 | 200 | 29.7 - 32.8 | 23.7 - 26.2 | 45.5 - 50.2 | 36.4 - 40.2 | 29.7 - 32.8 | 23.7 - 26.2 | 45.5 - 50.2 | 36.4 - 40.2 |
| 500 x 450 | 500.0 - 503.0 | 450.0 - 452.7 | 450 | 200 | 200 | 29.7 - 32.8 | 26.7 - 29.5 | 45.5 - 50.2 | 40.9 - 45.1 | 29.7 - 32.8 | 26.7 - 29.5 | 45.5 - 50.2 | 40.9 - 45.1 |
| 560 x 400 | 560.0 - 563.4 | 400.0 - 402.4 | 72 | 37 | 187 | 33.2 - 36.7 | 23.7 - 26.2 | 50.9 - 56.1 | 36.3 - 40.1 | 33.2 - 36.7 | 23.7 - 26.2 | 50.9 - 56.1 | 36.3 - 40.1 |
| 560 x 450 | 560.0 - 563.4 | 450.0 - 452.7 | 71 | 36 | 163 | 33.2 - 36.7 | 26.7 - 29.5 | 50.9 - 56.1 | 40.9 - 45.1 | 33.2 - 36.7 | 26.7 - 29.5 | 50.9 - 56.1 | 40.9 - 45.1 |
| 560 x 500 | 560.0 - 563.4 | 500.0 - 503.0 | 71 | 42 | 163 | 33.2 - 36.7 | 29.7 - 32.8 | 50.9 - 56.1 | 45.5 - 50.2 | 33.2 - 36.7 | 29.7 - 32.8 | 50.9 - 56.1 | 45.5 - 50.2 |
| 630 x 450 | 630.0 - 633.8 | 450.0 - 452.7 | 72 | 43 | 200 | 37.4 - 41.3 | 26.7 - 29.5 | 57.3 - 63.2 | 40.9 - 45.1 | 37.4 - 41.3 | 26.7 - 29.5 | 57.3 - 63.2 | 40.9 - 45.1 |
| 630 x 500 | 630.0 - 633.8 | 500.0 - 503.0 | 70 | 68 | 200 | 37.4 - 41.3 | 29.7 - 32.8 | 57.3 - 63.2 | 45.4 - 50.1 | 37.4 - 41.3 | 29.7 - 32.8 | 57.3 - 63.2 | 45.4 - 50.1 |
| 630 x 560 | 630.0 - 633.8 | 560.0 - 563.4 | 66 | 96 | 200 | 37.4 - 41.3 | 33.2 - 36.7 | 57.3 - 63.2 | 50.9 - 56.1 | 37.4 - 41.3 | 33.2 - 36.7 | 57.3 - 63.2 | 50.9 - 56.1 |

NOTE:

- The tolerance limit for the dimensions (L, L1 & L2) will be ±5 mm.
- e & c = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- Other SDRs and sizes are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

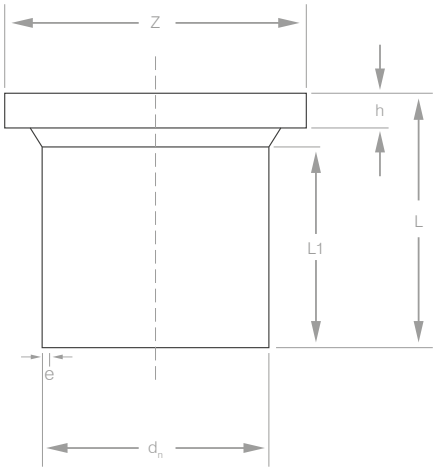



Concentric Reducer

# Moulded Fittings

(Metric)

## Stub Flange (ISO 4437 & BS EN 1555):




Stub Flange

SD-PEMSF

| $d_n$ | D (Min - Max) | Z | L | L1 | PE 100 SDR 17 PN 6.25 Wall Thickness | | PE 100 SDR 11 PN 10 Wall Thickness | | PE 80 SDR 17 PN 5 Wall Thickness | | PE 80 SDR 11 PN 8 Wall Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | h | e | h | e | h | e | h | e |
| mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm |
| 20 | 20.0 - 20.3 | 45 | 67 | 60 | - | - | 7 | 2.3 - 2.7 | - | - | 7 | 2.3 - 2.7 |
| 25 | 25.0 - 25.3 | 58 | 75 | 65 | - | - | 9 | 2.3 - 2.7 | - | - | 9 | 2.3 - 2.7 |
| 32 | 32.0 - 32.3 | 68 | 94 | 83 | - | - | 10 | 3.0 - 3.5 | - | - | 10 | 3.0 - 3.5 |
| 40 | 40.0 - 40.4 | 78 | 96 | 84 | - | - | 11 | 3.7 - 4.2 | - | - | 11 | 3.7 - 4.2 |
| 50 | 50.0 - 50.4 | 88 | 98 | 85 | - | - | 12 | 4.6 - 5.2 | - | - | 12 | 4.6 - 5.2 |
| 63 | 63.0 - 63.4 | 102 | 100 | 70 | - | - | 14 | 5.8 - 6.5 | - | - | 14 | 5.8 - 6.5 |
| 75 | 75.0 - 75.5 | 122 | 110 | 75 | - | - | 16 | 6.8 - 7.6 | - | - | 16 | 6.8 - 7.6 |
| 90 | 90.0 - 90.6 | 138 | 125 | 85 | 17 | 5.4 - 6.1 | 17 | 8.2 - 9.2 | 17 | 5.4 - 6.1 | 17 | 8.2 - 9.2 |
| 110 | 110.0 - 110.7 | 158 | 130 | 90 | 18 | 6.6 - 7.4 | 18 | 10.0 - 11.1 | 18 | 6.6 - 7.4 | 18 | 10.0 - 11.1 |
| 125 | 125.0 - 125.8 | 158 | 135 | 95 | 25 | 7.4 - 8.3 | 25 | 11.4 - 12.7 | 25 | 7.4 - 8.3 | 25 | 11.4 - 12.7 |
| 160 | 160.0 - 161.0 | 212 | 175 | 120 | 25 | 9.5 - 10.6 | 25 | 14.6 - 16.2 | 25 | 9.5 - 10.6 | 25 | 14.6 - 16.2 |
| 180 | 180.0 - 181.1 | 212 | 180 | 125 | 30 | 10.7 - 11.9 | 30 | 16.4 - 18.2 | 30 | 10.7 - 11.9 | 30 | 16.4 - 18.2 |
| 200 | 200.0 - 201.2 | 268 | 190 | 130 | 32 | 11.9 - 13.2 | 32 | 18.2 - 20.2 | 32 | 11.9 - 13.2 | 32 | 18.2 - 20.2 |
| 225 | 225.0 - 226.4 | 268 | 200 | 140 | 32 | 13.4 - 14.9 | 32 | 20.5 - 22.7 | 32 | 13.4 - 14.9 | 32 | 20.5 - 22.7 |
| 250 | 250.0 - 251.5 | 320 | 210 | 150 | 35 | 14.8 - 16.4 | 35 | 22.7 - 25.1 | 35 | 14.8 - 16.4 | 35 | 22.7 - 25.1 |
| 280 | 280.0 - 281.7 | 320 | 175 | 145 | 39 | 16.6 - 18.4 | 36 | 25.4 - 28.1 | 39 | 16.6 - 18.4 | 36 | 25.4 - 28.1 |
| 315 | 315.0 - 316.9 | 370 | 175 | 142 | 38 | 18.7 - 20.7 | 38 | 28.6 - 31.6 | 38 | 18.7 - 20.7 | 38 | 28.6 - 31.6 |
| 355 | 355.0 - 357.2 | 430 | 185 | 150 | 42 | 21.1 - 23.4 | 42 | 32.2 - 35.6 | 42 | 21.1 - 23.4 | 42 | 32.2 - 35.6 |
| 400 | 400.0 - 402.4 | 482 | 215 | 175 | 48 | 23.7 - 26.2 | 48 | 36.3 - 40.1 | 48 | 23.7 - 26.2 | 48 | 36.3 - 40.1 |
| 450 | 450.0 - 452.7 | 585 | 220 | 175 | 50 | 26.7 - 29.5 | 50 | 40.9 - 45.1 | 50 | 26.7 - 29.5 | 50 | 40.9 - 45.1 |
| 500 | 500.0 - 503.0 | 585 | 230 | 185 | 50 | 29.7 - 32.8 | 50 | 45.4 - 50.1 | 50 | 29.7 - 32.8 | 50 | 45.4 - 50.1 |
| 560 | 560.0 - 563.4 | 685 | 305 | 205 | 50 | 33.2 - 36.7 | 50 | 50.9 - 56.1 | 50 | 33.2 - 36.7 | 50 | 50.9 - 56.1 |
| 630 | 630.0 - 633.8 | 685 | 330 | 255 | 55 | 37.4 - 41.3 | 55 | 57.3 - 63.2 | 55 | 37.4 - 41.3 | 55 | 57.3 - 63.2 |

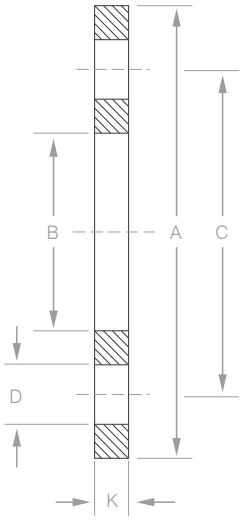
NOTE:

- The tolerance limit for the dimensions (Z, L, L1 & h) will be ±5 mm.
- e = Thickness at the end.
- Fittings for gas application in Orange (PE100), Black (PE100) & Yellow (PE80) colours are available.
- This product "Stub Flange" for gas application is usually used with SS flange EN 1092-1 (ANSI/ASME B16.5 can also be supplied upon request) and NBR rubber gasket.
- Other SDRs and sizes are also available upon request.
- All dimensions for BS EN 1555 are same as ISO 4437 except for 20 & 25 mm (min 3mm Wall Thickness for SDR 11).

