

# Removable Insulation Blankets Fabrication & Materials Selection Guide

## What materials to use for what applications



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## 1.0 Scope

This guide specification recommends the quality of materials and methods of construction used to fabricate removable insulation blankets. The blankets are to be used to insulate piping, fittings, valves and equipment that require periodic maintenance or are otherwise unsuitable for permanent insulation. The blankets are typically prefabricated off site to dimensions verified by field measurement. Thermal effectiveness can be maintained as long as the blankets fit with no resulting gaps or compression. Blankets are to be designed for ease of installation and removal, without special tools or skills.

## 2.0 General

### 2.1 Definition of Terms

Hot Face	The surface of a blanket that 'Sees' or is in direct contact with the surface being insulated
Cold Face	The surface of a blanket that is exposed to ambient conditions
Insulation Filler	The thermal insulation material enclosed by the hot face and cold face materials
Parting Line	The edges of a blanket that butt together when installed
Terminal Ends	The edges of a blanket that are drawn around adjacent to insulation penetrations, supports, valve stems, tracers, etc.
Seams	Method of joining hot face and cold face materials
Wind flap	Overlapping flap of cold face material which is drawn around adjacent insulation to reduce possibility of water entry
Gusset	Usually a separate piece of hot face material joining the hot face and cold face materials to assure full thickness of insulation filler at edges
Lacing Hooks	Special stainless steel disc with integral anchor (hook) secured through blanket with a stainless steel pin and speed clip. Used to lace blanket parting edges together or to otherwise secure blanket to fitting being installed

Quilting Pins	Is similar to a lacing hook, but without the hook. - Used to keep hot and cold face materials and insulation filler together to prevent filler from shifting
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## 2.2 Special Conditions

In addition to the normal conditions encountered, i.e. temperature exposure and weather exposure, there are other conditions that may be encountered. These conditions require special treatment over and above the scope of this specification. Such conditions include:

- a. Chemical exposure
- b. High ambient temperatures
- c. Extreme weather conditions
- d. Fire resistance
- e. Acoustical considerations

When these conditions or requirements need to be met, consult with your local blanket fabricator for special constructions.

## 3.0 Materials

**3.1 Needle mat **DSNM** series Insulation Filler** - Needled mat from long strong amorphous silica fibers. Fibers are Non-hazardous, and suitable to 1000°C continuous. Silica fibers are stronger and more vibration resistant than ceramic fiber.

### 3.2 Needle mat **DENM** series

#### From ambient to 650°C

E Glass mechanically needled mat, 6mm, 12 mm and 25mm thick. The most common is **DENM25**, 4500 g/m<sup>2</sup> (180 Kg/m<sup>3</sup>), 25mm x 1520mm x 13.7 m. Marine Certification Available compliant MED / IMO.

#### From ambient to 1250°C

- Darco **CBL series** - Ceramic fiber blanket 1260°C, 160kg/m, 25mm thick or 12.5 mm & 50 mm thick. Also **CSOL** series Fraunhofer certified soluble fiber.
- Darco **DSNM** Silica Glass Needled mat - 180 kg/m<sup>3</sup>, 25 mm. (12mm also available). Marine Certification Available compliant MED / IMO.

### 3.3 Hot/Cold Face Enclosure Material

#### Temperature range of -37°C to 260°C

Silicone rubber coated glass fabric, 560g/m<sup>2</sup> total weight, of which 130g/m<sup>2</sup> is silicone.

- Darco **DEF560P/GLS2** (Grey) - Fire Test Certified to AS1530.3.
- We have alternatives to US Mil Spec, FM approved, MED / IMO certified etc.

Where size and weight of the blanket requires a heavier, stronger fabric, use a range of silicone coated glass fiber fabrics.

