STARFLEX
Modular fibre optic system
STARFLEX
Modular fibre optic system
The power of STARFLEX
Creativity and professionalism

Fibre optic technology

Ettore Sottsass, one of the most eminent Italian design masters, presented treasures by the legendary French jeweller Cartier under the title “Art de Cartier” – historical precious items, elaborate jewellery, watches and accessories from the company’s own collection. These valuable pieces sparkled in showcases illuminated by Zumtobel Staff’s STARFLEX system. The exhibition was shown at the Vitra Design Museum in Berlin and the Palazzo Reale in Milan, and will move to Tokyo in 2004.

Fibre optic technology is one of the most fascinating proven ways of accomplishing precise, technically advanced lighting. Its broad spectrum of applications includes lighting in shops, museums and art galleries as well as use in hotels, catering areas and wellness centres.

Separating light from electricity and from UV and IR components opens up infinite possibilities when it comes to presenting invaluable treasures in gentle, perfect light.
Zumtobel Staff’s STARFLEX fibre optic system represents the latest generation of light guide technology. It is distinguished by the following features:

- Wide range of light engines from 35 W to 250 W for use indoors as well as in damp and temperature-controlled areas and outdoor locations;
- Internal system protection with electronic fan control and temperature sensor;
- Flexible; can be adapted to suit requirements of any specific project thanks to modular design;
- Logos or slides can be projected using light guide technology;
- New splicing technique to pre-assemble PMMA fibres now enables use of high-wattage, extremely powerful light engines;
- Colour temperature can be adapted to suit specific project requirements.
STARFLEX for indoor and outdoor applications
Fascinating and versatile
Lighting installation, Architect Klessman, Lemgo, Germany.
STARFLEX for art and culture
Gentle and precise

Necklace, “Art de Cartier” exhibition presented by Ettore Sottsass, Vitra Design Museum, Berlin, Germany
Sarcophagus of Charles the Great, "Art and Culture during the time of the Carolingians", Archiepiscopal Diocesan Museum, Paderborn, Germany
STARFLEX for presentation and retail
Conspicuous and enticing

7 Swabians Pharmacy, Dr. Renschler, Laupheim, Germany

Transparent factory, Volkswagen AG, Dresden, Germany
7 Swabians Pharmacy, Dr. Renschler, Laupheim, Germany
STARFLEX for wellness and fitness
Luxurious and relaxing

Bar, Hotel Riders Palace, Laax, Switzerland

Restaurant Lindenlife, Berlin, Germany
Hotel room, Hotel Riders Palace, Laax, Switzerland
Three components
for fascinating lighting effects

Modular fibre optic system

The main components of the light guide system combine three different technologies: the light engine which produces the light; the optical fibre which carries the light, and the light outlet to achieve a defined lighting pattern. The quality of the entire system depends on each of these individual components. This is why Zumtobel Staff adheres to only the very highest quality standards in order to achieve the best possible results.

Light engine

Several factors determine the quality of a light engine:
• The optical system which feeds the maximum possible luminous flux into the connector via the reflector;
• Efficient ventilation which ideally operates silently and prolongs the service life of the light source, electronic components and optical fibres;
• Flexibility for the user: modular accessories modify the light in terms of colour, brightness and colour temperature;
• Optional facility allowing control via all existing bus systems.

Optical fibres

In the case of optical fibres, a distinction is made between glass fibres and PMMA fibres made of plastic. There is further classification into side-radiating and terminal light emission fibres. Here, too, clear quality criteria apply:
• Glass optical fibres are non-flammable, and the Megolon sheathing of PMMA fibres is fire-retardant;
• Side-radiating PMMA fibres have excellent ability to withstand UV and offer uniform, intensive radiation characteristics along their entire length;
• Reasonably resistant to chlorine and algae;
• Fibre connector can be pre-assembled by splicing or crimping for high-wattage, extremely powerful light engines;
• Colour temperature can be adapted to suit specific project requirements.

Light outlets

A broad selection of light outlets ensures maximum flexibility and encourages creative use of STARFLEX. All the light outlets have several features in common – attractive design, simple handling and great functionality.
• Fixed and pivoting recessed light outlets;
• Pivoting light outlets having different radiation characteristics;
• Light outlets with IP protection;
• Light tube systems;
• Projection heads.
Fascinating lighting effects

STARFLEX offers an abundance of application possibilities ranging from starry sky effects through to fascinating light and water compositions. Thanks to its versatility, the system is suitable for outdoor as well as indoor use.

Projection

STARFLEX can be used to throw light statically or dynamically in geometric shapes. Lighting inserts or slides are used to project messages onto various surfaces just like images.

Extraordinary lighting effects

Combining light and water produces captivating effects, and separating light from electricity delivers “liquid” light safely as well as ensuring straightforward maintenance.

Light points

One light source produces up to 1,000 decorative light points for a starry sky for example. The light points have a dynamic appearance thanks to changing colours or different brightness.

Lines of light

Side-radiating fibres have a decorative or guiding effect in architectural and advertising applications. Intensive white or variable-colour light conveys messages and clearly delineates specific areas.