# Fittings Accessories

## Stainless Steel Backing Ring (BS 4504/EN 1092-1):

(for PE Stub Flange Adaptor)




SS Backing Ring

SD-SSBKR (as per BS 4504/EN 1092-1)

| PE Pipe Size | | $d_n$ | Outer Diameter | Internal Diameter | PCD | Hole Diameter | No. of Holes | Thickness |
|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | | K |
| mm | Inch | mm | mm | mm | mm | mm | mm | mm |
| 20 | ¼ | 15 | 95 | 28 | 65 | 14 | 4 | 14 |
| 25 | ½ | 20 | 105 | 34 | 75 | 14 | 4 | 16 |
| 32 | 1 | 25 | 115 | 42 | 85 | 14 | 4 | 18 |
| 40 | 1¼ | 32 | 140 | 51 | 100 | 18 | 4 | 18 |
| 50 | 1½ | 40 | 150 | 63 | 110 | 18 | 4 | 18 |
| 63 | 2 | 50 | 165 | 79 | 125 | 18 | 4 | 19 |
| 75 | 2½ | 65 | 185 | 93 | 145 | 18 | 8 | 20 |
| 90 | 3 | 80 | 200 | 110 | 160 | 18 | 8 | 20 |
| 110 | 4 | 100 | 220 | 128 | 180 | 18 | 8 | 22 |
| 125 | - | 125 | 250 | 135 | 210 | 18 | 8 | 22 |
| 160 | 6 | 150 | 285 | 178 | 240 | 22 | 8 | 24 |
| 180 | - | 150 | 285 | 188 | 240 | 22 | 8 | 24 |
| 200 | 8 | 200 | 340 | 236 | 295 | 22 | 12 | 26 |
| 225 | - | 200 | 340 | 238 | 295 | 22 | 12 | 26 |
| 250 | 10 | 250 | 405 | 290 | 355 | 26 | 12 | 29 |
| 280 | - | 250 | 405 | 294 | 355 | 26 | 12 | 29 |
| 315 | 12 | 300 | 460 | 338 | 410 | 26 | 12 | 32 |
| 355 | 14 | 350 | 520 | 376 | 470 | 26 | 16 | 35 |
| 400 | 16 | 400 | 580 | 430 | 525 | 30 | 16 | 38 |
| 450 | 18 | 450 | 640 | 518 | 585 | 30 | 20 | 42 |
| 500 | 20 | 500 | 715 | 535 | 650 | 33 | 20 | 46 |
| 560 | 22 | 560 | 840 | 618 | 770 | 36 | 20 | 46 |
| 630 | 24 | 630 | 840 | 645 | 770 | 36 | 20 | 48 |

NOTE:

- SS Backing Ring is available in ANSI/ASME B16.5 Class 150.
- Backing Rings have been modified as per the requirements of HDPE & MDPE sizes.
- G.I. and PP/Steel are also available upon request.

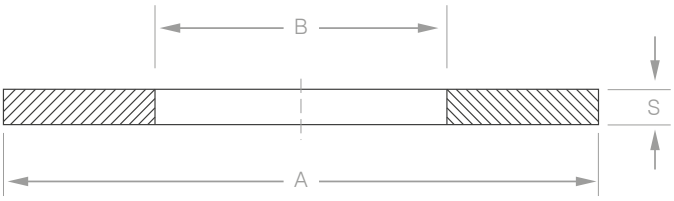
# Fittings Accessories

## NBR - Gasket:

(for PE Stub Flange Adaptor - Gas application)

SD-NBRGKT

| $d_n$ mm | Ø mm | A mm | B mm | S mm |
|---|---|---|---|---|
| 15 | 20 | 45 | 18 | 3 |
| 20 | 25 | 58 | 24 | 3 |
| 25 | 32 | 68 | 28 | 3 |
| 32 | 40 | 78 | 36 | 3 |
| 40 | 50 | 88 | 44 | 3 |
| 50 | 63 | 102 | 54 | 3 |
| 65 | 75 | 122 | 53 | 3 |
| 80 | 90 | 138 | 76 | 3 |
| 100 | 110 | 158 | 92 | 3 |
| 100 | 125 | 158 | 104 | 3 |
| 125 | 140 | 188 | 116 | 3 |
| 150 | 160 | 212 | 134 | 3 |
| 150 | 180 | 212 | 150 | 3 |
| 200 | 200 | 268 | 166 | 3 |
| 200 | 225 | 268 | 188 | 3 |
| 250 | 250 | 320 | 207 | 3 |
| 250 | 280 | 320 | 233 | 3 |
| 300 | 315 | 370 | 260 | 3 |
| 350 | 355 | 430 | 294 | 3 |
| 400 | 400 | 482 | 330 | 4 |
| 450 | 450 | 535 | 372 | 4 |
| 500 | 450 | 585 | 372 | 4 |
| 500 | 500 | 585 | 446 | 4 |
| 600 | 560 | 685 | 500 | 4 |
| 600 | 630 | 685 | 562 | 4 |




NBR - Gasket

NOTE:

- NBR Gasket have been modified as per the requirements of HDPE & MDPE sizes.
- Full face gasket also available upon request.

SHIELD™
Trusted Worldwide

# Electro
## Fusion fittings

SHIELD also supplies state-of-the-art electrofusion fittings for various applications.

NOTE: Please contact us for more information.

# Electro-Fusion Fittings

| Product Image | S.No | Description | Size Range | Available |
|---|---|---|---|---|
|  | 1 | Couplers | 20 mm - 400 mm | PE 100 Black |
|  | 2 | 90° Elbows | 20 mm - 200 mm | PE 100 Black |
|  | 3 | 45° Elbows | 20 mm - 200 mm | PE 100 Black |
|  | 4 | Tees | 20 mm - 200 mm | PE 100 Black |
|  | 5 | Reducers | 20 mm - 200 mm | PE 100 Black |
|  | 6 | 20/32/40/50/63mm Top Loading Branch Saddle | 40 mm - 250 mm | PE 100 Black |
|  | 7 | 20/32/40/50/63mm Top Loading Tapping Tees | 40 mm - 250 mm | PE 100 Black |
|  | 8 | Under Clamping Tapping Tees - Monobloc version | 40 mm - 110 mm | PE 100 Black |
|  | 9 | Branch Saddle - Monobloc version | 40 mm - 110 mm | PE 100 Black |
|  | 10 | End Cap | 20 mm - 180 mm | PE 100 Black |
|  | 11 | Male Transition Socket | 20 mm - 110 mm | PE 100 Black |
|  | 12 | Female Transition Socket | 20 mm - 110 mm | PE 100 Black |

# Electro-Fusion Fittings

| Product Image | S.No | Description | Size Range | Available |
|---|---|---|---|---|
|  | 13 | Transition Adaptor, PE / Brass, Male BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 14 | Transition Adaptor, PE / Brass, Female BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 15 | 90° Transition Elbow, PE / Brass, Male BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 16 | 90° Transition Elbow, PE / Brass, Female BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 17 | 45° Transition Elbow, PE / Brass, Male BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 18 | 45° Transition Elbow, PE / Brass, Female BSP Taper | 20 mm - 110 mm | PE 100 Black |
|  | 19 | Transition Socket, PE / Brass - Free Nut | 20 mm - 63 mm | PE 100 Black |
|  | 20 | 90° Transition Elbow, PE / Brass - Free Nut | 20 mm - 63 mm | PE 100 Black |
|  | 21 | 45° Transition Elbow, PE / Brass - Free Nut | 32 mm - 63 mm | PE 100 Black |
|  | 22 | Transition Spigot Saddle, PE / Brass | 110 mm - 160 mm | PE 100 Black |
|  | 23 | Spigot Saddle , PE / Brass - Shut-off Equipment | 110 mm - 160 mm | PE 100 Black |

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Trusted Worldwide

# PE Installation Manual

Note: The given SHIELD PE installation manual is a general practice guide for the installation of PE pipes & fittings under normal site conditions. It may vary & require modified approach, please refer to consultant approval and project specifications.