- Darco **DEF960BLS1** (Black, High quality spec coated 1 side, 960 g/m<sup>2</sup>)

- Darco **DEF1150GLS2** (Grey High quality spec coated 2 sides, 1150 g/m<sup>2</sup>)
- Darco **DEF1150RLS2** (Red High quality spec coated 2 sides, 1150 g/m<sup>2</sup>)
- Darco **DEF3500RLS2** (Red High quality spec coated 2 sides, 3500 g/m<sup>2</sup>)

For Food processing areas or where chemical attack is likely, fluorocarbon (Teflon) coated glass fabric should be used 560g/m<sup>2</sup> total weight.

Darco **DEF580F1/1500** – Premium soft handle PTFE coated scratch resistant, easy to sew.

Darco **DEF610F2/1500** – Alternative heavier 610 g/m<sup>2</sup> double side grey.

#### From -37°C to 260°C in leak prone areas

A two-ply laminate of glass fabric and aluminium foil is recommended - Continuous working temperature for adhesive is 260°C.

- Darco **DEF663AL** - Total weight 663g/m<sup>2</sup>. US Mil Spec approved.
- Cheaper Chinese near equivalent and up market European MED / IMO certified variants also available.
- Darco **DEF1100HTAL** - heavier 1000g/m<sup>2</sup>, 1.6 mm thick fabric for heavier duty applications.

For low temperature applications where a vapour barrier is required, a two-ply laminate of glass fabric and aluminized polyester film should be used - Maximum operating temperature 180°C, total weight 400g/m<sup>2</sup>.

- Darco **DEF460MY** (460 g/m<sup>2</sup>) OR
- Lighter duty Darco **DEF220MY** (220 g/m<sup>2</sup>)

#### From -37°C to 260°C

In environments where a lot of vibration is expected such as turbine and engine exhaust blankets, a stainless steel wire reinforced glass fibre fabric with grey silicone coating on 1 side is recommended.

- Darco **DEF720P1/WR** (Grey PU coated 1 side) or **DEF780P2/WR** (Grey PU coated 2 side) for lower smoke emission (also used as 2hr fire curtain) OR
- Darco **DEF725GS1/WR/1200** (725 g/m<sup>2</sup>), or **DEF1010GLS2/WR** (1010 g/m<sup>2</sup>) (Grey silicone coated both sides) for liquid impermeability.

#### From 260°C to 1200°C

A high purity 99% silica fabric, 650 and 1200 g/m<sup>2</sup> should be used. Both are available with a light gold CV abrasion resistant weave lock coating to stabilize the fabric during cutting and sewing operations and improve abrasion resistance. Alternative black graphite coating is used to enhance friction abrasion resistance and not show up dirt against the black.

- Darco **DSF630** (630g/m<sup>2</sup>) and **DSF11150V** (1150g/2) for light gold weave lock vermiculite coated finish 935 mm wide and **DSF630V/1524** (630 g/m<sup>2</sup>), 1524 mm wide x 50 m roll
- Darco **DSF630WBL/1524G** (630 g/m<sup>2</sup>), 1524 mm wide x 50 m roll for black graphite finish more aesthetically popular for automotive turbo covers.

For hot face vibration abrasion protection of pads and mattresses up to 700°C, Use 304 stainless steel knitted wire mesh for general purpose indoor applications.

- Darco **SSM304** for 760 mm and 1060 mm tube widths - For corrosive marine environments up to 800°C.

- Darco **SSM316**, 1060 mm tube width up to 900 °C. For higher temperatures to 1100°C Inconel alloys are recommended (Available on indent orders)

### 3.4 Fabrication Materials

#### 3.3.1 Sewing Thread to 550°C

For machine and hand sewing twisted glass fibre thread, 0.5mm in diameter and Teflon coated, and silicone oil lubricated, use Darco **R753-12L** 51 N breaking strength **R753-24L** 111 N breaking strength.

