KNAUF INSULATION

it's time to save energy

December 2014

Supafil® Loft

Installation Manual

Knauf Insulation is part of the Knauf Group of Companies, a family owned global building material business with annual revenue in excess of €5 billion.

Leading insulation manufacturer

As one of the world's leading insulation manufacturers, we are active in more than fifty countries and have over thirty manufacturing sites producing glass and rock mineral wool, extruded polystyrene (XPS), expanded polystyrene (EPS), extruded polyethylene (XPE) and also wood wool products.

Northern Europe

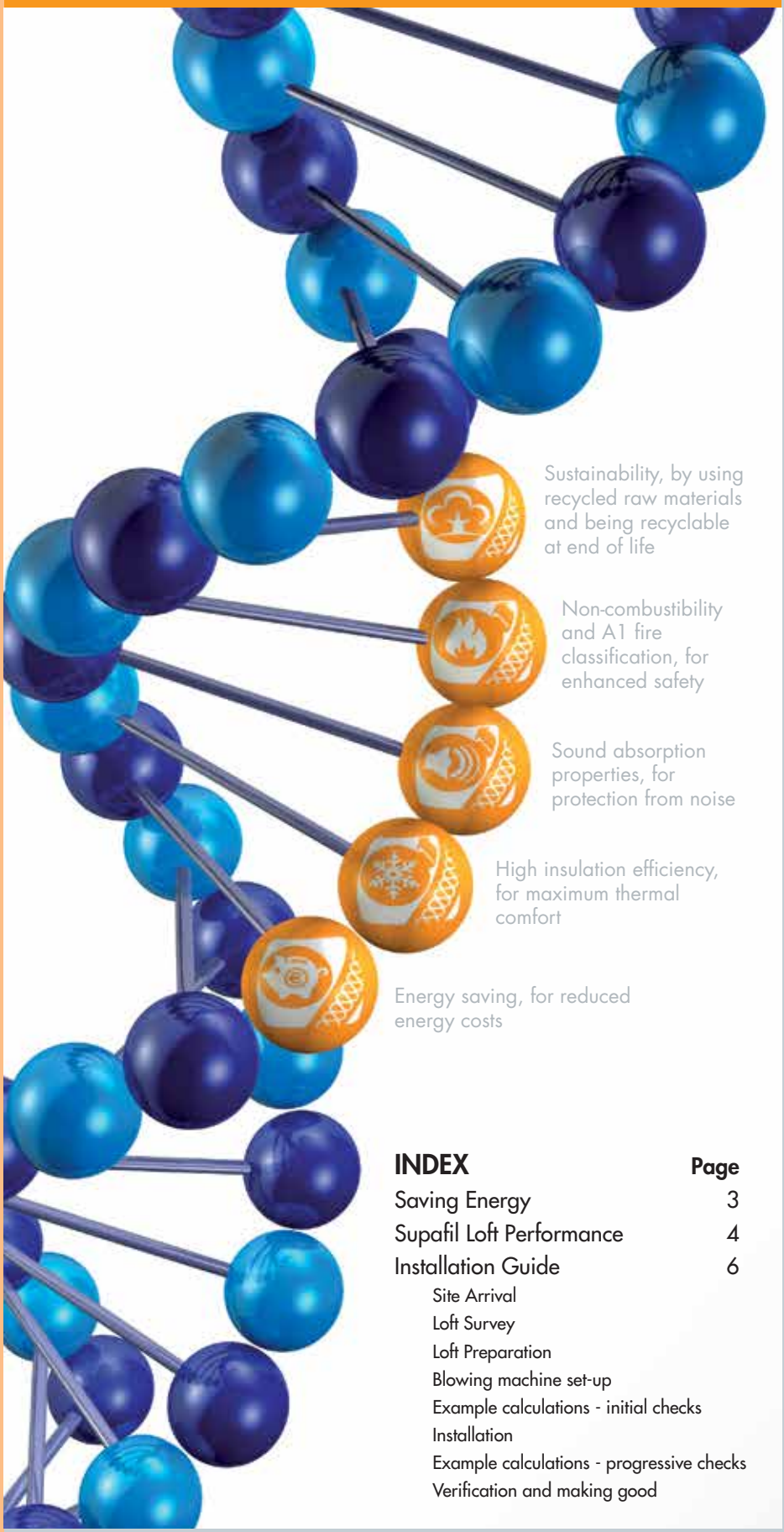
The Knauf Insulation business supplies a wide range of insulation products and design services to Denmark, Norway, Sweden, Finland, United Kingdom, and Ireland. We produce insulation of the highest quality along with customer service to continually enhance industry standards.