# Installation Manual

## Jointing Methods:

Safety considerations are very important when jointing the polyethylene piping material, but they are not a part of this document; the user of this jointing information must consult and follow the appropriate safety instructions, please refer to the Health and Safety section.

| For permanent Joints (FUSION) | For Mobile (detachable) Joints (MECHANICAL) |
|---|---|
| Electro-Fusion welding | Flanged Joints |
| Butt-Fusion Welding | - |

*No chain is stronger than its weakest link is a common saying which can also be applied to the piping system joints.*

The main requirements to be fulfilled are hydraulic tightness as well as the structural stability of the system. An integral part of any piping system is the method used to joint the system components. Proper engineering design of a system will take into consideration along with the type and effectiveness of techniques used to joint the piping components and appurtenances as well as the durability of the resulting Joints.

The integrity and versatility of the jointing techniques used for polyethylene pipe allow the designer to take advantage of the performance benefits in a variety of applications.

PE pipe and fitting can be assembled into a pipeline network using fusion or mechanical assembly techniques depending on the project requirements.

Wide range of fittings is available to cater design flexibility for PE piping system.

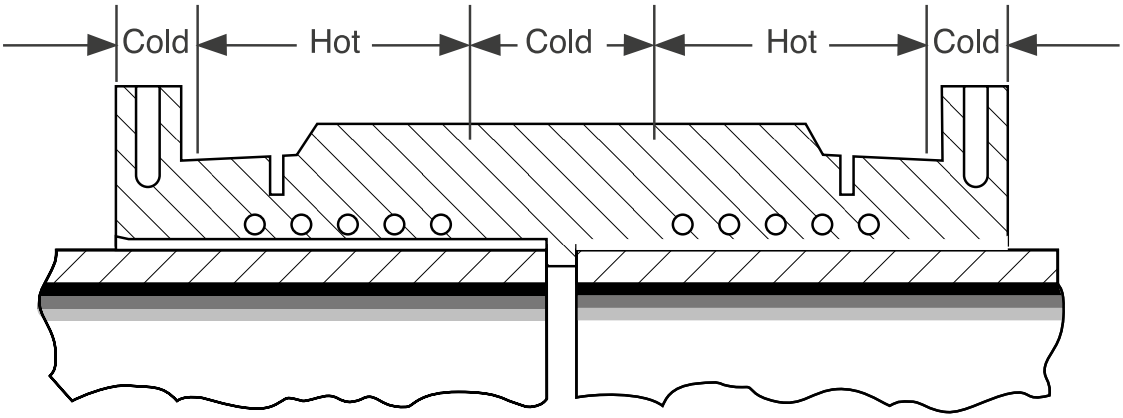
# Installation Manual

## Principles of Electrofusion:

Electrofusion fittings incorporate an electrical heating coil to which an Electrofusion Control Unit (ECU) supplies the electrical energy necessary to heat the coil. When the coil is energised the material adjacent to it melts and forms an expanding pool which comes into contact with the surface of the pipe. The continued introduction of heat energy causes the pipe surface also to melt and a mixing of pipe melt and fitting melt takes place; this is vital to produce a good weld. Following the termination of the heat cycle, the fitting and pipe are left to cool and the melted material solidifies to form a sound joint.

Preparation and assembly procedures are similar for all electrofusion systems. Some fittings require the fusion time to be entered into the ECU manually and are therefore described as manual. Some fittings incorporate auto-recognition aids and the ECUs are therefore described as automatic. Some of our fittings are Barcode read-only and can only be read by an ECU that has Barcode read facility. Normal standard fittings require a 39.5V supply. Please be aware that the Barcode read-only fittings are variable voltage and are determined by the ECU box via the Barcode read facility.

Hot and cold zones sometimes called melt and freeze zones, are formed after energising the coil. The length of these zones is particularly important. Each zone ensures that fusion is controlled to a precise length of the socket of the fitting and that the melt pressure is also controlled throughout the entire jointing process. The precisely controlled pitch and positioning of the coil concerning the inner surface of the socket ensure uniform heat distribution.




## Barcodes and ECUs:

ECUs can be supplied with the ability to read a bar code when connected to an electrofusion fitting. The machines have a bar code reading device that the operator uses to scan the data contained within the bar code can be entered manually. Once the bar code data has been entered, the ECU will usually display a description of the fitting and its size, which should be checked by the operator before proceeding with the electrofusion process.

The bar code system will automatically adjust the fusion time by small amounts to compensate for variations in ambient temperatures. ECUs should contain data logging facilities to ensure traceability of welding parameters. An output socket allows this information to be downloaded onto a computer database or printer to obtain a complete record of the joints that have been made.

NOTE: Refer to the related ECUs for more details.

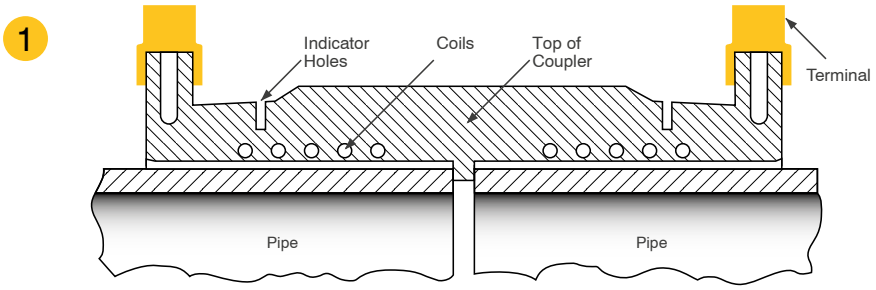
# Installation Manual

## Traceability Barcodes:

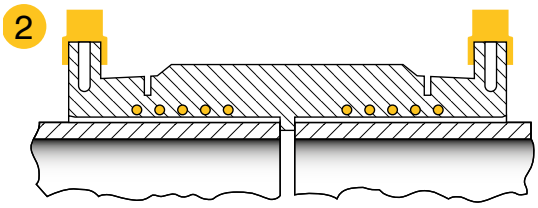
Most electrofusion fittings are fitted with traceability barcodes that can be read by any ECU with a traceability option. This barcode contains specific information regarding the manufacture of the product such as; the name of the fitting manufacturer, the type of fitting, the size of the fitting, the production batch number, the product SDR rating and the product raw material.

## Electrofusion Sequence:

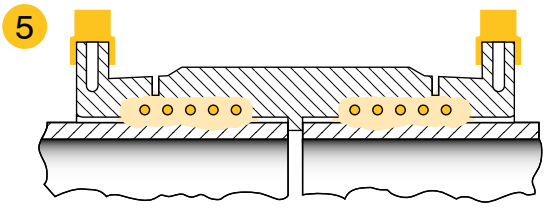
The sectional drawings show the jointing sequence from energising the coil until completion of fusion. The whole cycle is electronically monitored by the electrofusion control unit (ECU).



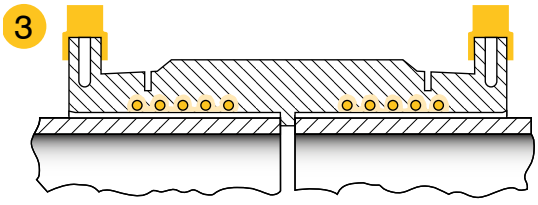

Pipe positioned in coupler prior to energising coil.



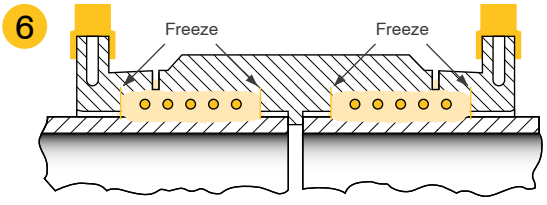

Coil energised.



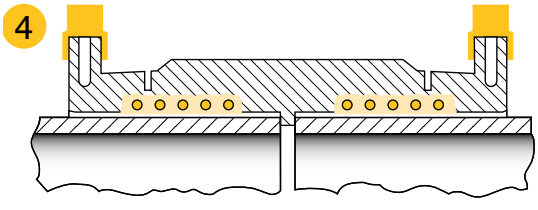

Heat transfers to pipe wall and pipe material starts to melt.



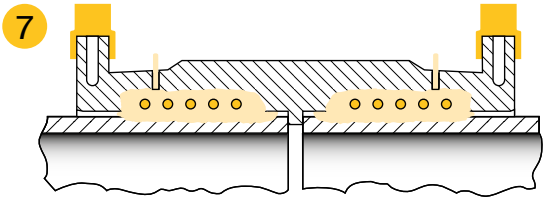

Material surrounding coils starts to melt.




Melt solidifies at the start of the cold zones, thereby sealing the melt zone. Further input of energy causes increase in melt pressure.




Area of melt extends leading to expansion towards pipe surface.




Melt pressure reaches optimum value at end of energising cycle. Emergence of the melt at the indicator holes shows that fusion is complete.
Please note: larger Dia. fittings have visual indicators that change colour to red when fused.

# Installation Manual

## Pre Jointing Checks:

- Use equipment that is clean, in good condition and regularly maintained.
- Mechanical pipe preparation tool, clamping tool or aligners must be used wherever possible.
- Ensure that the cutters/blades of mechanical scrapers are clean and in good condition.
- Check that you have somewhere clean and dry to place tools and equipment during the electrofusion process, and enough access to the work area.