Illuminating objects

From clear presentation through to dramatic stage settings, STARFLEX makes it possible to flexibly set the scene for objects in museums or in retail areas.
A halogen light engine with a 50 W QR-CBC lamp and HIT engines with a 35 W or 70 W CDM-TC lamp are the entry-level models in the STARFLEX light engine range. The 50 W halogen engine is ideal for decorative applications such as starry skies and light points as well as for using light to guide people. The 35 W and 70 W HIT engines are perfect for showcases in museums and exhibitions where objects need to be shown in restrained ambient lighting. All these engines are most effective thanks to their absolute silence achieved by surface cooling and are also suitable for both glass and PMMA optical fibres. Flexibility is what counts – no tools are required for relamping or cleaning the UV/IR blocking filters, wall-mounting is possible without accessories supplied by the factory, and immediate or subsequent retrofitting is child's play thanks to modular accessories.

50 W tungsten-halogen light engine
- Dimmable using conventional halogen reverse-phase dimmer;
- Attractively priced and easily available 50 W QR-CBC light source with 38° radiation angle.

Applications
The entry-level model is perfect for decorative applications:
- Starry sky;
- Light points for interior design or architectural purposes;
- Light points to decorate advertising signs;
- For backlighting glazed surfaces.

Compact
Small, flexible, silent
STARFLEX LIGHT ENGINES

35 W and 70 W CDM-TC light engine

- 35 W and 70 W metal halide lamp with a colour temperature of 3,000 K;
- The 3,300 lumen luminous flux of the 35 W light engine is equivalent to the brightness level of a 100 W halogen lamp, but consumes only one third of its energy;
- 70 W CDM-TC lamp for high-intensity, silent illumination;
- Long service life of light source makes for long maintenance intervals;
- Optimised glass reflector for maximum possible light injection.

Applications

The smallest HIT light engines open up numerous possibilities for showcase lighting in museums, exhibitions and retail areas. Because STARFLEX illuminates objects without giving off any heat, the system is also suitable for foodstuffs and even for lighting freezer chests. STARFLEX is gentle on delicate items – ideal for illuminating porcelain, wine or precious documents.
These two compact STARFLEX light engines are exactly what is needed in situations where no control of lamp brightness is needed and easily adjustable fan operation suffices. The optical system – a 100 W QR-CB halogen lamp with 38° radiation angle and an aluminised glass reflector – is designed for a 30 mm common end. Both engines are suitable for both glass and PMMA optical fibres and offer full system safety thanks to automatic temperature monitoring (ambient temperature up to 45 ºC). No tools are required to replace lamps or clean the UV/IR blocking filter, and immediate or subsequent conversion is easy thanks to modular accessories.

100 W ECO light engine

The 100 W ECO light engine is primarily used for:
- Backlighting glazed surfaces;
- Creative lighting design in showcases;
- Lighting in shelves and shop windows.

Necklace, “Art de Cartier” exhibition, Vitra Design Museum, Berlin, Germany
A temperature-based fan control system adjusts the fan’s speed depending on the ambient temperature, thus ensuring minimum noise levels. If the permissible temperature range is exceeded or if the fan wheel jams, the system automatically switches off. Once the temperature drops to acceptable levels, or the fan wheel runs freely, the light engine switches itself on again automatically.

100 W light engine

The 100 W light engine can be dimmed by a built-in potentiometer or a separate 1–10 V signal, which allows perfect brightness adjustment. The user can adjust the brightness directly on the engine (e.g. in or underneath the showcase) or from any other location, especially if the engine is installed in a location which is difficult to access.
STARFLEX scores as a flexible system – it can be used practically anywhere and embodies innovative technology. Naturally, the range of accessories available is equally diverse. Colour and sparkle effects are also impressive in lighting applications.

Accessories
Light as desired

Static colour filters
Yellow, red, orange, green, blue, magenta or pink static colour filters gently immerse objects and their surroundings in attractive colours.

Colour temperature correction filters
These filters are used to raise or lower the colour temperature to various intensities.

Adapter
The adapter is used if fewer fibres than usual are bundled together, or in the case of special applications where a 9 mm diameter is used: it reduces the common end in the engine from 30 mm to 9 mm.
Plug-in power supply unit

The plug-in power supply unit sets the STARFLEX system in motion – it is used to operate colour wheel and sparkle-effect wheel modules with a 35 W and 70 W HiT and 50 W halogen light engine. The power supply unit has a Euro plug for direct connection to a safety socket, and comes with a 3 m feed line as well as a matching connector for the colour wheel and sparkle-effect wheel module.

Sparkle-effect wheel module

The sparkle-effect wheel module also provides decorative effects: a perforated aluminium disc rotates in front of the connector and alternately obscures and reveals various individual fibres. Result: individual light points light up and darken repeatedly. In addition, the sparkle-effect wheel module can also be used with a static colour filter or a colour temperature correction insert. The S2 313 540 plug-in power supply unit is required for operation in a 35 W, 70 W CRI or 50 W engine.

Colour wheel module

The colour wheel module has eight panels and yellow, red, orange, green, blue, magenta, pink colour filters – which can be replaced on site –, plus an empty opening for white light and brings a splash of colour to things. The wheel rotates at a speed of 1 rpm and can be paused in any position. The S2 313 540 plug-in power supply unit is required for operation with a 35 W or 70 W CRI or 50 W engine.
Metal halide lamps are the ideal light sources when plenty of light is needed – the HIT 150 W and HIT 250 W light engines should then be used. Both engines are extremely silent because the fan speed is controlled depending on the ambient temperature. Besides the standard version, controllable engines which can be adapted to match various bus systems are also available.

Two lamp types which have different radiation characteristics are available for the HIT 150 W engine and guarantee light that is just right for a wide variety of applications:

- A Philips lamp with a colour temperature of 4,400 K and optimised for a 30 mm diameter is recommended for larger fibre bundles;
- Smaller fibre bundles and side-radiating fibres are best used with a BLV MHR lamp (colour temperature 4,200 K).