Research and development

Our investment in research and development has created an unrivalled portfolio of highly sustainable energy efficiency products. Furthermore our 'compression packaging' and 'blowing wool' technology leads the insulation industry.

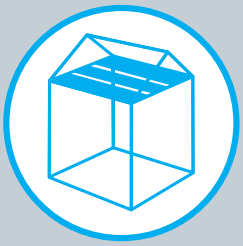
Innovative solutions

Knauf Insulation provides a range of products that are easy to install and offer innovative solutions to provide comfort and energy efficiency. Long term, equal value partnerships with our customers is an integral part of our approach.



INDEX

Saving energy



Insulating buildings is the easiest and most cost effective way to save energy and reduce fuel bills.

Buildings account for 40% of our energy consumption.

A great deal of this energy is lost through the fabric of the building. Insulation incorporated into floors, walls and roofs makes a significant contribution to a building's long-term energy performance. Insulation is fast to install and performs for the life of a building with no need for ongoing maintenance. In the drive to reduce carbon emissions, regulators and designers are increasingly turning to enhanced levels of thermal insulation.
Insulating with Supafil® Loft offers many benefits:

- Sustainability, by using recycled raw materials and being recyclable at end of life
- Non-combustibility and A1 fire classification, for enhanced safety
- Sound absorption properties, for protection from noise
- High insulation efficiency, for enhanced thermal comfort
- Energy saving, for reduced fuel bills
- Fast installation, reducing costs and increasing added value

Supafil® Loft is an unbonded, glass mineral wool insulation that's designed to be blown into pitched roofs from the inside of a house. Supafil Loft has optimal thermal properties and excellent coverage and blowing characteristics.

Supafil Loft @ 0.042 W/mK				
Declared thermal resistance level R m² K/W	**Thickness after settlement (mm)**	**Minimum installed thickness (mm)**	**Minimum coverage kg/²**	**Minimum bag usage rate bages per 100m²**
4.5	189	190	2.9	18.4
5.0	210	210	3.2	20.3
5.5	231	235	3.6	22.7
6.0	252	255	3.9	24.7
6.5	273	275	4.2	26.6
7.0	294	295	4.5	28.5
7.5	315	315	4.8	30.5
8.0	336	340	5.1	32.9
8.5	357	360	5.4	34.8
9.0	378	380	5.7	36.8
9.5	399	400	6.0	38.7
10.0	420	420	6.3	40.6
10.5	441	445	6.7	43.1
11.0	462	465	7.0	45.0
11.5	483	485	7.3	46.9
12.0	504	505	7.6	48.9

Product Quantities			
Product	**Packs per pallet**	**Pallets per load**	**Bag weight (kg)**
Supafil Loft	28	24	15.5

All dimensions are nominal

Blown installation for open lofts - step by step guide

1 Arrive on site prepared

- To ensure that the installation can be completed without disruption the following items are required as a minimum: This is to include:-
  - o Installation materials
  - o Ensure the blowing machine, switches and gauges are in good condition and appropriate for use with Supafil Loft
  - o Access equipment
  - o Quality check equipment
  - o General tool kit
  - o Safety and personal protective equipment
  - o Cleaning equipment

2 Survey the loft space

- Assess suitability and load bearing capability of loft to ensure it is suitable for the work activity.
- Measure and calculate the loft installation volume correcting for joists, water tanks, flues, and any other features. Ensure that the best, most accurate assessment of the installation volume is made, as this is used to calculate the overall installed density of the installation.
- Determine depth of wool required to meet customer request/ contract/regulation U-value.
- Check for electrical, TV, water, ventilation provisions and other features that need protection or shielding.

3 Prepare the loft for installation

- Protect eaves and shield ventilation paths to a minimum130mm above intended insulation height.
- Protect areas below and around the water tank and water installations to a minimum 50mm above intended insulation height. Do not insulate below water tanks unless they are in an elevated position.
- Shield electrical and TV cables.
- Protect loft hatch to a minimum 50mm above intended insulation height.
- Construct walkway(s) to ensure access to all required service areas.
- Position gauge tapes at intended insulation depth.