Do not pressurize the system until the joints have cooled down to ambient temperature.

## Do's:

- DO WORK SAFELY
- Do understand the principals of electrofusion (refer to pipe manufacturers details if necessary).
- Do use a shelter and groundsheet, (a suitable anti-slip surface) in both dry and wet conditions to minimise contamination. Use end protection to pipes, (plugs or caps) to eliminate draughts.
- Do always use appropriate clamps for the true alignment, restraining and re-rounding of all pipes, both sticks and coils.
- Do ensure control box voltage is compatible with fitting.
- Do ensure pipe and fittings to be jointed are compatible with each other.
- Do cut pipe ends square for all electrofusion socket fittings.
- Do fully prepare pipe and/or spigot surfaces. (Secura- Line pipe ends need not be scraped before electrofusion if outer skin has been freshly peeled and the core pipe is pristine. Should the peeled pipe ends become contaminated then they should be prepared in the same way as standard PE pipe.)
- Do keep the pipe and/or spigot surfaces and fittings prepared & clean.
- Do assemble joint and fuse immediately following preparing the pipe.
- Do check that the fusion time displayed by the ECU (automatic or manual) matches the fusion time on the fitting. In the case of automatic recognition, if the time is different from that shown on the fitting, do not weld.
- Do ensure correct fusion and cooling times are observed and adhered to.
- Do always input the correct operator code and job code to allow for full traceability with Electrofusion Control Units with data retrieval facilities.
- Do mark finished joints with a joint number/data.
- Do ensure that the fusion indicators have risen, if there is no apparent movement of one or both of the indicators, the joint should be cut out and a new joint made (WIS 4-32-08).
- Do ensure that when jointing tapping tees the fitting is correctly positioned on the pipe before fusion. Following the required quality inspections and pressure testing of the welded saddle fitting, the pipe can then be tapped through.
- Do always enter your I.D. details should the ECU request it. Enter your operator and job code to allow full traceability.
- Do always ensure you mark/sign the completed joint with the number issued from the ECU, along with the date if given. This is imperative for full traceability.

## Dont's:

- Do not start any electrofusion joint unless it can be completed without interruption.
- Under no circumstances shall an attempt be made to carry out a second fusion cycle on any fitting. This is a WIS 4-32-08 Specification and shall be adhered to.
- Do not use dirty or contaminated fittings.
- Do not use fittings from split or torn bags, all fittings should remain bagged until immediately before use.
- Do not ever touch prepared fusion/jointing surfaces.
- Do not allow prepared fusion/jointing surfaces to become wet or damp.
- Do not remove clamps from fitting until cooling time has elapsed.
- Do not remove the integral cutter from the stack/saddle (contamination risk).

# Installation Manual

## Butt-Fusion Jointing Procedures:

Butt-Fusion is a jointing method which allows on-site jointing of pipes 90mm and above. It is a thermofusion process which involves the simultaneous heating of the ends of two components which are to be joined, until a melt state is attained at each contact surface. The two surfaces are then brought together under controlled pressure for a specific fusion/ cooling time and homogeneous fusion takes place.

The resultant joint is fully resistant to end thrust and has identical performance under pressure to the pipe.

This method of jointing requires an electrically heated plate to raise the temperature of the pipe ends to the required fusion temperature. It is used for both PE80 and PE100 grades of material for pipes of size 90mm and above of the same Standard Dimension Ratio (SDR).

All installers of polyethylene pipe systems must have received thorough training. Training leading to nationally-recognised qualifications can be done at several organisations.

## Equipment:

- Generator for power supply the heater plate, trimmer and hydraulic pump
- Butt-Fusion machine fitted with the correct size clamp shells, trimmer, heater plate, hydraulic pump and timer
- Pipe support rollers
- Welding tent
- Cleaning material, lint-free cotton cloth or paper towel
- External/internal debeading tool, if applicable
- Bead gauge
- Digital thermometer with a surface probe to check the heater plate
- Pipe end caps
- Baseboard
- Pipe cutters
- Air temperature thermometer
- Indelible marker pen
- Timer

## Jointing Method Pre-Jointing Checks:

Before commencing a welding operation:

- Ensure that the equipment used is clean, in good condition and regularly maintained
- Ensure that the correct jointing parameters for the machine type and pipe are known
- Check that the heater plate is clean and dry
- Check that the trimmer is clean and that the blades are not damaged and in the correct position for required pipe size
- Ensure clamp liners and securing screws are of the correct size
- Ensure that the generator is in good condition and has sufficient fuel
- A tent is available to provide shelter during welding and end caps are available.
- The pipes and/or fittings to be jointed are of the same size, SDR and material.

## Dummy Welds:

Even though cleaning of the heater plate may remove large deposits of dirt, very fine particles of dust may remain on the heater plate. To remove such dust it is necessary to make a dummy joint at the start of each jointing session, whenever the plate has been allowed to cool below 180°C, or at a change of pipe size. Two dummy joints must be made if the pipe size is greater than 180mm.

A dummy joint can be made using pipe off-cuts of the same size, SDR and material as the pipe being installed, however, it is not necessary to actually make a joint as the procedure can be discontinued after the full heat cycle has been completed. In the case of Automatic machines, the abort button can be used to stop the process after the heat soak period has elapsed.

# Installation Manual

## Welding Procedure:

- With the machine in the open position place, the pipes in the clamps with the ends adjacent to the trimming tool and with the pipe markings aligned.
- Align and level the components using external support rollers.
- Tighten the pipe clamps to grip and re-round the pipes.
- Cover the free ends of the pipes to prevent cooling of the plate by internal draughts.
- Switch on the trimming tool and bring the clamps slowly together so that the pipe ends are moved against the trimming tool until continuous shavings are cut from each surface.
- Keep the trimming tool turning whilst separating the clamps to avoid steps on the trimmed surfaces.
- Remove the trimming tool taking care not to touch the trimmed ends.
- Remove loose shavings from the machine and component ends. Do not touch the prepared surfaces or place hands between the pipe ends.
- Check that both surfaces are completely planed. If they are not, then repeat the trimming process.
- Bring the clamps together and check that there is no visible gap between the trimmed faces.
- Automatic machines will measure the drag pressure and compensate for this but with the earlier manual machines, there was a need for this to be assessed accurately prior to making each fusion joint and added to the basic ram pressure values shown on the machine.
- With the machine in the open position place the heater plate assembly on the machine, checking that it is up to the correct temperature.
- The automatic butt-fusion cycle can now be commenced whereupon the required interface pressure will be maintained until a uniform bead of the correct size is formed on each pipe.
- After the initial bead up, the pressure in the hydraulic system will be reduced to between zero and the drag pressure, so as to control the bead growth during the heat soak time.
- When the heat soak time is completed, the machine will automatically open and remove the heater plate before bringing the pipe ends together under the prescribed interface pressure.
- The prescribed pressure must be maintained for the required minimum cooling time.
- After this time the assembly can be removed from the machine but should not be handled excessively for the required period.

## Post Welding Checks:

- Examine the joint for cleanliness and uniformity and check that the bead width is within the specified limits.
- Remove the external bead and if required the internal bead using suitable debeading tools.
- The beads and joint should be numbered/coded using an indelible marker pen to correspond with the joint details entered into the butt fusion machine data retrieval system.
- The beads should be twisted at several positions and if a bead is seen to split at any point or deformities are present on the underside, then the joint should be cut out from the pipeline and remade. If a similar defect reoccurs, all further jointing should cease until the equipment has been thoroughly cleaned, examined and new trial joints made which are shown to be satisfactory.

## Do's:

- DO WORK SAFELY
- Do understand the principals of butt fusion (refer to pipe manufacturers/machine suppliers guidelines if necessary).
- Do always input correct operator code and job code to allow for full traceability with Automatic Butt Fusion machines.
- Do mark finished joint with joint number.
- Do use a shelter and groundsheet (a suitable antislip surface*), both in dry and wet conditions, to minimise contamination, and fit end protection to pipes, (plugs or caps) to eliminate draughts.
- Do ensure pipes are aligned correctly and supported on pipe rollers to minimise drag.
- Do position pipes in clamps with pipe markings aligned and to the top.
- Do perform dummy welds at the start of every welding session, when changing pipe size or if the heater plate has been allowed to cool (one dummy weld-on pipe size 180mm and below and two on larger pipe sizes).
- Do ensure that when trimming, a continuous ribbon of material is produced from both pipes ends before commencing feathering operation.
- Do always use the trimmer and heater plate stands provided.
- Do always remove swarf from underneath pipe ends and machine chassis following trimming.
- Do visually check that both pipe ends are completely trimmed.
- Do always check pipes for alignment and gaps around the entire circumference of the abutted pipes.
- Do always remove the external bead from completed joint, inspect for slit defects/bead uniformity then bag and label with a corresponding joint number for full traceability.

