Growth driven. Future proof.
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Dear reader,

You are holding Phormium’s complete technical reference book for climate screens.

Have you ever wondered why screens are needed? Do you sometimes find it hard to choose a certain type of screen for your customers? This book will provide you all the answers. You will find everything you need to know about our company, about our products and also a comparison with other products on the market.

This book can serve as a sales tool with fact sheets, as reference book or even as a training manual for new coworkers.

Of course, our sales team is available to answer any other question you may still have. Please reach out to us through our website or via your sales contact.

Enjoy reading!

The Phormium team
The Phormium brand in time

Textile company Phormium
The company started by weaving natural jute for packaging. Phormium is the type of flax which is used.

1925

1977

First Phormium screens
Introduction of Phormium in the horticultural sector.

1986

Phormium becomes a part of Low & Bonar
Followed by a complete rebranding, Phormium became part of (Low&) Bonar.

2017

2018

Re-introduction Phormium
The globally recognized brand for agrotexiles is back.

2018

Takeover by IFG
Low & Bonar’s agrotech division becomes part of IFG.

ABOUT PHORMIUM
Phormium
Growth driven. Future proof.

PHORMIUM PLANT BELGIUM

- Selling in more than 60 countries
- Production of all
  - Climate screens
  - Biobased ground covers
  - Mushroom & compost nets
  - Industrial fabrics
- Active in niches with growth
- Reinvestment in R&D >5%
- Focused on significant organic growth opportunities
- Approx. 200 employees
- PLC. quoted on Stockholm Stock Echange
  * Part of the IFG/Duroc Group

Growth driven. Future proof.
**Unique technology**

Phormium screens are unique because of their **woven technology**. Compared to knitted screens, this has numerous benefits:

<table>
<thead>
<tr>
<th>Woven screen</th>
<th>Knitted screen</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Image of woven screen" /></td>
<td><img src="image2" alt="Image of knitted screen" /></td>
</tr>
</tbody>
</table>

**Tapes in two directions:**
- High dimensional stability over time.
- High insulation capacity, even at end-of-life -> **emissivity is up to 2X lower** than in knitted screens.*

**Woven screen**
- Low dimensional stability: higher chance of twisting tapes during installation and operation.
- Lower insulation capacity.

**Knitted screen**
- High dimensional stability over time.
- High insulation capacity, even at end-of-life -> **emissivity is up to 2X lower** than in knitted screens.*

**Low shrinkage** (max 1%) thanks to thermal fixation of the tapes.

**High mechanical properties thanks to HDPE**
- High **strength**, up to 5X higher than knitted equivalent -> longer product life.
- Long product life: **6 year warranty** (NL).

**Reduced product life due to the use of e.g. LDPE**
- Warranty only 5 years (NL).

**Up to 25% more active moisture transport** thanks to acrylic yarns without energy loss.

**Low moisture transport due to the use of polyester yarns.**

**Cooling capacity up to 38% higher** in open screens.

**Lower cooling capacity due to high amount of yarn crossings.**

**Darkest blackout on the market.**

**More light penetration because of open knitted structure.**

*As tested by Wageningen University*
PHORMIUM’S UNIQUE TECHNOLOGY

Control over the production process

The entire production process takes place in Europe:

◆ Fully controlled production process from raw materials to finished goods
◆ Extensive quality control throughout the process
◆ In-house R&D department and testing lab

FR behaviour

As safety is one of Phormium’s highest priorities, the PhormiTex screens comply to the highest European and North American FR standards. Please check our technical data sheets for more information.

Extensive warranty

◆ Our warranty is based on the amount of UV light (~sunlight) our screens can handle, since UV light is one of the most important factors for degradation.

◆ The intensity of UV radiation is measured in kLY (kilo-Langley), a unit which represents how much UV radiation energy falls on a m² per year. On the map below, one can see how much UV radiation normally falls in a certain region of the world.

  E.g. In The Netherlands, the radiation is 100 kLY per year. The warranty for PhormiTex Bright is 600 kLY. This means that PhormiTex Bright has a warranty period of 6 years when installed in The Netherlands.
HOW TO CHOOSE WHICH SCREEN IS REQUIRED?

