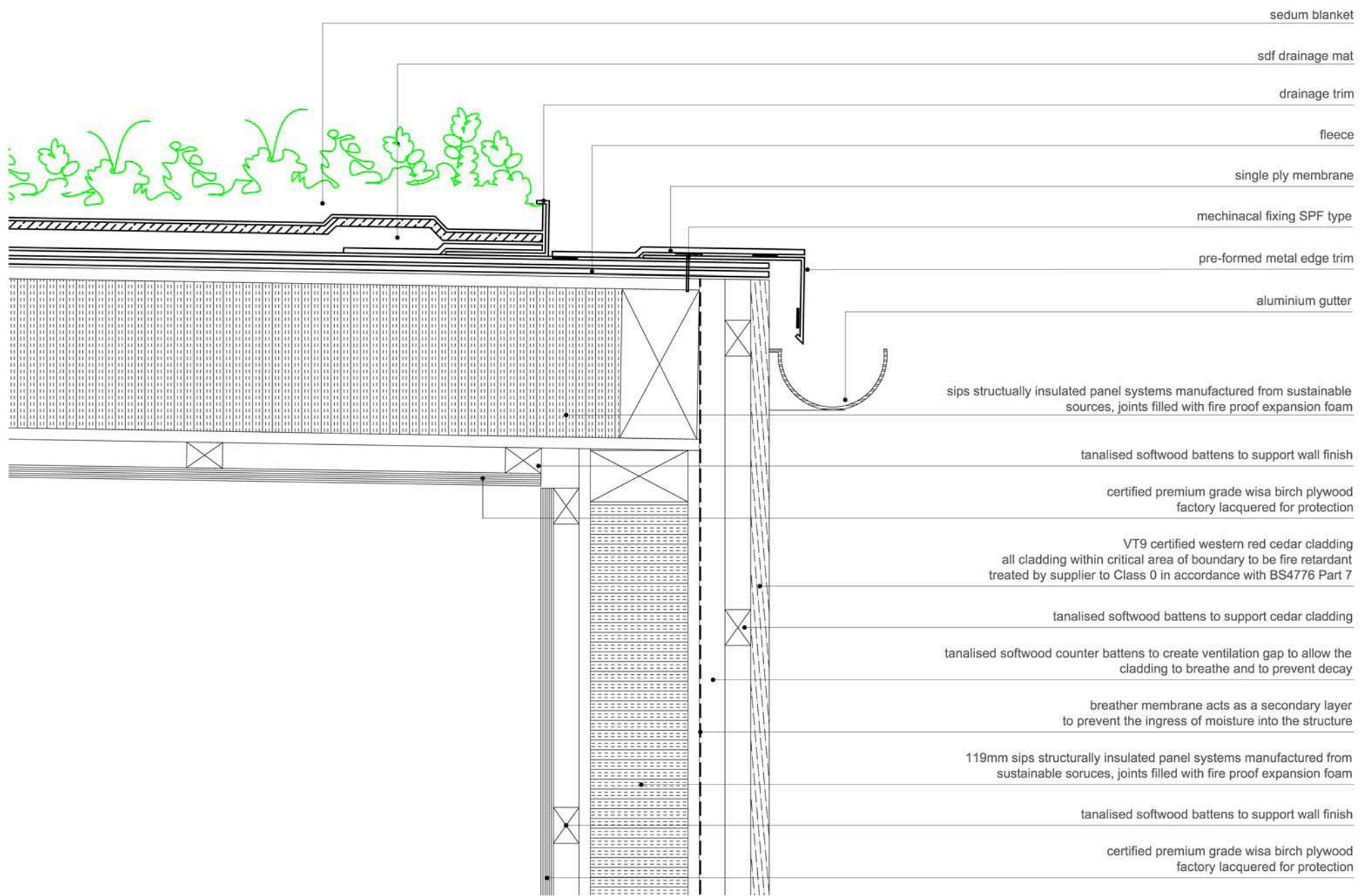


## Appendix 1.0

- 1.1 Drawing no. ECO.DTL.02 illustrating construction details of sedum roof
- 1.2 Outlining the extensive green system specified
- 1.3 Outlining the species within the green roof system
- 1.4 Outlining the maintenance of the green roof system