## Dont's:

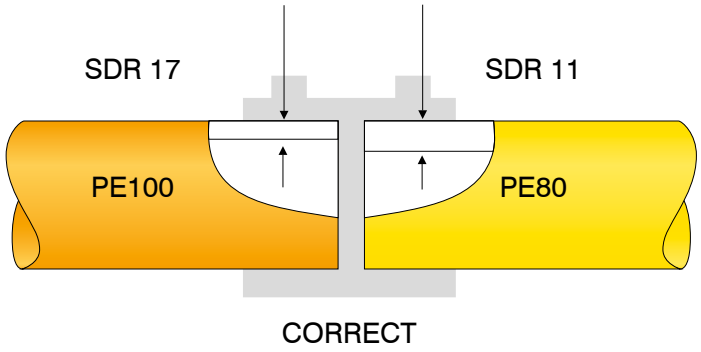
- Do not attempt to use equipment unless trained to do so.
- Do not attempt to weld pipes of different wall thickness.
- Do not touch trimmer blades when cleaning and especially when in motion, blades are very sharp and can cause serious injury.
- Do not touch the heater plate (unless to clean when cold).
- Do not leave swarf inside the pipe or on machine chassis.
- Do not introduce dirt onto the trimmed pipe ends at any time, particularly when removing swarf.
- Do not remove pipes from the machine until cooling time has elapsed.
- Do not attempt to install pipe until fully cooled.
- Do not attempt to operate the trimmer whilst it is out of the machine or attempts to by-pass the safety switch.
- Do not attempt to cut corners in any part of the welding cycle.

# Installation Manual

## Material & SDR Compatibility Summary:

Dissimilar materials and dissimilar wall thickness can be jointed by **electro-fusion**.

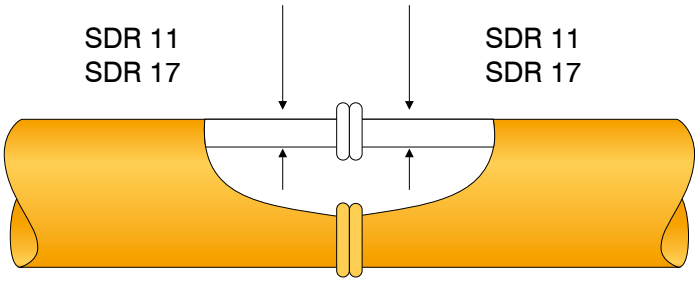
Note: The maximum working pressure should not exceed the lower value for the two pipes




CORRECT

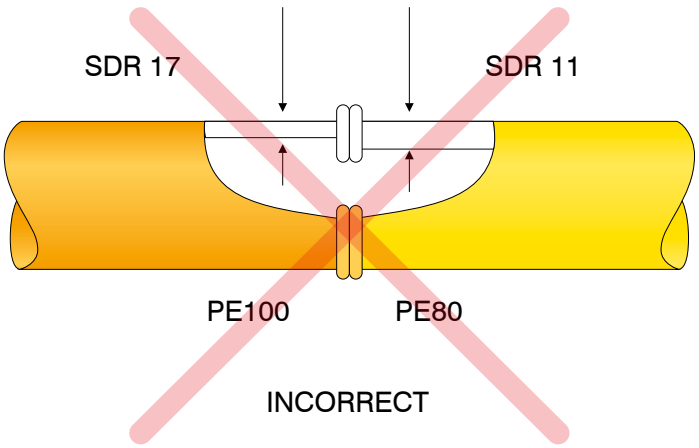
Similar materials and/or wall thickness may be jointed by **butt-fusion** or **electro-fusion**.

Note: SDR17 may be butt-fused to SDR17,6




Dissimilar wall thickness must not be jointed on-site using **butt-fusion.**

Note: PE80 should only be butt-fused to PE100 under closely controlled factory conditions.




INCORRECT

## Flanged Connections

When joining to metal or certain other piping materials, or if a pipe section capable of disassembly is required, PE flange adapters are available. The “Flange Adapter” and its shorter version, the “Stub End,” are designed so that one end is sized the same as the PE pipe for butt fusion to it. The other end has been specially made with a flange-type end that, provides structural support, which eliminates the need for a stiffener and, with the addition of a metal back-up ring, permits bolting to a similar flanged end connection.

The general procedures for joining would be:

- Slip the metal ring onto the PE pipe section, far enough away from the end to avoid interference with the operation of the butt fusion equipment or towards the flange face for welding the stub to the pipe.
- If a stub end is used, first butt-fuse a short length of PE pipe to the pipe end of the stub end. If a “flange adapter” is used, the PE pipe-sized end is usually long enough that this step is unnecessary.
- Butt fuse the flange adapter to the PE pipe segment.
- The fusion bead may need to be removed to clear the back-up ring as it is moved against the flange.
- Position the flanged face of the adapter at the position required so that the back-up ring previously placed on the PE pipe segment can be attached to the metal flange.
- Install and tighten the flange bolts in a criss-cross pattern sequence, normally used with flange type connections, drawing the metal and PE flange faces evenly and flat. Do not use the process of tightening the flanges to draw the two sections of pipe together.

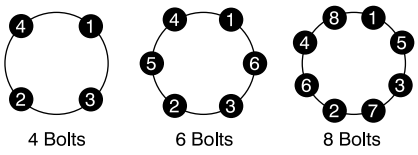
The serrated surface of the flange adapter helps hold the gasket in place. The flange face serrations should be individual closed concentric serrations as opposed to a continuous spiral groove which could act as a leak path. Back-up ring materials are steel, primer coated steel, epoxy-coated steel, galvanised steel, or stainless steel. Ductile Iron, fibreglass & PP coated can also be used. In below ground service, coatings and cathodic protection may be appropriate to protect metal back-up rings from corrosion. One edge of the back-up ring bore must be rounded or chamfered. This edge fits against the back of the sealing surface flange.

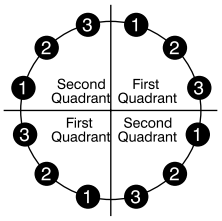
An all-PE flange without a back-up ring is not recommended because PE flanges require uniform pressure over the entire sealing surface. Without a back-up ring, a PE flange will leak between the bolts.

Flange adapters differ from stub-ends by their overall length. A flange adapter is longer allowing it to be clamped in a fusion machine like a pipe end. The back-up ring is fitted to the flange adapter before fusion, so external fusion bead removal is not required.

When joining to metal or certain other piping materials, or if a pipe section capable of disassembly is required, PE flange adapters are available. The “Flange Adapter” and its shorter version, the “Stub End,” are designed so that one end is sized the same as the PE pipe for butt fusion to it. The other end has been specially made with a flange-type end that, provides structural support, which eliminates the need for a stiffener and, with the addition of a metal back-up ring, permits bolting to a similar flanged end connection.

Bolting Sequences



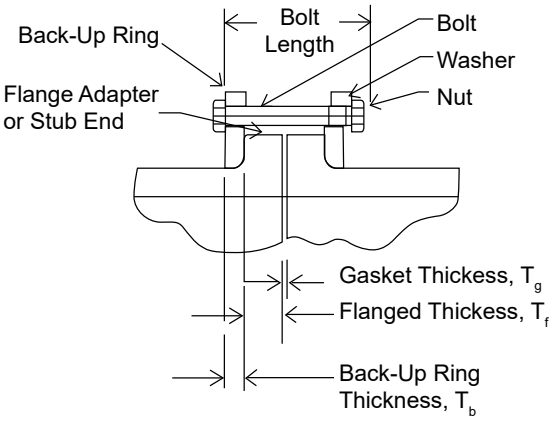

12 Bolts or more

| Nominal PE Size | Standard Flanges | | |
|---|---|---|---|
| | Flange Size | | Bolting |
| mm | mm | Inch | |
| 20 | 15 | ½ | M12x4 |
| 25 | 20 | ¾ | M12x4 |
| 32 | 25 | 1 | M12x4 |
| 40 | 32 | 1¼ | M16x4 |
| 50 | 40 | 1½ | M16x4 |
| 63 | 50 | 2 | M16x4 |
| 75 | 65 | 2½ | M16x8 |
| 90 | 80 | 3 | M16x8 |
| 110 | 100 | 4 | M16x8 |
| 125 | 100 | 4 | M16x8 |
| 125 | 125 | 5 | M16x8 |
| 140 | 125 | 5 | M16x8 |
| 160 | 150 | 6 | M20x8 |
| 180 | 150 | 6 | M20x8 |
| 200 | 200 | 8 | M20x12 |
| 225 | 200 | 8 | M20x12 |
| 250 | 250 | 10 | M24x12 |
| 280 | 250 | 10 | M24x12 |
| 315 | 300 | 12 | M24x12 |
| 355 | 350 | 14 | M24x16 |
| 400 | 400 | 16 | M27x16 |
| 450 | 450 | 18 | M27x20 |
| 500 | 500 | 20 | M30x20 |
| 560 | 600 | 22 | M33x20 |
| 630 | 600 | 24 | M33x20 |

# Installation Manual

## Flange Gasket:

Gaskets may be needed for higher pressures and connections between PE and non-PE flanges. If used, gasket materials should be chemically and thermally compatible with the internal fluid and the external environment and should be of appropriate hardness, thickness and style. Elevated temperature applications may require higher temperature capability. Gasket thickness should be about 1/8"-3/16" (3-5mm) and about 60-75 Shore A hardness. Too soft or too thick gaskets may blow out under pressure. Overly hard gaskets may not seal. Common gasket styles are full-face or drop-in. Full-face style gaskets are usually applied to larger sizes, because flange bolts hold a flexible gasket in place while fitting the components together. Drop-in style gaskets are usually applied to smaller pipe sizes.