Should requirements change, the lighting module can be changed at any time without a problem.

HIT 150 W light engine

The HIT 150 W light engine is suitable for glass fibre bundles as well as crimped or spliced PMMA fibre bundles. The lamp fitting is fixed optimally in the focus inside the lighting module and provides excellent, project-specific lighting.
STARFLEX LIGHT ENGINES

250 W HIT light engine

An Osram HIT HSD 250 W lamp makes this engine a real powerhouse.

Only PMMA fibre bundles spliced in the connector guarantee a high level of safety; glass fibre bundles must not be used!

Controllable engines

“Electronic intelligence” which enables the processing of various protocols (DMX, 1–10 V, LUXMATE® and DALI) forms the basis of the controllable version of the HIT 150 W and HIT 250 W light engines. Programs which can be run by selecting various DIP switch positions are pre-installed in the engines as standard. Each program controls a colour wheel and a dimming wheel. Independent control of each individual engine is also possible, as is safe electronic synchronisation.

Illuminated ice crystals,
Restaurant Lindenlife, Berlin, Germany
Safe
For damp areas and outdoor use

Particularly in situations where conventional lighting systems reach their limits, it is often possible to achieve delightful features – light combined with water, in wellness areas, or as decorative light points in natural settings. Light engines with IP54 protection are corrosion-resistant and just as user-friendly as all the other engines in the STARFLEX range, and are ideally suited for these difficult application areas. A wide variety of suitable versions is available:

- HIT 150W
- HIT 150W controllable
- HIT 250W
- HIT 250W controllable

They all use the lighting modules and all the accessories in the IP20 range as well as its control system. In addition, these engines with IP54 protection also boast a rugged housing made of V4A special steel and splash-proof covers to prevent the ingress of rainwater or splash water.
A toggle fastener secures the outdoor light engine (a safety cylinder lock is also available on request).

The dust filters which protect the ventilation system – similar to the air filter in a car – clean the cooling air. Filters are easily removable and cleanable.

An internal heating system ensures that the temperature inside the engine does not drop below 15 °C. This prevents condensed water forming.

The heating system is controlled in an energy-efficient manner by a thermostat and operates independently from the engine’s lighting circuit.
In terms of modularity and functionality, the accessories for the HIT 150 W and 250 W engines are identical to those for the compact light engines. They support all lighting effects, and the following components are available:

- Static colour filters;
- Static colour temperature correction filters;
- Colour wheel module;
- Sparkle-effect wheel module;
- Colour temperature correction wheel;
- 30 mm-to-9 mm adapter.

**Colour wheel module**

The colour wheel module has yellow, red, orange, green, blue, magenta and pink colour filters that can be replaced on site, as well as an empty opening for white light. The wheel rotates at a speed of 1 rpm and can be paused in any position by using a switch on the front panel of the engine or a separate switch. The configuration and colour of the filters is the same as those of the colour wheel module for compact light engines.

**Colour temperature correction wheel**

The colour temperature correction wheel has six colour temperature correction filters which allow individual colour temperature adjustment. By rotating the wheel manually, the colour temperature can be set to suit specific needs. This is useful in showcases which accommodate frequently changing items, because the installation can simply be readjusted, rather than having to modify it.
Sparkle-effect wheel module

As with the compact engines, the sparkle-effect wheel module produces eye-catching decorative effects by revealing and obscuring individual light points. The specially perforated aluminium disc rotates in front of the connector and obscures the various individual fibres at different times. The sparkle-effect wheel module can optionally be fitted with a static colour filter insert or a colour temperature correction insert.

Adapter

The adapter is used to narrow the common end in the engine from 30 mm to 9 mm. This enables to use fibre bundles containing fewer fibres, and also supports special applications.

Static colour filter

Yellow, red, orange, green, blue, magenta or pink static colour filters gently immerse objects and their surroundings in pleasant colours.

Colour temperature correction filter

This filter is used to raise or lower the colour temperature of the light source fitted at different intensities.

All accessories are fitted inside the engine without the use of any tools.
Controllable STARFLEX engines attract attention in shops, wellness areas, cinemas or theatres, but there are of course many other areas where they can be used. Individual decorative effects ranging from a single eye-catching unit through to complex ACTIVE LIGHT concepts can be created by controlling brightness and/or light colour.

Teaming up light with water also opens up exciting possibilities in wellness areas, indoor swimming pools, saunas and steam rooms. Exquisite interplays of light and music, or the use of light to set the scene for architectural features – as a work of art on a building, as a lighting sculpture or as part of the architecture itself – are among the further attractive possibilities.

The STARFLEX control system can either be part of an extensive building management system or a standalone solution.