Blown installation for open lofts - step by step guide

4 Set up the blowing machine

- Advice on installation pipes.
  1. Ensure hose length is a minimum of 40 meters.
  2. Ensure hose diameter is a minimum of 75mm and where possible use 100mm.
  3. Try to avoid adding extension hoses, you will need to look at increasing the air pressure if extensions are added, also, they must be of the same diameter as the standard hose. If possible, re-locate the machine before adding extensions.
     Failure to do any of the items mentioned above could result in a higher installed density
- The insulation must be installed at a minimum of 15kg/m^3 to ensure it achieves its declared thermal conductivity value.
- During manufacture, the material quality is checked using typical blowing equipment and typical settings. This ensures its capability of achieving the minimum density value. These quality checks indicate that in a typical installation a range of 15kg/m^3 will be achievable.
- There are many possible influences on the installed density including type, set up, and condition of the blowing machinery, size, length and condition of delivery hose, blowing technique, installed depth, environment, and specific features of the area to be installed.
- In order to achieve the specified density range (i.e. 15 - 17kg/m^3) it is recommended that the machine is adjusted and specifically set up to deliver the correct installed density at the start of the installation.
  This can be done by:-
    - o Undertaking an initial installation density check by blowing a test area of known volume, weighing the material blown and calculating the density (see example calculation below).
    - o Measuring the blow rate by filling a hessian sack for a set time period and checking the time to install an initial known area of the installation (see example over page).
- Supafil Loft gives excellent thermal properties at low densities. This means that the machine settings will be different from those used with other higher density insulants such as cellulose and stone wool materials. Large capacity blowing machines with large hose diameters are recommended for this blowing application in which low material feed and medium to high air volume are the most appropriate settings.

EXAMPLE - Initial Installation Density Check

Test box volume: (length) 0.447m x (width) 0.447m x (depth) 0.5 m = $0.1m^3$
Required weight for 15 kg/m³: 1.5 kg (known due to the following calculation)

Density: $\frac{\text{Weight}}{\text{Volume}}$ $15kg/m^3 = \frac{\text{Target weight}}{0.1m^3}$ Target weight = $15kg/m^3 \times 0.1m^3$ Target weight = 1.5kg

As an example, if the actual material in the test box weighs 1.56 kg:
Actual density: $\frac{\text{Weight}}{\text{Volume}}$ Actual density = $\frac{1.56kg}{0.1m^3}$ Actual density = $15.6kg/m^3$

The actual density of $15.6kg/m^3$ is within the target range of 15 - $17m^3$ and would be acceptable.

Correct Fill Projection

It is essential when blowing Knauf blown wool into loft spaces that the material is projecting between 1.5m and 2m from the end of the pipe. If this is not the case then machine setting changes need to take place. They can be done by following the procedures below.

Blowing Machine Setup

1. Ensure use of internally ribbed pipe and not smooth internal pipe as this will affect the fibre flow and distribution within the pipe which may cause blockages in the pipe.
2. Increase the amount of air going through the pipe by shutting the air relief valve.
3. If the air relief valve is fully closed and still not producing the correct amount of air to project the material to the correct distance you should
   a) Increase the machine revs on the engine or
   b) Close the material feeder gate

You may have to do a combination of the two to get the right balance. We need to ensure you put enough air through the material to re-energise the wool to ensure the correct density.

Blown installation for open lofts - step by step guide

EXAMPLE - Blow Time Check

1. Calculating blow rate:

- Blow material into a bag for 30 seconds
- Weigh material taking into account weight of bag

As an example, if the actual net weight of material is 3.1kg:

Blow rate = 6.2kg per minute
(net weight x 2 in order to calculate the weight which would be blown in 60 seconds)

2. Calculating the volume of a test area:

As an example, a typical volume may be: 3.20m (length) x 3.00m (width) x 0.5m (thickness) = $4.5m^3$

3. Calculating the target installation time for the test area:

Target weight of blown material for density of $15kg/m^3$ is as follows:

$$\text{Density} = \frac{\text{Weight}}{\text{Volume}} \qquad 15kg/m^3 = \frac{\text{Target weight}}{4.5m^3} \qquad \text{Target weight} = 15kg/m^3 \times 4.5m^3 \qquad \text{Target weight} = 67.5kg$$