Flange Adapter Bolted Assembly Cross Section

## Flange Bolting:

Mating flanges are usually joined together with hex bolts and hex nuts, or threaded studs and hex nuts. Bolting materials should have tensile strength equivalent to at least SAE Grade 3 for pressure pipe service, and to at least SAE Grade 2 for non-pressure service. Corrosion-resistant materials should be considered for underground, underwater, or other corrosive environments. Flange bolts are sized 1/8" smaller than the bolt hole diameter. Flat washers should be used between the nut and the back-up ring.

Flange bolts must span the entire width of the flange joint, and provide sufficient thread length to fully engage the nut.

## Hydrostatic Pressure Pipeline Testing:

This is carried out before a pneumatic pressure test. The mechanical integrity of a main or service is determined by filling the pipeline to be tested with water which is then pressurised.

When using this technique the engineer should avoid excessive test pressures which may occur due to hydrostatic head at low lying points.

The initial test pressure of 350mbar should be applied before the main test to ensure the general integrity of the system.

If the main is being filled by gravity, thought should be given to the need to vent air at high points and to allow water removal at low points. Also, excessively aerated water should not be used. Wherever possible water should be introduced into the pipeline at the lowest point.

An uninterrupted, even flow of water should be used to fill the pipe. This should not take place if the air temperature is 2°C or less or likely to drop to such a level.

Once the water has been pumped into the pipe, the temperature should be allowed to stabilise before pressurising to the test level (refer to relevant governing body). This test pressure should be applied to the highest point of the pipe and checked with a gauge.

Regular re-pressurisation is necessary before the start of the test period to permit creep to take place. Once this has elapsed the test period can begin.

Pressure and ground temperature should be recorded at regular intervals (e.g. every 15 minutes) during the test period. The pressure test is passed if there is no pressure loss recorded or if there is a constant or declining pressure decay rate which does not exceed 5% of the test pressure per hour.

If the results do not meet the above criteria, it is advisable to extend the test period to allow more data to be collected.

Following the test, the water must be removed, usually by the use of air propelled pigs. Dry pigs should then be put through the system until the pipe is deemed dry enough by the engineer.

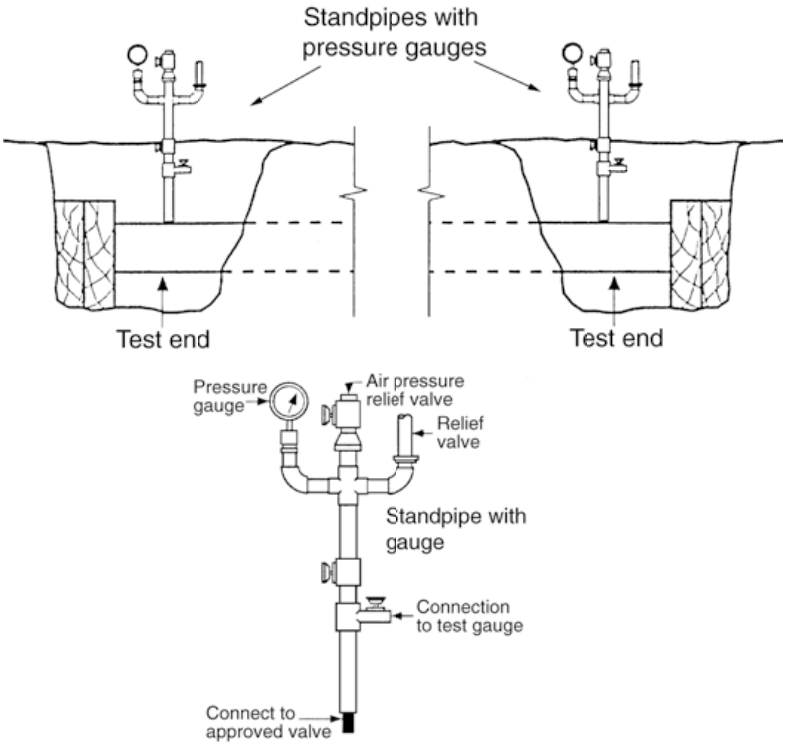
## Pneumatic Pressure Testing:

This is a leakage test that simulates the system at its maximum operating pressure under gas conditions. When conducting this type of test account must be taken of barometric pressure.

For pipes greater than 63mm, standpipes and gauges, should be connected at the ends of the new main and include a pressure relief valve. Air should be introduced into the main until the correct test pressure is attained.

Before the start of the test period, the temperature of the air should be allowed to stabilise.
At the start of the test period, a pressure reading should be taken followed by another reading at the end. If the period is long, it may be wise to take several readings during the test. In this way, an early indication of probable test failure avoids the need to run for the full period.

When completed, air should be vented in a controlled manner until the main is at atmospheric pressure. For pipes of a diameter not greater than 63mm, and low pressure (not greater than 75 mbar), the air is introduced into the service through the meter control valve, which is left open whilst the opposite end of the service, at the electrofusion tapping tee, is securely blanked off. For medium pressure (greater than 75 mbar not greater than 2 bar) and intermediate pressure (greater than 2 bar, but not greater than 7 bar) the test is from the main to the inlet valve of the service governor.




The pressure in the service should be increased to the relevant value.

The test period should be as recommended by the relevant governing body. No pressure loss is permissible.

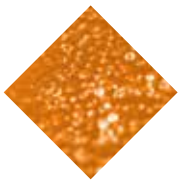
For low-pressure services, once a successful test has been completed, the meter control valve should be closed, the test apparatus detached and the integrity of the metre control valve tested. The pressure can then be released from the electrofusion tapping tee end.

The length of the main pipe should be checked for leakages, over the lead(s) for has from located, the pipe should be repaired and all pneumatic text related.

# Health & Safety

Polyethylene pipes and fittings have been used safely and effectively throughout the world, in a wide variety of installation conditions for almost 40 years and shall continue to do so in the future.

At all times, the health and safety of operatives and other people involved in the processing, handling, jointing, installation, testing and end-user of PE piping systems have been of utmost importance to SHIELD. To achieve and maintain these objectives, good working practice is essential. The guidelines for the usage of polyethylene piping systems have been published by several regulatory bodies and they should always be strictly followed.



### The Material:

Polyethylene is chemically non-reactive and generally regarded as biologically inert. It is not classified as a dangerous product (EEC).

### Ingestion:

Ingestion of polyethylene in any form should be avoided.

### Inhalation:

Inhalation of PE dust can irritate the respiratory system. Wherever possible, when cutting or scrapping PE pipes, operatives should work in the open air or well-ventilated areas with proper Personal Protective Equipment (PPE).

### Physical Contact:

Polyethylene is not regarded to be a skin irritant.

When cutting or scrapping PE pipes or fittings, PE dust particles may cause eye irritation and it is recommended that protective eye-wear must be used.

### Recycling:

The product is suitable for recycling using modern methods of shredding and cleaning. In-house production waste should be kept clean to facilitate direct recycling.

### Disposal of Waste Material:

Surplus or waste PE material can be reprocessed for new pipes or other products. Alternatively, the disposal should be as per the standard local regulations.

### Fire Hazards:

Polyethylene burns, but it is not classified as flammable. It has a flashpoint of 360°C approx.

Above 300°C, PE will degrade to produce carbon monoxide, water and small amounts of various hydrocarbons and aldehyde. Avoid the accumulation of PE dust particles as they could give a potential risk of dust explosion.

All electrical equipment in the area should be carefully earthed. In the vent of a fire involving PE materials, apply water in a spread jet. Dry chemical, foam and carbon dioxide can also be used.

### The Environment:

Polyethylene is not considered dangerous for the environment.

NOTE:

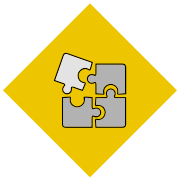
- Drawings are for illustration purpose only.
- This is only a general information and qualified medical attention should be obtained as soon as practically possible.

# Health & Safety

### Handling:

PE pipes and fittings should be handled and moved under the instructions detailed in the manuals of regulatory bodies and the Handling and Storage section of this publication. Particular care should be taken while handling large diameter pipes.

Safety clothing and equipment should be used at all times when handling and moving PE pipes.
When transporting, handling and releasing coils of PE pipes, extreme caution should be taken, particularly with pipes 90 mm and above, dispensing trailer must be used and the details in Handling and Storage section must be strictly followed.



### Jointing:

Butt fusion or Electro-Fusion jointing of PE pipes and fittings should always be carried out in well-ventilated areas. The fusion process is a high-temperature operation and fumes are generated around the jointing area. Inhalation of the fumes should be avoided.

During the butt-fusion operation, molten PE is formed. This should not be allowed to come into contact with the skin as it will adhere strongly and cause severe burns. Protective gloves should be worn during the jointing process and when using the heater plates of the welding machinery.