This summary shows how individual light engines can be controlled:

- **Dimmable**
  - *Halogen reverse-phase dimmer*
  - **Internal or external with electronic dimmer**
  - ***Only with plug-in power supply unit S2 313 540***

- **Static filter insert**

- **Sparkle-effect wheel or colour wheel insert**

- **Synchronised dimming**

- **Colour wheel synchronisation**

<table>
<thead>
<tr>
<th>Engine</th>
<th>50 W</th>
<th>100 W</th>
<th>100 W Eco</th>
<th>HIT35/70</th>
<th>HIT 150 W</th>
<th>HIT 250 W</th>
<th>HIT150 W DMX/1-10V</th>
<th>HIT250 DMX/1-10V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimmable</td>
<td>Yes*</td>
<td>Yes**</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes (Bus)</td>
<td>Yes (Bus)</td>
<td>No</td>
</tr>
<tr>
<td>Static filter insert</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sparkle-effect wheel or colour wheel insert</td>
<td>Yes***</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes***</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Synchronised dimming</td>
<td>Yes****</td>
<td>Yes*****</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Colour wheel synchronisation</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Control options of HIT 150 W and 250 W light engines

HIT 150 W and 250 W light engines can be controlled by DMX as well as by 1–10 V signals. Pre-installed firmware can be run by means of DIP switches.

Comprehensive retail area lighting system including fibre optic technology with LUXMATE® Controls:
7 Swabians Pharmacy, Dr. Renschler, Laupheim, Germany
The brightness of the 100 W halogen light engine can be controlled by using a potentiometer fitted in the cover. If this is difficult to achieve because of the way the engine is mounted, this function can also be performed by an external electronic potentiometer (100 kΩ linear). The light engine is switched on and off separately.

A conventional low-voltage halogen dimmer is used to control the brightness of the 50 W halogen light engine. Be careful not to exceed the maximum power input specified by the manufacturer in cases where the brightness of several light engines needs to be controlled synchronously using a single low-voltage halogen dimmer.

Control made easy
Four options to choose from

Controlling the brightness of the 50 W halogen light engine using a LV halogen dimmer

Controlling the brightness of a 100W halogen light engine using an electronic potentiometer
**Four options**

**Control made easy**

Depending on where and how the STARFLEX fibre optic system is used and the particular requirements which it must meet, the light engines are controlled via DMX, 1–10 V, LUXMATE® or DALI. Zumtobel Staff offers a range of accessories for each of these control options.

---

**Control by DMX using a DMX input unit**

There are plenty of options here: Using control by DMX, several light engines can run synchronously or they can be controlled independently of each other via different channels. If no (re)programming is envisaged for the building, the DMX input unit can be replaced by a DMX recorder. In addition, any conventional DMX 512 input unit can be fitted on site.

---

**Control via a digital LUXMATE®-Bus**

If STARFLEX is part of an extensive lighting concept which involves a wide variety of different luminaire types, it is advisable to use a LUXMATE® control system. Its signals are converted into analogue signals and output by the LM-2ANAS (V) module (art. no. 22 145 374). Subsequent engines are installed and synchronised in the same way as for 1-10 V control.

---

**Control via a 1–10 V analogue bus**

The 1–10 V control signal is fed into the first engine via a control cable (art. no. S2313 530). There the analogue signal is converted into a DMX signal and amplified so that subsequent engines up to 50 m away can be switched synchronously without any problem.

---

**Control via a digital DALI bus**

Control via a DALI bus system corresponds to control via a LUXMATE® system. However, two converters (60 010 001 for switch cabinets/60 010 002 for recess) must be used since combined units equivalent to the 2-ANAS module are not yet available.

---

**LUXMATE® Emotion Touchpanel**

The operation of light guide installation and complete lighting systems is made especially easy and flexible by using the touch-sensitive LUXMATE® EMOTION Touchpanel. Programming and calling up various lighting scenes requires very little effort. The EMOTION touchpanel scores not only because of its flexibility and intuitive user prompting, but also in terms of its design (Matteo Thun Studio, Milan).
From DMX to Luxmate
What you will need

DMX input unit
A DMX input unit is required when using dynamic light to set various lighting scenes in meeting and conference rooms, for shop and shop window lighting, and to set the stage for architectural features. This unit operates up to eight channels and a master controller. Colours, brightness, times and programmed dissolve phases can be successively stored and called up, and dissolves may range from harmonious colour transitions through to stroboscopic effects. Benefits of the DMX input unit are its compact size, ease of use, and generous storage capacity.

DMX recorder
The DMX recorder is comparable to a cassette recorder: DMX installations operate using various memory chips without the need for any on-site programming. This is ideal in cases where the same lighting concept is to be implemented at various locations. After programming, all that needs to be done is to connect the DMX recorder to the controllable engine(s) – pressing the "start" button automatically runs the desired lighting sequence.

DMX control cable
The DMX control cable connects a DMX input device and/or DMX recorder to the engine and links individual engines. Installation is “Plug & Play” and requires no tools; the signal direction is determined by the sockets or connector ends. The standard, flexible screened cable is two metres long; special lengths up to 50 m are available on request.
**1–10 V control cable**

The 1–10 V control cable is used if control signals are fed to the engine via its 1–10 V interface (control via 1–10 V, LUXMATE®, DALI). This cable has a diode connector at one end, and insulated conductors for connection to the module contacts at its other end. In order to ensure reliable data transfer, the control modules must not be located more than 3 m from the light engine.

**DALI converter**

Digital DALI signals are fed to the light engine via its 1–10 V interface and two converters – one signal for the colour wheel and one for the dimming wheel. Connection is achieved by using a 1–10 V control cable.

**2-ANAS module**

Digital LUXMATE® signals are converted into analog control signals in the 2-ANAS module and then control the colour and dimming wheel in different channels via the 1–10 V input. In addition, engine switch-off can be installed and programmed specifically for each project (0 to 10 V/1–10 V) by using the existing relay contacts.
Both the material and the diameter of the STARFLEX fibres influence the transmission of light from the engine to the light exit point. Depending on the particular application, PMMA or glass fibres are available. The specific properties (see Summary) of each material determine which is the most suitable material.