**Proposal for new outdoor structure within the rear garden of:  
26A Elsworthy Road, London NW3 3DL**





# Extensive Green Roofs

## The System

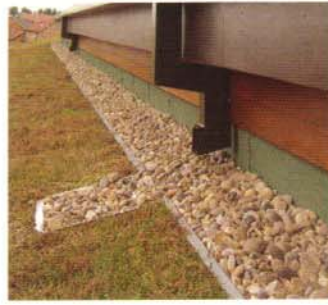
These are not roof top gardens for recreational use, but are primarily planted for aesthetic or ecological reasons, or increasingly, where planners or developers wish to utilise the benefits of a green roof system for the environment, the masking of buildings, and water attenuation.

Extensive greening involves the cultivation of vegetation that is wind, frost and drought resistant, requiring a minimum of maintenance. These types of plant are well suited to cope with the full range of conditions that they are likely to encounter at the locations in which they will be planted and are capable of self-propagation. These plants should be of central European flora stock, however local flora could be considered. In general, the species of plant will consist of mosses, succulents, herbaceous plants and grasses. This vegetation stock will undergo a natural process of change through the climatic seasons.

Apart from any watering which may be needed and appropriate feeding whilst the site is being created, all that will be required in the way of attention will be an annual or bi-annual inspection plus any action to deal with any problems that may be identified. As a rule, extensive green roof systems are the most economic to implement and maintain.



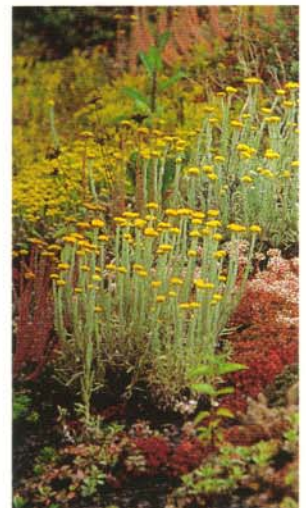




Developed in Germany over 25 years ago, this type of green roof system is very lightweight and is designed to be suitable for installation on to almost any type of structural deck, it is also the most suitable type of green roof for retrofit and refurbishment projects. Depending on the system used, extensive green roofs are suitable for roof slopes starting with a minimum pitch of 1 degree up to a maximum of 30 degrees.

Where an established vegetation finish is required for instant greening the use of pre-cultivated sedum blankets offer a fast and reliable solution. Other options include plug-planting or hydroplanting onto a lightweight growing medium, though these options can take 12-18 months to establish a reasonable surface cover, they do offer a more diverse range of planting with the ability for natural plant colonisation to take place from the surrounding area.

Extensive green roofs in most cases, once established, survive quite happily in the United Kingdom and Irish climates without the need for irrigation. However on pitched roofs over 10 degrees or in exposed locations, it is advisable to install a simple leaky pipe system at the ridge in case of periods of prolonged drought.



# Bauder

As requested please find attached list of Sedum species in our XF301 Sedum blanket. Please note that most Sedum.sp prefer dry, sunny aspects to partial shade.

- *Sedum album* – coral carpet \*
- *Sedum album* – 'bella d' Inverno
- *Sedum Kamtschaticum* – ellacombianum
- *Sedum Kamtschaticum* – weinstephaner gold
- *Sedum montanum orientale*
- *Sedum rupestri (reflexum)* \*
- *Sedum pulchellum*
- *Sedum acre* \*
- *Sedum sexangulare* \*
- *Sedum ewersie*
- *Sedum verticillatam*
- *Sedum spurium* – mesemlanthemum = Delosferma \*
- *Sedum spurium* – mesemlanthemum = hallii \*

**\*(shade tolerating species, but not permanent shade cast by buildings)**

Additional Sedum species not in our blanket but shade tolerating (available only as plug plants):

- *S floriferum*
- *S. hybridum*
- *S. cauticolum*

Please either contact the project's area technical sales manager Mr Mike Jones on 07885 291 982 or us if you have any further queries

Regards,

for and on behalf of Bauder Ltd

**Hermina Nina Doncic, BSc(Hons)**  
**Landscape Support Specialist (Green Roof Systems)**

Bauder Ltd . Broughton House. 26 Broughton Road, Ipswich. IP1 3QR

Tel: +44(0)1473 257671



## **MAINTENANCE PROCEDURE**

### **BAUDER EXTENSIVE GREEN ROOF SYSTEMS**

#### **What to Expect From A Bauder Extensive Green Roof System**

There is a common misconception that extensive green roofs and sedums plants in particular are always green, or that from ground level appear to resemble grass. This is not accurate. They consist mainly of low growing drought tolerant Sedum plants, but may also include other species such as Saxifrage, wild grasses, moss and even herbs.