During the Electro-Fusion process, care should be taken to prevent the ejection of molten material from the joint. Protective clothing including gloves and safety eye-wear should be worn during the jointing process.

### First Aid:

The following are recommendations for immediate first aid to be applied in the event of an accident involving polyethylene products.

Ingestion: Wash the mouth with clean water.

Inhalation: Move the affected person into fresh air situation. If in distress, apply oxygen or artificial respiration.

Eye Injury: If PE particles get into the eyes, immediately flush with clean water, repeating as necessary.

Burns: If molten PE material comes into contact with skin, cool the affected area immediately by the flow of cold water. DO NOT attempt to remove the PE material from the skin. Seek medical attention as quickly as possible, even for the smallest burn.

## DISCLAIMER

This technical product guide should only be used as a reference and for any clarification, refer to the relevant standards for further information.

NOTE:
- Drawings are for illustration purpose only.
- This is only a general information and qualified medical attention should be obtained as soon as practically possible.

# Handling & Storage

## General Handling:

Although relatively lightweight, polyethylene pipe products should be treated with a similar level of caution as for heavier metallic pipe products. Whilst polyethylene is a robust and resilient material, care should be taken not to cause excessive scuffing or gouging of the surface. Surface damage may occur during handling, storage and installation, but providing the depth, the value should not be more than 10% of the wall thickness, only then the service performance of the pipe or fitting will not be affected. Further guidance regarding handling and storage of PE pipes and fittings is given by various industry bodies, including the following:

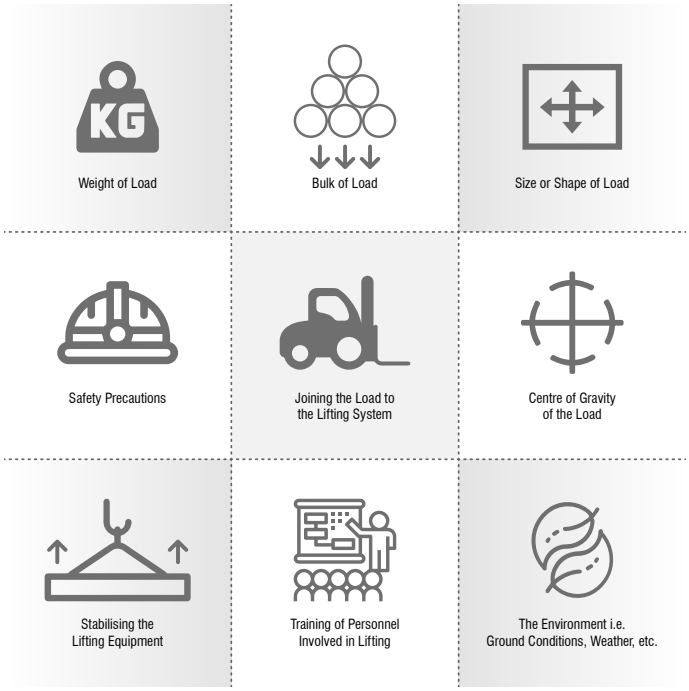
HSE Guidance - Avoidance of danger from overhead power lines (HS GS 6); Protect yourself, protect the load; The lifting operations and lifting equipment regulations (LOLER); The provision and use of work equipment regulations (PUWER).

Department of Transport - Safety of loads on vehicles.
WRc - Polyethylene Pipe Systems For Water Supply (version 01/02).

IGEM/G/8 Handling, Transport and Storage of PE Pipes and Fittings.

## Factors of Safe Lifting & Loading:

In lifting operations, where either manual or mechanical effort is involved in moving a load, the following factors are common to all situations and provide the basis on which the selection of the appropriate type of lifting equipment can be made:




NOTE: Drawings are for illustration purpose only.

# Rules of Handling & Storage

Never drag or roll individual pipes or bundles

Never throw or drop pipe and fittings from vehicle

Never use metal hooks, slings or chains when handling pipes/fittings

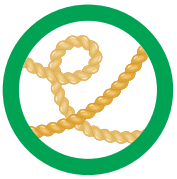
Never stack pipe bundles more than 3 meters or 3 bundles high

Never place pipes/fittings in contact with lubricating or hydraulic oil, gasoline, solvent, or other aggressive materials

Never stack coils more than 2 meters high

Never store pipes and fittings near sharp objects

Always store pipes/fittings on flat, firm ground, able to withstand the weight of the material and lifting apparatus

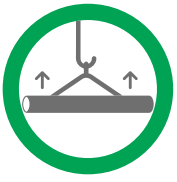


Always use non-metal slings when handling pipes/fittings (e.g. nylon or polypropylene)

Always exercise special care when handling pipes in wet or frosty conditions, since they may become slippery

Always keep protective packaging (battens, shrink-wrap, pallets, strapping, etc.) intact until pipes/fittings are required to be used.

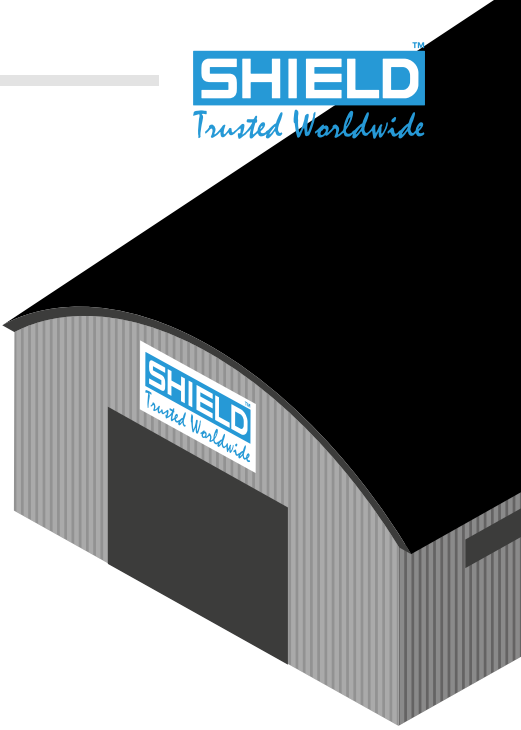
Always store pipes/fittings away from intense heat



Always allow some bending deflection when pipes are loaded and unloaded

Always protect pipes/fittings with opaque sheeting or tarpaulin

# Handling & Storage


## Delivery & Unloading at Customer Sites:

The Plastic Pipe Industry - Recommended Guidelines for the Safe Delivery and Unloading of Plastic Pipes to Customer's Site (Health & Safety Charter) has been developed by industry stakeholders to provide a risk-based framework to assist with the safe delivery and off-loading of plastic pipe products. This document has been recommended by the HSE and SHIELD formally adopted these guidelines.

Deliveries should not be made to unmanned sites.

### Length & Bundles:

It is the responsibility of the Site In-charge to ensure that the site is safe to accept pipe deliveries. The area where the delivery vehicle is to be stopped shall be safe and the location for storage shall be on firm level ground, which is free from damaging material.

Polyethylene pipe products should be off-loaded in a controlled manner. All polyethylene pipe products shall be mechanically off-loaded and if there is no suitable mechanical off-loading equipment available on-site then an on-board crane vehicle shall be requested. It is the responsibility of the on-board crane operator to off-load polyethylene pipes and he is the only person authorised to access the trailer for this purpose. It is important to maintain an exclusion zone with all personnel and vehicular traffic kept at a safe distance.

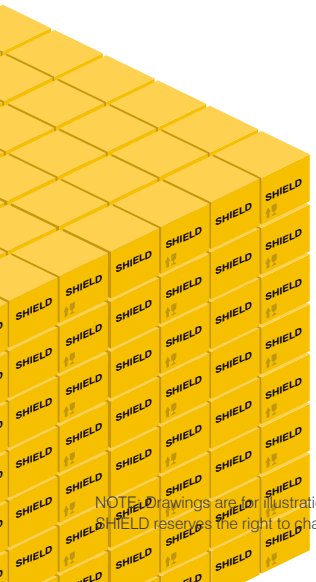
### Coils:

The delivery driver is responsible for undoing the load securing devices, which should only be removed from the product that is to be imminently off-loaded. The driver is the only person authorised to access the trailer and if off-loading is to be carried out by fork-lift then the driver should be escorted to a safe zone away from the off-loading area by the Site In-charge.

It is the responsibility of the person operating the fork-lift to ensure that the off-loading process is carried out safely. If off-loading is to be carried out by the driver using the onboard crane, then the procedures for handling lengths and bundles should be followed.

Larger coils 90mm - 180mm pipe will require lifting by a fork-lift ensuring that the tines are covered to protect the coils from damage. It is recommended to use anti-slip protective fork covers, which are readily available.

Small coils of pipe delivered on pallets may be handled by forklift, but they should remain secured to the pallet during transportation. Securing bands should only be cut at the time of use. Coils delivered in shrink-wrapped packs should be handled with care to avoid damage.