**ENERGY SAVING**
- High humidity needed?
  - Yes: PhormiTex Clear
  - No: Diffuse light needed?
    - Yes: PhormiTex Super
    - No: PhormiTex Bright

**SHADING**
- Maximum cooling? Diffuse light?
  - Maximum cooling: PH O
  - Diffuse light: Clima+ O or PhormiTex Lumina O

**BOTH ENERGY SAVING & SHADING**
- OR

**DARKENING**
- PhormiTex Eclipse or PH 1+98

**DIFFUSE LIGHT**
- Maximum energy saving? Diffuse light?
  - Maximum energy saving: PH
  - Diffuse light: Clima+ or PhormiTex Lumina
<table>
<thead>
<tr>
<th>Type</th>
<th>Standard widths (cm)</th>
<th>FR**</th>
<th>Energy saving %</th>
<th>Shading %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENERGY SAVING SCREENS</strong></td>
<td></td>
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<tr>
<td>Phormitex Clear</td>
<td>325 *</td>
<td>430</td>
<td>480</td>
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<tr>
<td>Phormitex Bright</td>
<td>325 400</td>
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<tr>
<td>Phormitex Super</td>
<td>325 *</td>
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<td><strong>OPEN SHADING SCREENS</strong></td>
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<tr>
<td>Phormitex Lumina 30 O</td>
<td>325 *</td>
<td>430</td>
<td>480</td>
<td>525</td>
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<tr>
<td>Phormitex Lumina 40 O</td>
<td>325 *</td>
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<td>Phormitex Lumina 50 O</td>
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<td>Phormitex Lumina 60 O</td>
<td>325 *</td>
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<td>Clima+ 35 O</td>
<td>325 *</td>
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<td>Clima+ 45 O</td>
<td>325 *</td>
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<td>Clima+ 55 O</td>
<td>325 *</td>
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<td>Clima+ 65 O</td>
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<td>PH 55 O</td>
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<td><strong>CLOSED SHADING SCREENS</strong></td>
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<td>Phormitex Lumina 30</td>
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<td>Phormitex Lumina 40</td>
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<td>Phormitex Lumina 50</td>
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<td>Phormitex Lumina 60</td>
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<td>Clima+ 35</td>
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<td>Clima+ 45</td>
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<td>Phormitex 44 (B)</td>
<td>335(B) *</td>
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<td>430(B)</td>
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<tr>
<td>Phormitex 55 (B)</td>
<td>335(B) 400</td>
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<td>475</td>
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<tr>
<td>Phormitex 66 (B)</td>
<td>335(B) 400</td>
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<td>475</td>
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<td>Phormitex 77 (B)</td>
<td>335(B) 400</td>
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<tr>
<td>PH 44 (B)</td>
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<td>PH 55 (B)</td>
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<td>PH 77 (B)</td>
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<td>430(B)</td>
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<td><strong>BLACK-OUT SCREENS</strong></td>
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<tr>
<td>Phormitex Eclipse 98 + 1</td>
<td>325 400</td>
<td>430</td>
<td>480</td>
<td>530</td>
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<tr>
<td>Phormitex Eclipse 98 + 98</td>
<td>325 400</td>
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<tr>
<td>PH 1</td>
<td>325 400</td>
<td>430</td>
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<td>530</td>
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<td>PH 1 + PH 1</td>
<td>325 400</td>
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<td>PH 98 + PH 1</td>
<td>325 400</td>
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<td>PH 98 + PH 98</td>
<td>325 400</td>
<td>430</td>
<td>480</td>
<td>530</td>
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<tr>
<td><strong>GABLE SCREENS</strong></td>
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<tr>
<td>Phormilux Outdoor</td>
<td>*</td>
<td>230</td>
<td>*</td>
<td>270</td>
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<tr>
<td>PHL 20</td>
<td>190 210</td>
<td>230</td>
<td>250</td>
<td>270</td>
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<tr>
<td>Phormitex PHL 20</td>
<td>190 210</td>
<td>230</td>
<td>250</td>
<td>270</td>
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<tr>
<td>PHL 55</td>
<td>190 *</td>
<td>230</td>
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</tr>
<tr>
<td>PHL WIT</td>
<td>190 210</td>
<td>230</td>
<td>250</td>
<td>270</td>
</tr>
<tr>
<td>Gev-Al/Wit</td>
<td>190 210</td>
<td>230</td>
<td>250</td>
<td>270</td>
</tr>
<tr>
<td>Phormitex Crystal V</td>
<td>190 210</td>
<td>230</td>
<td>250</td>
<td>270</td>
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</tbody>
</table>