The appearance of planting will change along with the seasonal weather cycles and this is perfectly natural. It is also expected that more grass or moss may be present during the wetter months, simply because the conditions exist for these species of plant to exist. However, they will tend to die off during the dry summer months, because the shallow free-draining substrate in the blanket does not hold sufficient moisture for these plants to survive.

There are approximately 8-10 different plant species in Bauder XF301 Sedum blanket, some being very similar in appearance to others, but perhaps being more 'drought tolerant' under certain conditions. Not every type of species will survive and the more dominant will be expected to prevail with time, simply because they adapt better to any given location. However, we would expect at least 50% of species to flourish regardless.

Another misconception is that extensive roofs are maintenance free. This is incorrect. They are 'low maintenance', but not 'no maintenance'. The Sedum blankets for example, contain little in the way of natural nutrient and so fertiliser must be applied at the required time to help the plants become resistant to weather and temperature extremes.

Extensive roofs that have a deeper substrate growing medium, with the vegetation provided from specifically chosen Plug plants or hydro-planting, will generally exhibit a greater variety of plant species that may also include grasses and herbs. Here it is expected that an increased amount of dead vegetation following flowering will occur and therefore the need for more maintenance to remove the dead seed heads.

Sedum plants absorb and store water in their leaves. They use this water to survive during times of drought. A moisture retention fleece is incorporated into the system beneath the blanket, but the function of this is to hold water after rainfall for sufficient time for the plants to take on the water via the roots. It is not a long-term water storage medium; so don't be too concerned if it is dry. Just check the leaves to see if they are fleshy and don't appear dried out. In winter, the plant appears to shrink back and the leaves become small and tight. This is because the plant has sufficient water present in the substrate, but will hold little so it is able to withstand frost.

## General Maintenance

General maintenance is normally carried out annually during springtime. However, certain tasks e.g. the removal of weeds or accumulated leaf litter, may need to be done during the Autumn, depending to some extent upon the surrounding environment i.e. trees, dependent upon the location of the roof.

The following procedures should be carried out as indicated below, in order to ensure the roof is maintained in good condition and to protect the validity of the guarantee.

### Basic roof related maintenance procedures:-

- 1 Ensure safe access can be gained to the roof and that relevant Health and Safety procedures are followed when working at roof level. Safety harness attachment points or man safe systems should always be used where provided.
- 2 Remove all debris and leaves from the roof surface, rainwater outlets, chutes, gutters, etc. All debris must be removed from the roof and not simply flushed down rainwater pipes. Roofs in the vicinity of taller trees will need more frequent maintenance. We recommend removing dead leaves during the spring and again in the autumn, to ensure that fallen leaves do not cover and suffocate the sedum plants.
- 3 Open the lid of the Inspection chambers and ensure that all rainwater outlets (including down pipes) are free from blockages and that water can flow freely.
- 4 Ensure that any protective metal flashings or termination bars remain securely fixed and in place.
- 5 Examine all mastic sealant and mortar pointing for signs of degradation, and repair or renew as necessary.
- 6 Where promenade tiles or paving slabs exist, ensure that they remain secure in position and in good condition.
- 7 Please ensure that any items of plant/equipment that may have been introduced to the roof, are sited on a suitable isolated slab and that any fixings that may have been used to secure them do not penetrate the waterproofing. Please contact Bauder for advice regarding suitability of slabs.
- 8 Report any signs of damage or degradation to Bauder immediately, so that arrangements can be made for remedial work to be carried out if necessary. It is recommended that a roof plan marked with co-ordinates be used to record the findings of the inspection. This will avoid confusion and provide an on-going record of roof performance, which can be compared year on year.
- 9 Works to adjoining areas - When carrying out maintenance to adjoining areas, care must be taken not to damage the system. For example, any solvent-based product allowed to wash down into the system will seriously de-stabilise the molecular structure of the bitumen causing it to fail. If this thought to be likely, then Bauder should be contacted so that they may advise. Chemical damage will invalidate the guarantee.
- 10 Alterations - Any alterations to the system that may affect its integrity will invalidate the guarantee. If such a situation should arise, then Bauder should be contacted so that they may advise on the alteration and how it should be incorporated without affecting the guarantee.