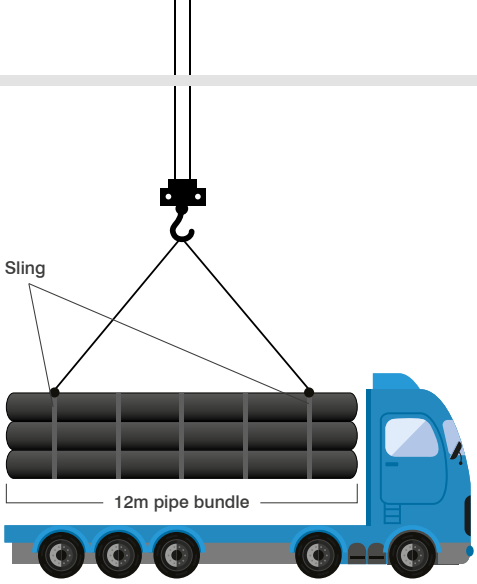



# Handling & Storage

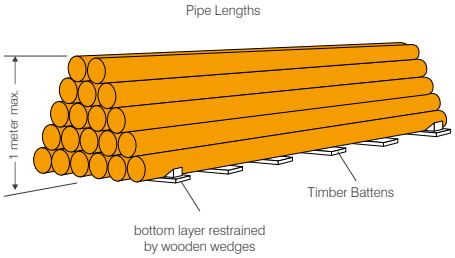
## Site/Depot Handling:

A flat-bed vehicle, free from sharp objects and projections should be used for transporting pipes. When lifting pipe bundles by crane, wideband slings of polypropylene, nylon or similar material is recommended. Do not use chains, hooks or hawsers.

Where large diameter coils are to be stored vertically at depots, the coils must be secured with purpose-built racking with protective matting positioned underneath, and facilities for safe lifting, movement and loading must be available.




Good Lifting Practice

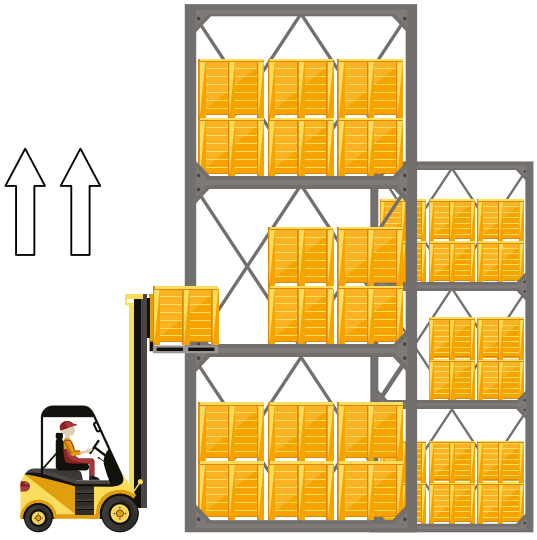



Storage of Loose Pipes

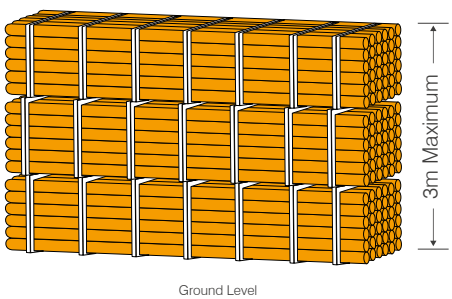
## Storage:

### Fittings:

Boxed fittings and pre-fabricated fittings may be stacked on pallets for transport which should be adequately secured. They should be stacked, secured and transported such that no loads are imparted to the fittings. Never use hooks to lift fittings.



Support Battens




Ground Level

Storage of Bundles

### Pipes:

The on-site storage facilities will vary depending upon factors such as the available space, location, size and nature of the project etc.

The storage may range from a secure central storage compound, localised storage points close to the laying operation, to stringing the pipes along the planned route. In all cases careful consideration should be given to the following aspects:

- Security of all materials and equipment from theft, vandalism, accidental damage or contamination (Pipe-end caps, intended to prevent ingress, should be kept in place during storage).
- Safety of the general public, especially, the elderly and disabled.
- The movement of traffic, construction equipment, farm machinery and animals.
- All pipe store locations should be on suitably firm, level ground, free from damaging material with adequate access for construction vehicles and/or lifting equipment.
- Badly stacked pallets, coils or bundles may slip or collapse, which will cause injury to personnel or damage to the pipe.

Pipe lengths stored individually should be stacked in a pyramid not more than one metre of height, with the bottom layer fully restrained by wedges. Where possible, the bottom layer of pipes should be laid on timber battens. On-site, pipes may be laid out individually in strings. (Where appropriate, protective barriers should be placed with adequate warning signs and lamps.)

Bundled packs of pipe should be stored on clear, level ground, with the battens supported from the outside by timbers or concrete blocks. For safety, bundled packs should not be stacked more than three metres of height.

# Handling & Storage

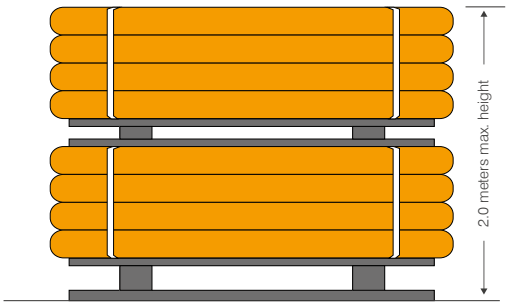
## Large Coils:

The oiled pipe should be stored flat, especially during periods of warm weather, and on firm level ground, which has suitable protection for the bottom coil. Where space is limited and colours are to be stacked, the height of stacked coils should be such that the stack is stable and the uppermost coil can be safely handled. The height of the stack should not exceed 2.0 metres under any circumstance.

Wedged-end wooden battens placed below the bottom coil and used as spacers between each layer will facilitate easy access for slinging.

When the need for transportation is required, it should only be carried out by trained operatives.

Batches of coils delivered on pallets must remain secured to the pallet and only to be cut at the time of use.




Storage of Coils

## Coil Dispensing:

**Safety first:** Pipe held in coils, is under tension and is strapped accordingly. Coils may be hazardous if released incorrectly — particularly if the end of the pipe is not kept restrained at all times. It is most important to read and understand the following guidelines before attempting to untie coils.

Coils are secured by one of two methods depending on the pipe's diameter:

**1. Outer bands with additional strapping of individual layers (63mm to 110mm).**
Do not remove any of these bands until the pipe is required for use. Remove them carefully, from the outermost layer first, so that only the length of pipe needed immediately is released. Successive layers can be released by removing band as the pipe is drawn away from the coil.

Coils of pipe should only be dispensed in the field from proprietary trailers.

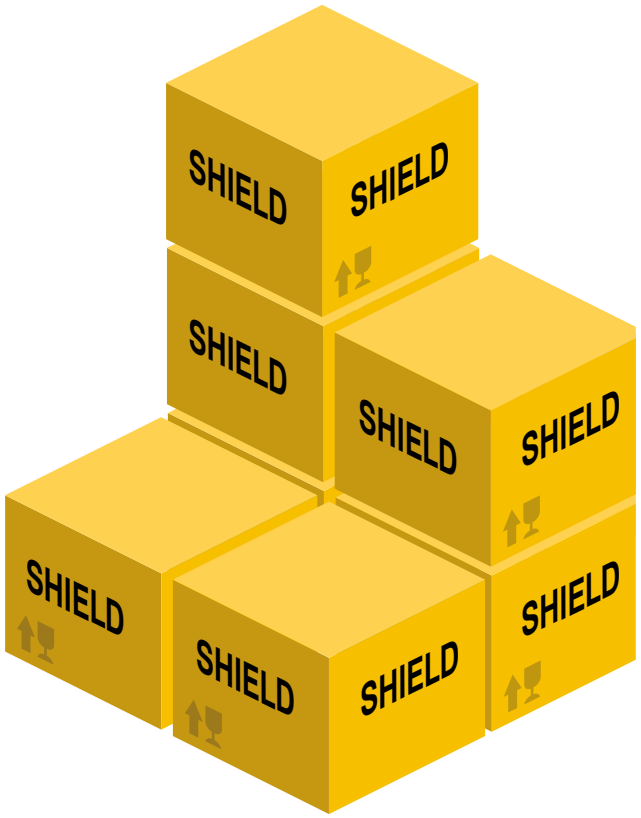
**2. Wrapped coils**
Pipe sizes in 32mm and below are protected with the film-wrap, enabling the free end of the pipe to be taken out from the coil. Take the only sufficient pipe for immediate use from the coil and on no account, should remove the outer wrapping until the coil is almost fully unwound.

# Handling & Storage

### Fittings:

Electro-Fusion fittings should be stored under cover in dry conditions, preferably on racking. They should be kept in their boxes/packaging until ready for use.

Fabricated fittings may be stored outdoors, as long as they are protected against damage and prolonged direct sunlight.





### Storage Outside:

Black polyethylene material contains ultraviolet stabiliser to provide excellent protection against degradation due to UV radiation.

Orange and yellow polyethylene is UV stabilised to resist degradation in storage only. The maximum recommended storage outside is 12 months. Product to be stored outside for periods above, should be covered with polyethylene sheet or stored under cover.

Additional precautions may be required, where polyethylene pipes are stored outdoor in regions of high solar radiation.

NOTE: Drawings are for illustration purpose only.

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For further information on any aspect of the Shield range of PE Piping System, please contact your nearest office.


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