**Glass fibres**
- Can withstand relatively high temperatures;
- Non-flammable;
- Extremely long service life (in excess of 20 years);
- Relatively tight bending radii;
- Projects preferring relatively warm light colour (low colour temperature).

**PMMA fibres**
- Cheaper than glass;
- Fire-retardant Megolon sheathing;
- Service life up to 20 years;
- Reduced light attenuation;
- Projects involving colder light colour (higher colour temperature);
- Choice of side-radiating or terminal light emitting fibres;
- Side-radiating and terminal light emission fibres can be combined in a single fibre bundle;
- Fibre bundle can optionally be pre-assembled on site.

The two principles of fibre optic lighting

Depending on the particular application, terminal or light point illumination is possible using either PMMA or glass fibres with a choice of standard fibre bundles (see chapter entitled “Sets”) or fibre bundles specially pre-assembled for a particular project.

Side-radiating fibres are used for side or linear illumination, and can be cut to the desired length and pre-assembled at the factory or on site. The different properties of glass and PMMA optical fibres must be taken into account at the project planning stage: PMMA fibres carry light in the range up to 600 nm (blue/green colour spectrum) better, whereas glass fibres are more suitable for the range above 670 nm (red/yellow) (Figure 1).

The colour temperature produced by the light source also changes over the length of the fibres to a varying extent:

In the case of PMMA fibres, the colour temperature rises and the light “drifts” down into the bluish-green range; in the case of glass fibres, the colour temperature reduces and the light point changes towards the reddish-yellowish range (Figure 2).
**Fibre closures**

The ends of individual STARFLEX fibres are bonded, polished and then fitted with the appropriate end sleeve for a particular application:

- If the light guide ends in a single point of light, the standard light outlet without an optical attachment is sufficient;
- In the case of starry sky components, individual fibres can be cut to the desired length on site (1 mm). When pre-assembled, the fibre tapers towards its end in order to emit light which is as diffuse as possible – this is the starry effect;
- Where components which direct light for optical or decorative purposes are used – such as integral or separately mounted lenses and crystal glass attachments – the light outlet must be appropriately terminated;
- In cases where relatively high IP67 protection is required – in damp areas or outdoors – the optical fibres are fitted with a special outlet for such termination;
- A water-tight end cap with an internal mirror which reflects the light back into the fibres is fitted at the end of side-radiating fibres;
- A special light outlet is needed for special optical components, e.g. for recessed mounting in shelves.

**Feed connection**

A fibre bundle is fed into a connector on the engine. Whereas glass fibre bundles have to be fixed using a special, thermally stable bonding agent, PMMA fibres are spliced or crimped.

The connector is improved by polishing. The maximum number of optical fibres in the connector depends on the material of which they are made, their diameter and how they are pre-assembled.

The amount of light which is coupled into the central and peripheral area respectively varies depending on the optical system used by as much as 1:10. The individual fibres in a fibre bundle are randomised in the connector in order to compensate for this discrepancy: fibres from the centre are mixed with those from the peripheral area before bonding and polishing in order to make sure that all light points are uniformly bright.

Glass fibres can only be used as fibres with terminal light emission and must not be longer than 10 m. In order to avoid differences in the colour temperature of individual light points in a system, the longest and the shortest fibre in a bundle must not differ in length by more than 4 m. One special feature regarding length must be noted where STARFLEX is used for museum lighting: To avoid distorting the colour of exhibits, light guides must not be longer than 6 m. Glass fibre bundles must be pre-assembled industrially. The fibre bundles are individually manufactured for specific projects.
Glass fibres

STARFLEX glass fibres are made of Schott “Spectraflex”, an especially high-grade material. These fibres attenuate luminous flux only slightly and ensure a stable colour temperature, a factor which is extremely important in lighting design. They are ideal for the following uses:

<table>
<thead>
<tr>
<th>Application</th>
<th>Main plus points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Showcases in museums</td>
<td>• Warm light colours;</td>
</tr>
<tr>
<td></td>
<td>• Fibres are non-flammable;</td>
</tr>
<tr>
<td></td>
<td>• Protects exhibits against fading and damage;</td>
</tr>
<tr>
<td>Saunas and steam baths</td>
<td>• Can withstand ambient temperatures up to 110 ºC</td>
</tr>
<tr>
<td></td>
<td>(130 ºC for short time);</td>
</tr>
<tr>
<td>Lighting on ships for decorative purposes, for guidance and for general lighting</td>
<td>• Non-flammability guarantees, high safety standards;</td>
</tr>
<tr>
<td></td>
<td>• Scope for using light and colour for creative design purposes;</td>
</tr>
<tr>
<td>Lighting in hotels and upmarket catering areas</td>
<td>• Extremely long service life;</td>
</tr>
<tr>
<td></td>
<td>• Non-flammability guarantees, high safety standards;</td>
</tr>
<tr>
<td></td>
<td>• Scope for using light and colour for creative design purposes.</td>
</tr>
</tbody>
</table>