* On demand
** Flame Retardant
Conserve energy

Screens save energy by reducing the heat loss surface area, providing an extra insulation barrier and trapping a layer of dead air on both sides of the screen material. If the material contains some aluminum, the infrared part of the heat within the greenhouse will be reflected towards the plants reducing heat loss another few percent. A warm overhead surface slows heat transfer from plants resulting in higher canopy temperature and lower chance of condensation.

Installing a screen:
- Reducing heat loss surface area
- Adding an insulation barrier
- Creating a layer of dead air on both sides of the screen

Higher canopy temperature
Lower chance of condensation
WHY SCREENS?

Shade or black-out

Screens can avoid excess light on your plants, whether they need a little shading or complete black-out like short-day plants.

Humidity Control

Screens significantly reduce excess humidity, reducing the risk for diseases.

Flexibility

A screen installation gives you flexibility. It’s not fixed. You can open and close it whenever you want and as much as you want.

Light reflection

A screen can be used to reflect the assimilation lights. This increases the amount of light and reduces light pollution.

Reduced Insurance Premium

A little-known benefit of screens; they may get you a break on your insurance. Fire-rated products, which resist or lower the risk of fire, are an appealing add-on for many insurance adjustors analyzing a greenhouse business. You put it in for energy savings, but it’s worth asking if you can get additional benefits in another area!

Keep Workers Happy

Worker comfort takes on new emphasis. Screens can help exponentially. Using high-diffusion screens can decrease interior greenhouse temperatures by 5 °C almost immediately.
ENERGY SAVING

Why Phormium?

Energy saving
Due to the unique woven technology, the screen remains closed over time. Even if a tape would twist or be removed, Phormium’s screens remain closed. In a knitted screen, an opening is created.

Optimal humidity transfer
◆ High humidity transfer: maximal humidity transport combined with minimal energy loss
◆ The screens PhormiTex Bright or PhormiTex Super have a network of acrylic yarns which enable a constant moisture transport through the screen.

In woven screens, a voluminous yarn can be used to maximize humidity transport, while minimizing convection through the screen.

◆ Low humidity transfer:
◆ PhormiTex Clear allows you to create a humid climate for young plants or to fully steer the climate if one has other dehumidification options.
ENERGY SAVING

Strength
Phormium uses HDPE (High Density Poly-Ethylene) for its tapes. HDPE is 2X stronger than the LDPE used in conventional screens.

<table>
<thead>
<tr>
<th>PhormiTex Bright</th>
<th>Knitted alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength: 10.69 kN/m</td>
<td>Tensile strength: 5.12 kN/m</td>
</tr>
</tbody>
</table>

What type of energy screen to choose?

Transparent screens: maximum screening hours
With a transparent screen, one chooses for maximum screening hours. A transparent screen allows using the screen with a minimal loss of sunlight. One can keep the screen closed in the morning or during cold days.

Night screen: High amount of alu -> high energy saving during the night!
Choose maximum insulation by utilizing a ‘night screen’, a highly insulating screen, which is (mainly) used during the night.
Pick the screen with the highest energy saving capacity (e.g. PhormiTex 77 or PH 77) to save the maximum amount of energy during the night and open it soon after sunrise. (See section about closed shading screens).

Next generation growing: saving energy while obtaining optimal yields

◆ A homogenous climate is key to optimizing production.
◆ One can grow at a higher Relative Humidity (RH) with a lower use of energy -> the risk of condensation on the plant decreases.
◆ When growing at a higher RH, control of humidity is important. Thanks to Phormium’s screens, humidity is transported through the screen and condensates against the greenhouse cover/roof. One can even increase the humidity transport by opening the windows (and keeping the screens closed).
◆ The climate needs to be active and to stimulate plant evaporation for the plant to grow.