#### 3.3.2 Sewing Thread to 1000°C (Most popular)

Kevlar covered multi strand stainless steel thread 0.4mm diameter (Darco **KEV/SS/THREAD2** (8 wire) rated to 800°C. Also new **KEV/SS/THREAD3+** (10 wire) rated to 1000°C.

### 3.5 Fastening Materials

#### Capstans to 850°C

Darco **CAPSTAN** and **CAPSTAN-WL** (2 washers per capstan)  
302 HQ stainless steel capstans with washers - Just like 304 s/s but 302 HQ s/s is better suited to making Capstans.

#### Lacing Anchors to 800°C

Darco **SSLA/63/14G/P** - Stainless steel lacing anchors and **SW/25/14G** stainless steel "speed clip" for manually installing fixings. We also offer a pneumatic insulation tacker with staples, hooks and plates for faster installation.

#### Straps & "D" rings

Straps can be **DET series** woven fiberglass tapes.  
Darco **DET252** (25mm x 2mm) and, Darco **D25**, 304 s/s "D" rings

#### Velcro – Fire retardant Hook and Loop

Darco **VHBFR50**, Hook and **VLBFR50**, Loop matching, Black 50 mm wide x 25 m roll

#### Drawstrings

Darco **DER04D** - 4mm diameter dense fiberglass rope or larger sizes available e.g. 6, 10 and 12 mm also used.

#### Lacing Tie Wire

Darco **SSTW0.9/G** - 0.9 mm diameter soft annealed Type 304 stainless steel wire on nom. 13.8 Kg plastic spools (easy to dispense)

### 3.6 Identification Tags

Blankets shall be provided with permanent identification tags bearing the fabrication company's name and address, location and description of fitting, pattern number or other number that will allow the fabricator to construct a new blanket without field measurement.

## 4.0 Design and Fabrication

### 4.1 Design

Blankets shall be custom designed and constructed for each individual item to be insulated. A close, conforming fit without gaps at the seams is required. Close attention to penetrations, supports, tracers etc. is important to minimize water entry. Blankets shall be designed to overlap the adjacent insulation by a minimum of the thickness of the insulation. The parting line of the blankets shall be designed at the low point and a small "drain hole" included to allow for drainage in the event of a leak.

Where leakage of combustible liquids into the insulation filler poses a fire hazard, non-absorptive hot face enclosure material shall be used (Refer 3.2.2)

Blankets are to be one-piece construction whenever possible. Large, thick or heavy blankets should be fabricated with heavier and stronger fabrics. If the finished blanket is heavier than 30kgs, it should be fabricated in two pieces.

If blankets will be subjected to mechanical abuse or must be removed and replaced frequently, stainless steel wire mesh should be used to cover the entire blanket (Refer 3.2.5).

Design of blankets must provide "boxed" edges to assure full thickness of insulation throughout the blanket.

Terminal ends of sewn blankets shall have wind flaps and fiberglass rope sewn permanently into them to provide protection against water entry and convective heat loss.

### 4.2 Fabrication

#### Sewn Blankets

Blankets are to be sewn inside out on all but one edge using parallel rows of lock stitching, 6 to 7 stitches per inch and rows to be 6 mm to 10 mm apart.

The enclosure shall be turned outside out and the insulation filler materials shall be fitted between the hot face and cold face material. A closing seam or outside bound seam shall be used to complete the enclosure.

Straps shall be located in such a way as to provide complete closure of parting line and prevent the blanket from sagging.

Fiberglass rope shall be inserted in the double stitched "tunnel", of the wind flap and then tack stitched in the middle of the wind flap to prevent it from pulling out.

Lacing anchors and quilting fasteners, if applicable, to be secured to the blanket using speed clips. Excess pin length shall be cut off and the remaining point turned 90°.