Pre-assembly of glass fibre bundles

<table>
<thead>
<tr>
<th>Active diameter of fibre cable</th>
<th>Outside diameter of sheathing</th>
<th>Maximum number of optical fibres per common end</th>
<th>Number of individual fibres per fibre cable</th>
<th>Minimum bending radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 mm</td>
<td>2.2 mm</td>
<td>615</td>
<td>280</td>
<td>7 mm</td>
</tr>
<tr>
<td>1.5 mm</td>
<td>2.7 mm</td>
<td>307</td>
<td>560</td>
<td>11 mm</td>
</tr>
<tr>
<td>2.0 mm</td>
<td>3.9 mm</td>
<td>176</td>
<td>630</td>
<td>14 mm</td>
</tr>
<tr>
<td>3.0 mm</td>
<td>4.9 mm</td>
<td>79</td>
<td>1450</td>
<td>21 mm</td>
</tr>
<tr>
<td>4.5 mm</td>
<td>6.4 mm</td>
<td>36</td>
<td>3430</td>
<td>32 mm</td>
</tr>
<tr>
<td>6.0 mm</td>
<td>8.7 mm</td>
<td>20</td>
<td>2730</td>
<td>42 mm</td>
</tr>
</tbody>
</table>

Length-dependent correction factors (attenuation) for glass fibre cables

<table>
<thead>
<tr>
<th>1 m</th>
<th>2 m</th>
<th>3 m</th>
<th>4 m</th>
<th>5 m</th>
<th>6 m</th>
<th>7 m</th>
<th>8 m</th>
<th>9 m</th>
<th>10 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.93</td>
<td>0.87</td>
<td>0.81</td>
<td>0.76</td>
<td>0.71</td>
<td>0.66</td>
<td>0.62</td>
<td>0.57</td>
<td>0.54</td>
<td>0.50</td>
</tr>
</tbody>
</table>
PMMA optical fibres

STARFLEX fibres made of PMMA are available as fibres with terminal light emission, and as side-radiating fibres which emit light along their entire length in a similar way to neon tubes. Products made by Roblon Fibre Optics, an expert in the field of PMMA fibres, are used exclusively for STARFLEX in order to ensure the highest possible quality.

PMMA fibres have several special properties:
- Reduced attenuation;
- Wide variety of active light guide diameters;
- Lower price than glass fibres;

If PMMA fibres are used as fibres with terminal light emission, they must not be longer than 12 m. As with glass fibres, to avoid differences in the colour temperature of individual light points in a system, the longest and the shortest fibre in a bundle must not differ in length by more than 4 m – especially if white light is required for defined lighting tasks. If STARFLEX is used for decorative purposes (with colour filter or colour wheel), the light colour is not so relevant; however, the loss of light due to the colour filter must be taken into account. The following diameters of PMMA fibres with terminal light emission are available:

Pre-assembly of PMMA fibre bundles (terminal light emission, factory-assembled)

<table>
<thead>
<tr>
<th>Active diameter of fibre cable</th>
<th>Outside diameter of sheathing</th>
<th>Maximum number of fibre cables per common end (crimped)</th>
<th>Number of individual fibres per fibre cable</th>
<th>Minimum bending radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 mm</td>
<td>2.2 mm</td>
<td>575</td>
<td>1</td>
<td>8 mm</td>
</tr>
<tr>
<td>1.5 mm</td>
<td>2.7 mm</td>
<td>342</td>
<td>3</td>
<td>12 mm</td>
</tr>
<tr>
<td>2.0 mm</td>
<td>4.0 mm</td>
<td>143</td>
<td>7</td>
<td>16 mm</td>
</tr>
<tr>
<td>3.0 mm</td>
<td>5.0 mm</td>
<td>72</td>
<td>14</td>
<td>24 mm</td>
</tr>
<tr>
<td>4.5 mm</td>
<td>6.5 mm</td>
<td>37</td>
<td>27</td>
<td>36 mm</td>
</tr>
<tr>
<td>6.0 mm</td>
<td>8.5 mm</td>
<td>20</td>
<td>50</td>
<td>48 mm</td>
</tr>
<tr>
<td>8.0 mm</td>
<td>10.0 mm</td>
<td>13</td>
<td>75</td>
<td>60 mm</td>
</tr>
<tr>
<td>10.0 mm</td>
<td>12.0 mm</td>
<td>8</td>
<td>71</td>
<td>75 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Active diameter of fibre cable</th>
<th>Outside diameter of sheathing</th>
<th>Maximum number of fibre cables per common end (spliced)</th>
<th>Number of individual fibres per fibre cable</th>
<th>Minimum bending radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 mm</td>
<td>2.2 mm</td>
<td>300</td>
<td>1</td>
<td>8 mm</td>
</tr>
<tr>
<td>1.5 mm</td>
<td>2.7 mm</td>
<td>165</td>
<td>3</td>
<td>12 mm</td>
</tr>
<tr>
<td>2.0 mm</td>
<td>4.0 mm</td>
<td>70</td>
<td>7</td>
<td>16 mm</td>
</tr>
<tr>
<td>3.0 mm</td>
<td>5.0 mm</td>
<td>35</td>
<td>14</td>
<td>24 mm</td>
</tr>
<tr>
<td>4.5 mm</td>
<td>6.5 mm</td>
<td>18</td>
<td>27</td>
<td>36 mm</td>
</tr>
<tr>
<td>6.0 mm</td>
<td>8.5 mm</td>
<td>10</td>
<td>50</td>
<td>48 mm</td>
</tr>
<tr>
<td>8.0 mm</td>
<td>10.0 mm</td>
<td>6</td>
<td>75</td>
<td>60 mm</td>
</tr>
<tr>
<td>10.0 mm</td>
<td>12.0 mm</td>
<td>4</td>
<td>71</td>
<td>75 mm</td>
</tr>
</tbody>
</table>