Recommended gable screen
Phormium offers reinforced gable screens PhormiTex Crystal V, PhormiTex PHL 20, PHL 20.

PHORMIUM SCREENS:
◆ Durable & strong
◆ Superior energy saving
◆ Optimal humidity transport
◆ Guaranteed European quality
Why Phormium open screens?

Maximal cooling - Superior strength

<table>
<thead>
<tr>
<th>PhormiTex Lumina 40 O</th>
<th>Knitted alternative, 40% shading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air permeability: 3872 l/m²*s</td>
<td>Air permeability: 2390 l/m²*s</td>
</tr>
<tr>
<td>Tensile strength: 15.03 kN/m</td>
<td>Tensile strength: 2.94 kN/m</td>
</tr>
</tbody>
</table>

38% higher ventilation capacity
5x stronger
OPEN SHADING SCREENS

Aluminum vs Diffuse screens

Diffuse screens

- Shade the light away -> avoids burning the top of the plants.
- Light is spread evenly -> high and constant yields over the complete area.

Wageningen University (Hemming et al., 2008) has shown that diffuse light ensures a better distribution of light with cucumbers.
  - Less light reaching the top -> less light saturation
  - Lower temperature at the top -> ensures better photosynthesis
  - More light goes to the lower leaves

This can generate 10% more production

Similar research with tomatoes has shown 9% higher crop yield in the diffuse compartments of the greenhouse (compared to the non-diffuse areas).

Diffuse screens decrease the bud temperature and the number of burned leaves with roses (Kempkes et al., 2012).

Aluminum screens

- Shade the sunlight away -> maximum cooling effect due to its highly reflective aluminum tapes.
- Cold nights/clear skies -> reduce the radiation heat losses which would cause condensation on the top of the plants. This also helps to prevent frost damage in cold crops.

Recommended gable screen

Phormium recommends installing PHL 55.

PHORMIUM SCREENS:

- Durable & strong
- Maximal cooling
- Guaranteed European quality
Why Phormium’s combi-screens?

The perfect all-in-one screen

One single screen can be used for both shading and energy saving.

Energy saving

Due to the unique woven technology, the screen remains closed over time. The images below exhibit that, even if you would remove a tape, Phormium’s screens remain closed. In a knitted screen, an opening is created.

Phormium’s energy saving screens

Knitted fabric

The unique woven 2-dimensional structure results in a high energy saving capacity; even at the end of product life.

Optimal humidity transfer

- The acrylic yarns guarantee a high humidity transport when the screens are closed.
- This reduces the disease burden and falling drops on the plants.

Yarns in a woven screen

Yarns in a conventional screen

In woven screens, a voluminous yarn can be used to maximize humidity transport, while minimizing convection through the screen.

In a knitted screen, a strong, thin yarn has to be used.
CLOSED SHADING SCREENS

Aluminum vs Diffuse screens

Diffuse screens

- Shade the light away -> avoids burning the top of the plants.
- Light is spread evenly -> high and constant yields over the complete area.

University of Wageningen (Hemming et al., 2008) has shown that diffuse light ensures a better distribution of light with cucumbers.
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Aluminum screens

- Shade the sunlight away -> maximum cooling effect due to its highly reflective aluminum tapes.
- Cold nights/clear skies -> reduce the radiation heat losses which would cause condensation on the top of the plants. (So called night screens).

Recommended gable screen

Phormium recommends installing PHL 55.

PHORMIUM SCREENS:

- Durable & strong
- Superior Energy saving
- Optimal Humidity transport
- Guaranteed European quality
## Why Phormium?