**5 Construction Recommendations (Conservative continuous max temperature ratings)**

<b>Cold Face Fabrics</b>	<b>°C</b>
1. Silicone Impregnated Fiber glass & Silica	260
2. PTFE/Teflon® Impregnated Fiber glass & Silica	280
3. Alum foil/Film Laminated Fiber glass & Silica	260
4. Plain & Texturized Fiberglass	550
5. Stainless Steel Knitted Blanket Mesh	816
<b>Hot Face Fabrics</b>	<b>°C</b>
1. Silicone Coated/impregnated Fiberglass & Silica	260
2. PTFE/Teflon® Impregnated Fiberglass	280
3. Alum foil/Film Laminated Fibre glass & Silica	260
4. Plain & Texturized Fiberglass	550
5. Vermiculite impregnated Fiberglass	800
6. Vermiculite impregnated silica	980
7. 304SS Foil	650
8. Inconel Foil	816
9. 304SS Blanket Mesh	650
10. Inconel Blanket Mesh	816

<b>Hog rings &amp; Staples</b>	<b>°C</b>
1. Galvanized	540
2. Stainless Steel	680
3. Inconel	815

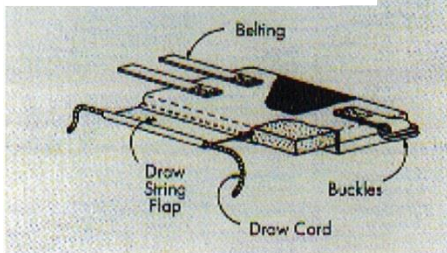
<b>Threads</b>	<b>°C</b>
1. Nome x®	200
2. Kevlar®	200
3. Plain Fiber glass	400
4. Teflon® Coated Fiber glass.	400
5. Teflon® Coated Quartz	815
6. Stainless Steel	650
7. Inconel	815

<b>Blanket Insulation</b>	<b>°C</b>
1. Foams (Flexible, Closed Cell Elastomeric)	150
2. Fibre glass w/binders	150
3. Needled E glass blanket	650
4. Needled E Glass/Silica composite blanket	816
5. Needled Silica Blanket	980
6. Ceramic Fibre Blanket-LT	1100
7. Ceramic Fibre Blanket-RT	1260
8. Ceramic Fibre Blanket-HTZ	1430

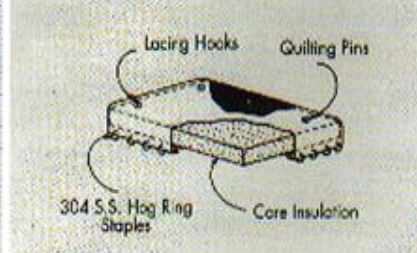


Accessories		
1. Belting	5. Quilting Pins	9. Grommets
2. Buckles	6. Draw Cord	10. Two
3. Velcro	7. SS Tie Wire	
4. Lacing Hooks	8. SS 1.0. Tags	

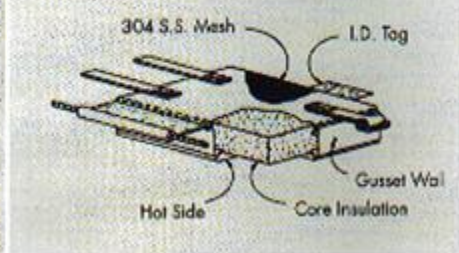
1" Sewn Construction



1" AND ABOVE HOG RING CONSTRUCTION



2" AND ABOVE SEWN CONSTRUCTION



Chemical Compatibility Data			Resistance to						
Product	Temp °C	Weathering	Oil	Fuel	Water	Ozone	Acid, dilute	Acid, conc	Solvents
PTFE/Teflon®	288	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Silicone	260	V.G.	Fair	Fair	V.G.	V.G.	Good	Fair	Poor
Neoprene	121	Good	Good	Fair	Good	Good	Good	Good	Good
Hypalon Natural Rubber	135	V.G.	Good	Fair	Good	V.G.	V.G.	V.G.	Good.
	116	Poor	Poor	Poor	Good	Poor	Fair	Fair	Poor