Length-dependent correction factors (attenuation) for PMMA fibre cables

<table>
<thead>
<tr>
<th>Length (m)</th>
<th>Attenuation Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>2</td>
<td>0.91</td>
</tr>
<tr>
<td>3</td>
<td>0.87</td>
</tr>
<tr>
<td>4</td>
<td>0.83</td>
</tr>
<tr>
<td>5</td>
<td>0.79</td>
</tr>
<tr>
<td>6</td>
<td>0.75</td>
</tr>
<tr>
<td>7</td>
<td>0.72</td>
</tr>
<tr>
<td>8</td>
<td>0.69</td>
</tr>
<tr>
<td>9</td>
<td>0.65</td>
</tr>
<tr>
<td>10</td>
<td>0.62</td>
</tr>
</tbody>
</table>
Crimping and splicing techniques

Like glass fibres, PMMA fibres are randomised inside the connector in order to ensure that all light points are uniformly bright. Fibres from the centre of the connector are mixed with those from the peripheral area before bonding and polishing. This makes it possible to fit a larger number of individual fibres into the connector, which in turn has a positive impact on costs. The splicing technique is used to splice randomised or non-randomised PMMA fibres inside the connector. This ensures that all the light energy fed into the connector is transmitted, thereby preventing energy build-up in the microscopically small gaps which would otherwise be present. This makes the connector thermally stable, and meets the requirements imposed for operating high-power engines having an output of more than 150W. However, using this technique, fewer optical fibres can be used than in a crimped connector.

HIT 250W light engines may be fitted only with PMMA optical fibres which have been spliced inside the connector!

Pre-assembly of PMMA fibres

PMMA fibres can be pre-assembled in various ways, which each have a significant effect on luminous efficiency:

<table>
<thead>
<tr>
<th>Application</th>
<th>Main plus points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut with hot knife</td>
<td>• Easy on-site installation but higher light losses;</td>
</tr>
<tr>
<td></td>
<td>• Poor thermal stability.</td>
</tr>
<tr>
<td>Industrially cut, crimped and polished</td>
<td>• Lower light losses;</td>
</tr>
<tr>
<td></td>
<td>• Can only be used with light engines having a max. output of 150W.</td>
</tr>
<tr>
<td>PMMA fibres spliced in the connector</td>
<td>• Good light injection;</td>
</tr>
<tr>
<td></td>
<td>• Extremely good thermal stability.</td>
</tr>
</tbody>
</table>

Conventionally cut and crimped  
Cut with hot knife and polished  
Industrially cut, polished and crimped in the connector  
Spliced in the connector
Pre-assembly of PMMA optical fibre bundles

PMMA fibre bundles must be pre-assembled and randomised before leaving the factory in order to guarantee a solution that is perfect in terms of technical lighting specifications and thermal stability. It is not possible to produce fibre bundles containing a large number of individual fibres using on-site facilities. If the project requires and depending on the location of the site, Zumtobel Staff experts may be able to offer to pre-assemble an appropriate PMMA fibre bundle version on site as an optional service. This is advisable, for instance, if the length of the fibres cannot be determined in advance or if fibres have to be pulled through narrow ducting and it is not possible to make allowance for the diameter of the connector.

<table>
<thead>
<tr>
<th>Application</th>
<th>Main plus points</th>
</tr>
</thead>
</table>
| Shop windows, shelves and showcases in retail areas | • High lighting levels are possible;  
• Various effects and ACTIVE LIGHT for a dynamic lighting solution. |
| Starry sky in hotels, upmarket catering and wellness areas | • Attractive price;  
• Fire-retardant Megolon sheathing around PMMA material;  
• Leave plenty of scope for the user. |
| Lighting in outdoor areas or in rooms where there is high humidity | • Higher colour temperature gives impression of extra light;  
• No maintenance required on individual light outlet;  
• IP protection for system can be preserved for long time;  
• Light and water can be combined without electric shock hazards or risk of system malfunction. |
Side-radiating PMMA optical fibres

These PMMA fibres emit light over their entire length. Transparent Megolon sheathing secures the individual optical fibres in position in order to allow linear illumination.

Like PMMA fibres with terminal light emission, the fibre bundle is pre-assembled. The end of each side-radiating fibre is fitted with an end cap with a reflector element, which reflects residual light received back into the fibre in order to make illumination more uniform.

HIT engines having an output of at least 150 W are recommended for side-radiating fibres. Advantages of side-radiating PMMA fibres include:
- Reduced attenuation;
- Good ability to withstand UV;
- Resistant to chlorine and algae;
- 4 active light guide diameters from 4.5 mm up to 14 mm;
- Optional combination of PMMA side-radiating fibres and fibres with terminal light emission in a single fibre bundle.

STARFLEX side-radiating fibres are perfect for outlining the contours of buildings, as an attention-grabbing detail of interesting architectural design, they can form advertising lettering, provide guidance as lines of light on the floor or on walls, and provide a wealth of other design possibilities. Unlike tubular fluorescent lamps, they are not suitable for achieving defined room lighting patterns. Up to 20 m of single fibre can be illuminated evenly. If a longer fibre is needed, light can be fed into it from both ends, or the fibre can be powered as a loop with both of its ends terminated in a single connector – this makes it possible to achieve lengths of 40 m or 50 m.