Installation time to blow in 67.5kg at a blow rate of 6.2kg per minute is as follows:

$$\text{Installation time} = \frac{\text{Target weight}}{\text{Blow rate}} \qquad \text{Installation time} = \frac{67.5kg}{6.2kg \text{ per minute}} \qquad \text{Installation time} = 10\text{mins } 53 \text{ secs}$$

4. Calculating the installed density of the test area:

As an example, if actual blow time for the test area was 11 min 22 secs:

Weight = Blow rate x Installation time Weight = $6.2kg/m^3$ x 11 mins 22 secs Weight = 70.4kg

$$\text{Actual density} = \frac{\text{Weight}}{\text{Volume}} \qquad \text{Actual density} = \frac{70.4kg}{4.5m^3} \qquad \text{Actual density} = 15.65kg/m^3$$

5. Calculating the estimated installation time for the whole loft to achieve a density of 15 - 17kg/m^3:

As an example, the volume of a loft may be: 10.00m (length) x 10.00m (width) x 0.50m (thickness) = $50m^3$

Target weight of blown material for density of $15kg/m^3$ is as follows:

$$\text{Density} = \frac{\text{Weight}}{\text{Volume}} \qquad 15kg/m^3 = \frac{\text{Target weight}}{50m^3} \qquad \text{Target weight} = 15kg/m^3 \times 50m^3 \qquad \text{Target weight} = 750kg$$

Installation time to blow in 750kg at a blow rate of 6.2kg per minute is as follows:

$$\text{Installation time} = \frac{\text{Target weight}}{\text{Blow rate}} \qquad \text{Installation time} = \frac{750kg}{6.2kg \text{ per minute}} \qquad \text{Installation time} = 2 \text{ hour } 58\text{secs}$$

Target weight of blown material for density of $17kg/m^3$ is as follows:

$$\text{Density} = \frac{\text{Weight}}{\text{Volume}} \qquad 17kg/m^3 = \frac{\text{Target weight}}{50m^3} \qquad \text{Target weight} = 17kg/m3 \times 50m^3 \qquad \text{Target weight} = 850kg$$

Installation time to blow in 850kg at a blow rate of 6.2kg per minute is as follows:

$$\text{Installation time} = \frac{\text{Target weight}}{\text{Blow rate}} \qquad \text{Installation time} = \frac{850kg}{6.2kg \text{ per minute}} \qquad \text{Installation time} = 2 \text{ hour } 17\text{mins } 06\text{secs}$$

Therefore, to achieve an installed density of 15-17kg/m^3 installation time for the whole loft area should be 2hour 58secs to 2 hour 17mins 06secs

It is also possible to calculate how many bags of material should be used to achieve the optimum installed density of 15 - $17kg/m^3$

5 Install the insulation

- Wear appropriate personal protective equipment (dust suit, face mask and goggles).
- Develop a blowing plan so that the loft can be filled systematically and efficiently to the target height using available access.
- In order to achieve the expected density range of 15 - 17kg/m^3 it is recommended that:-
    - o Blowing is undertaken from a horizontal hose at a distance of approximately 2 metres from the point at which the wool settles.
    - o The projection of wool at close proximity and directly into corners and around features is avoided as this can increase material usage.
    - o Drifting and uneven installation is avoided as this can increase material usage.
    - o The target insulation depth is regularly checked during the course of the installation using gauge tapes and the depth stick.
    - o In large volume installations the approximate usage of material, installation time and approximate area of installation are monitored throughout the course of the installation as a progressive guide to the achievement of the correct final installed density.

Installation Technique

1. The pipe should always be as straight as possible and not coiled up at the bottom of the loft hatch or by the blowing machine.
2. Where possible ensure the pipe is held horizontally during installation as the projection of fibre flow towards the floor will increase the installed density.
3. Do not interfere with the flow of fibre exiting from the installation pipe. (i.e. controlling fibre flow/direction by covering output with operators hand)- This will create higher density by compressing exiting fibre.
4. Do density checks at the start of the installation, repeat checks on a regular basis.