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<th>Knitted screen</th>
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<td>◆ High dimensional stability</td>
<td>◆ Low dimensional stability: higher chance of twisting tapes during installation and operation</td>
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<tr>
<td></td>
<td>◆ High insulation capacity, even at end-of-life</td>
<td>◆ Lower insulation capacity</td>
</tr>
<tr>
<td></td>
<td>High strength: <strong>4X stronger</strong> than knitted alternative</td>
<td>◆ Lower strength</td>
</tr>
<tr>
<td>Low shrinkage (max 1%)</td>
<td>(thanks to thermal fixation of the tapes.)</td>
<td>Higher shrinkage</td>
</tr>
<tr>
<td>Long product life: <strong>6 year warranty</strong> (NL)</td>
<td></td>
<td>Warranty only 5 years (NL)</td>
</tr>
<tr>
<td>High moisture transport</td>
<td>thanks to acrylic yarns.</td>
<td>Low moisture transport due to the use of polyester yarns.</td>
</tr>
</tbody>
</table>
BLACK OUT SCREENS

Ultimate darkening

Light penetration through a PhormiTex Eclipse 98 (left) and its knitted alternative

Optimal humidity transfer

- In all closed Phormium screens a network of acrylic yarns allow humidity transport without losing warmth.

Yarns in a woven screen

In woven screens, a voluminous yarn can be used to maximize humidity transport, while minimizing convection through the screen.

Yarns in a conventional screen

In a knitted screen, a strong, thin yarn has to be used.

Growth driven. Future proof.
Active Humidity Control with PhormiTex Eclipse Dry

To answer the request for high humidity transport without energy loss, Phormium's Research Center has developed PhormiTex Eclipse Dry: a 3D woven darkening screen with active humidity control.

Benefits

- Active humidity control
- Ease of installation: two screens are woven into 1 3D fabric -> no sliding of screens
- No energy loss
- Darkest black
Aluminum screens

- Benefits of aluminum facing the sun: cooling effect
- Benefits of aluminum facing the plants:
  - Insulation
  - Heat and light reflection

What type of screen to choose

PhormiTex Eclipse 1+1: Best value for money on the market
PhormiTex Eclipse 1+1+White: Best value for money with light reflection
PhormiTex Eclipse 98+1: The world’s most preferred black-out system
PhormiTex Eclipse 98+98: Complete black-out + maximum energy saving + reflection of assimilation light
PhormiTex Eclipse Dry +1: The world’s darkest screen: The preferred cannabis screen
PhormiTex Eclipse Dry + White: The preferred cannabis screen with light reflection

* Non FR options are available

Recommended gable screen

Phormium recommends installing PHL White or Gev Al/White.

PHORMIUM SCREENS:

- Durable & strong
- Maximum darkening
- Active Humidity control
- Guaranteed European quality
MULTIPLE SCREEN INSTALLATIONS: OPTIMAL CLIMATE CONTROL

Cold nights

Use both screens during cold nights

Mornings

Use a transparent screen in the morning: start by opening the shading screen with a small gap in order to avoid cold on the plants.

Once the shading screen is fully opened, the transparent screen should stay fully closed as long as possible to avoid energy losses.

Warm days

Shading during sunny days while allowing maximal cooling.
Screen advice

We offer comprehensive free screen advice tailored to your specific project. Our team will work closely with you to understand your requirements. We can recommend the best solution(s) for your specific project and supply the technical specifications necessary for your customized system.

On our website (www.phormium.com/en/screen-advice) you can fill out a form to collect all necessary information so we can provide a detailed and tailored advice.

Modelling energy saving and screening hours

Together with DLV Glas & Energy, Phormium developed an application to model energy saving and screening hours for a specific project.
QUALITY MANAGEMENT SYSTEM CERTIFICATE
ISO 9001 : 2015

IFG Cresco

located at Weverslaan 15, - 9160 Lokeren - Belgïe, has been examined on 2017-09-29
and found in conformity with the ISO 9001, edition 2015, standard for the following application field:

Development, production and sale of a standard range of textiles such as agro-textiles, textiles for the
construction sector and geosynthetics as well as similar products developed to the specificication of the customer.

This certificate has been issued by BQA nv according to its quality manual concerning the certification of
systems, and after concluding the contract of certification N° CER_JB_QMS2015_02-10-2017_734_N
under which the company accepts a regular control of its management system.

Certificate N° BQA_QMS019_C_2017734
Valid until 2021-09-28

D. SIMOENS
Director

Any person aware of misuse of this certificate may address himself to BQA nv. This certificate may only be disclosed in its entirety.
BQA nv – Technologiepark 7 - 9120 Gent-Zwijnaarde
Growth driven. Future proof.
Growth driven. Future proof.