## **Plant related maintenance tasks required:-**

### **1 Plant encroachment.**

Any planting, which has encroached into drainage outlets, walkways and the vegetation barriers (pebbles), should be removed. This removed vegetation can be used to repair any bare patches if required (see below). If movement/settlement of the pebble vegetation barrier has occurred, then additional washed stone pebbles (similar to the existing) should be added.

### **2 Monitor the colour and rate of growth.**

The colour and rate of growth should be examined, to establish the health of the plants. It must be stressed that many things can affect the growth and colour of the sedum plants. Generally, plants tend to be greener in wetter mild conditions (springtime) and where the roof pitch is shallow.

During May, June and July the plants flower and you will see a mixture of colours - whites, pinks, yellows and even some purple. Some species of sedum blush red naturally during the summer and autumn, (e.g. Sedum album 'coral carpet') and so the roof takes on a more 'red/brown appearance. This is particularly the case once plants have flowered, leaving remnants of dry brown seed heads. The best visible indication of health is if the leaves are fleshy and contain plenty of water.

When exposed to extreme conditions, sedum plants have a tendency to turn a deep red colour. Please note that this is a natural phenomenon and that this behaviour is important to the plant to acclimatise for surviving through a cold winter or hot summer. This usually occurs during climate extremes e.g. extreme hot or cold weather, prolonged drought or in very exposed conditions or when the plants are in distress, for example through lack of nutrient (fertiliser).

Plants affected by a severe lack of water shrink back and the leaves will tend to be small and very tight. In distress the plants change gradually to a deep crimson red. If an

Irrigation system is fitted, it is best to run it only during prolonged dry weather for limited periods – see 'Irrigation' information below,

If the plants are in this condition, but have received regular rainfall, then the likely problem is lack of nutrient and fertiliser should be applied.

In shade, Sedums tend to grow greener and leggier. In general, sedums do not like permanent shade, so either avoid areas under larger trees or surrounded by buildings, or make it possible for more natural light to reach the roof. There may be noticeable differences in the growth of similar sedums in a different area of the same roof. This emphasises the living nature of each individual roof.

If problems are suspected, Bauder may be contacted for advice and if necessary, a suitable course of action.

### **3 Weeding.**

Sedum blankets will at times include moss and grass. If considered excessive, provision should be made to remove any unwanted vegetation, e.g. weeds/ grasses/ saplings. These can be removed manually by hand, or by using a 'spot weed wipe', although care should be taken to follow specific instructions regarding the use of any proprietary products. Weeds are a problem of aesthetics rather than damaging the roof, but large areas of weed or grass should be removed, as should saplings. After removal of weeds treat area as if it were a bare patch (see below).



#### **4 Repairing Bare Patches.**

Bare patches can be repaired easily, but only during the growing season (ideally during March/April or late August until the end of September). Take clumps of Sedum from areas of abundant growth and place on bare patches pressing gently into the soil. They can then have a light sprinkling of sand mixed with compost or Bauder substrate to improve uptake of cuttings.

The Sedum cuttings will grow best if this is carried out during spring maintenance and kept moist and free of temperature extremes (frost and intense sun). Compost or topsoil can be used for smaller bare patches, but contact Bauder for advice or to buy specialised substrate.

#### **5 Fertiliser for Bauder XF301 sedum blankets**

Bauder Sedum Blankets are grown in a very shallow growing medium that contains very little nutrient, so the annual application of fertiliser is crucial to ensure that the plants remain healthy. Fertiliser should be applied during March/April. It is important to carry out this task during this time, because it helps to prepare the plants for extreme weather conditions and flowering and also because it allows the different species to gain all their nutrients without competing against each other.