Blown installation for open lofts - step by step guide

EXAMPLE - Progressive time checks

Using the information from the blow rate check it is known that the total weight of material in the given loft should be between 750kg (to achieve a density of 15kg/m^3) and 850kg (to achieve a density of 17kg/m^3).

Material weight per bag of Supafil Loft = 15.5kg

Total number of bags required to achieve a density of 12kg/m^3 = $\frac{750kg}{15.5kg}$ = 48.38 bags

Total number of bags required to achieve a density of 14kg/m^3 = $\frac{850kg}{15.5kg}$ = 54.84 bags

Therefore, to achieve an optimum density of 15 - 17kg/m^3, a total of 48.38 to 54.84 bags should be used.

EXAMPLE - Progressive check on bag usage

1. Blowing rate

The known blowing rate from the earlier example is 6.2kg per minute

2. Calculate total weight of installed material

Monitor the amount of time taken to install an area of known volume – it is recommended to use a number of areas to confirm a consistent density distribution:

Area 1 = 10.00m (length) x 5.00m (width) x 0.50m (depth) = 25m^3

As an example, if this area took 61 minutes to install, total material weight would be:

6.2kg x 61 minutes = 378.2kg

Area 2 = 10.00m (length) x 6.00m (width) x 0.50m (depth) = 30m^3

As an example, if this area took 74 minutes to install, total material weight would be:

6.2kg x 74 minutes = 458.8kg

3. Calculating the installed density of the test area:

Area 1 = $\frac{\text{Actual density}}{\text{Volume}}$ = Weight Actual density = $\frac{378.2kg}{25m^3}$ Actual density = 15.13kg/m^3

Area 2 = $\frac{\text{Actual density}}{\text{Volume}}$ = Weight Actual density = $\frac{458.8kg}{30m^3}$ Actual density = 15.29kg/m^3

EXAMPLE

As an example, a loft area with 100m^2 (10m x 10m)

Depth of insulation = 500mm

Target insulated volume = Area x Depth = 100m^2 x 0.500m = 50m^3

If average measured depth (using 4 separate measurements) was = 507mm

Total loft volume = 100m^2 x 0.507m = 50.7 m^3

Adjustment for drifting and overblown fibre = +1.8 m^3

Total loft Volume = 52.5 m^3

If number of 15.5kg bags used = 52

Total insulation weight = 806 kg

Installed Density = 15.35 kg/m^3

6 Verify the final installed density

- Monitor the number of bags installed as the installation progresses and verify the total used at the end of the installation.
- Re-check the wool depth at 4 positions in the loft and correct the completed installation depth to achieve the correct minimum volume accounting for overblown or drifted areas.
- Calculate the wool weight, insulation volume and the installed density.

7 Make good

- Remove all equipment.
- Vacuum any spilled product or debris not contained in the loft area.
- Leave the site as it was found.
- Complete job/project declaration form to confirm installation details.

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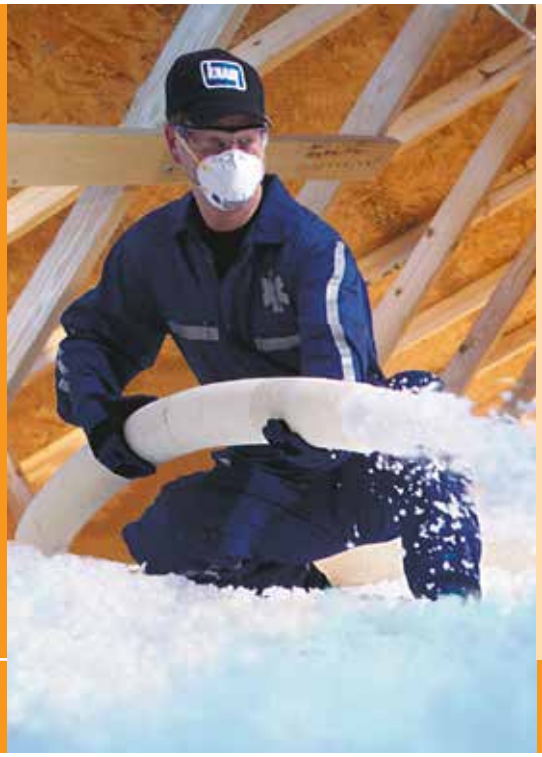

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