A good organic fertiliser called Fertigrün can be obtained direct from Bauder in 25kg bags (each bag sufficient for covering 312.5m<sup>2</sup>). This should be applied at the rate of 80gm/m<sup>2</sup>. Small areas (up to 30m<sup>2</sup>) can be applied using a hand held spreader or strewn by hand from a bucket. Fertilising larger roofs should be done using a trolley applicator, which can be purchased direct from Bauder. Apply fertiliser at the given rate written on bag.

Fertiliser pellets settling on damp leaves may have a detrimental effect i.e. burning the leaves. It is therefore recommended that the fertiliser is lightly 'watered in' immediately after application. Dung based organic fertilisers should be avoided.

#### **6 Fertiliser for either plug planted or hydro-planted extensive green roofs**

Use a 6-month slow release chemical fertiliser with an NPK ratio of 15, 9, 14 respectively, such as Plantacote Plus 6M, applied at a coverage rate of 50gm/m<sup>2</sup>. Application: Small areas (up to 30m<sup>2</sup>) can be applied using a hand held spreader or strewn by hand from a bucket. Fertilising larger roofs should be done using a trolley applicator, which can be purchased direct from Bauder. Apply fertiliser at the given rate written on bag. This product can also be used on sedum blankets.

#### **7 Irrigation**

Sedum plants absorb and store water in their leaves. They use this water to survive during times of drought. A moisture retention fleece is incorporated into the system beneath the blanket, but the function of this is to hold water after rainfall for sufficient time for the plants to take on the water. It is not a water storage medium; so don't be concerned if it is dry. Check the leaves to see if they are fleshy and not dried out.

Generally speaking, sedum roofs require no artificial watering following establishment. However, for sedum blanket systems only, we recommend provision for installing a 'leaky pipe' or drip line irrigation system where the following conditions apply: -

All south facing roof slopes exceeding 25° pitch.

Very windy or exposed site locations (wind accelerates drying out of the blanket)

Sites up to 50 miles inland of the east coast of the UK mainland (due to less frequent rainfall), where the roof pitch exceeds 9 degrees.

Cont...

Leaky pipe or drip line irrigation systems are relatively inexpensive and considering the unpredictable weather patterns over the past 15 years and the extremely dry year experienced in 2003, we feel that this small additional cost is a really worthwhile investment to maintain your sedum roof finish in top condition.

Irrigation should only be activated during prolonged periods of hot, dry weather, or if the sedum plants are showing signs of distress. The irrigation system is best activated for 2-3 hours, preferably at dawn or dusk to minimize unnecessary evaporation. Then once every 4-6 days for the duration of the hot weather conditions. This can be achieved using an inexpensive battery powered programmable timer

*Please note - continuous daily watering is neither recommended or necessary, as this will only promote weeds and other unwanted plant species.*

### **Advice and Supply of Irrigation Equipment**

Access Irrigation Ltd is one of the country's longest established irrigation specialists and has considerable experience in many types of irrigation, including green roofs. They are happy to provide irrigation advice on any Bauder project and can supply a wide range of irrigation products. Please contact:-

Access Irrigation Ltd  
Crick  
Northampton  
NN6 7XS

T: 01788 823811    F: 01788 824256    E: [sales@access-irrigation.co.uk](mailto:sales@access-irrigation.co.uk)  
[www.access-irrigation.co.uk](http://www.access-irrigation.co.uk)

### **Support**

Extensive roofs require only minimal maintenance and we are happy to offer advice on issues concerning your green roof and how to keep it in good order. We believe our products and systems are of the highest standard and we are happy to talk through any queries or concerns. It can help greatly to provide a photograph to accompany any such queries.

*Please note: In the event of any query arising which it is thought may affect the condition of the system, then Bauder should be contacted at the address below. We cannot accept responsibility for any problem or failure due to use outside those parameters for which the system was designed or 'acts of god' beyond our control e.g. extreme weather conditions or damage through pests.*

**Bauder Ltd**  
Broughton House, Broughton Road, Ipswich, Suffolk IP1 3QR England  
T: +44 (0)1473 257671    F: +44 (0)1473 230761    E: [technical@bauder.co.uk](mailto:technical@bauder.co.uk)  
[www.bauder.co.uk](http://www.bauder.co.uk)