For straight lines of light, PMMA side-radiating fibres are installed in transparent ducting; if curves or various shapes are needed, clear fixing clips (available as accessories) secure the light guides. When installed in the floor, liquid plastic is used to bond the fibre in appropriately milled, white reflective ducting. PMMA side-radiating fibres are pre-assembled at the factory or on site by splicing or crimping. If a fibre is led through narrow ducting, signs, walls or other elements, the connector may have to be adapted on site.

### Pre-assembly of PMMA fibre bundles (side-radiating, factory-assembled)

<table>
<thead>
<tr>
<th>Outside diameter of sheathing</th>
<th>Maximum number of fibre cables per common end (crimped)</th>
<th>Maximum number of fibre cables per common end (spliced)</th>
<th>Number of individual fibres per fibre cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 mm</td>
<td>80</td>
<td>40</td>
<td>12</td>
</tr>
<tr>
<td>8.0 mm</td>
<td>19</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td>11.0 mm</td>
<td>11</td>
<td>5</td>
<td>84</td>
</tr>
<tr>
<td>14.0 mm</td>
<td>6</td>
<td>3</td>
<td>144</td>
</tr>
</tbody>
</table>
Typical applications for side-radiating light guides made of PMMA fibres

<table>
<thead>
<tr>
<th>Application</th>
<th>Main plus points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decorative lines of light for outlining contours</td>
<td>• Low maintenance effort for light elements in areas difficult or impossible to access;</td>
</tr>
<tr>
<td></td>
<td>• Choice of white or variable-colour light.</td>
</tr>
<tr>
<td>Decorative lines of light in order to emphasise an object (or catch the eye)</td>
<td>• Narrow and multi-coloured lines of light;</td>
</tr>
<tr>
<td></td>
<td>• Maintenance-free in inaccessible areas.</td>
</tr>
<tr>
<td>Illumination of lettering or signs as replacement for neon advertisements</td>
<td>• Long service life;</td>
</tr>
<tr>
<td></td>
<td>• Low maintenance effort;</td>
</tr>
<tr>
<td></td>
<td>• High-quality appearance of lettering over long period of time because individual letters do not fail.</td>
</tr>
<tr>
<td>Lines of light beside or underneath water, lighting for swimming pools or</td>
<td>• Safe thanks to separation of light and electricity;</td>
</tr>
<tr>
<td>ponds</td>
<td>• Immersed light element is maintenance-free;</td>
</tr>
<tr>
<td></td>
<td>• Long service life thanks to resistance to algae and chlorine.</td>
</tr>
</tbody>
</table>
Choosing the right light outlet determines the effect achieved by a lighting solution. Various models ensure plenty of flexibility and a wide range of possible applications. Regardless of whether decorative effects or technical accuracy are required – the appropriate STARFLEX light outlet provides an attractive solution for any project.

**Recessed light outlets**

Recessed light outlets allow conventional downlighting or uplighting. Diffuse (60–70°) or narrow-beam versions (up to 25° or 7°) with a fixed or pivoting lens provide extremely precise, focusable lighting. This is important not only in showcases, display cases and on shelving, but is a feature which can also be exploited in order to illuminate entire rooms with ceiling heights up to 2.50 m. The appropriate light guides made of PMMA or glass fibres have an active diameter of 3 to 6 mm depending on the particular application.
In the STARFLEX tube system, the fibres are fed through a tube to the outlets which are mounted on the tube. Such tube structures are suitable for any application and can also be installed in existing systems.

The shape, length and surface finish of the tube structure and the position of the light outlets is always the customer’s own specification. The tube system is made in various diameters according to the number and type of light outlets required.

**Surface-mounted light outlets**

If the light head needs to pivot even more, adjustable surface-mounted light outlets which have the same radiation characteristics as recessed light outlets but which pivot as much as 38° in both directions thanks to a ball-and-socket joint are used. This is the way to show details in the right light. PMMA or glass fibre light guides having an active diameter of 3 to 4.5 mm are recommended.

**Surface finishes available:**
Chrome, matt chrome, black chrome, gold-plated, painted in RAL as required

**Installation accessories:**
Plastic mounting clips, black or white depending on the surface finish of the tube system, can be supplied on request
Light outlets
Special light outlets

A particular lighting solution may sometimes require specific light outlets. Such requirements are met by special light outlets which incorporate technical lighting features specially adapted to particular application areas.

Light outlet for shelving
This light outlet ensures gentle illumination of shelving and can be installed to obtain uplighting or downlighting. Its low-profile height of just 13 mm makes it perfect for the job, and a special optic reflects the light through 90º. The matching optical fibre has a diameter of 2 to 3 mm; a special fibre closure is required.

Asymmetrical light outlet
The asymmetric light outlet reflects the light through an angle of 30º. It can handle special showcase and shelf lighting tasks, or can be used to provide lighting for guidance of people in corridors, passageways or near steps. An optical fibre with a diameter of 2 to 3 mm is required.

Light outlet for staircase lighting
This light outlet is suitable for lighting to provide guidance along routes or above or in steps. The light emitted is diffuse and is radiated downwards across the wall. The requisite optical fibre has a diameter of 3 to 6 mm.

“Curved tube” light outlet
This curved tube outlet provides interesting possibilities for museum lighting. Made of anodised aluminium, its compact shape is unobtrusive. The outlet can be pivoted through 360º around its own axis, and exhibits can therefore be arranged flexibly. Two light outlet types are available so that light guides having a diameter of 1 to 3 mm or 1 to 4.5 mm can be used for particular application areas.

Dual light outlet
The two flexible tubes of this light outlet can be adjusted individually so that the light from each of them is perfectly aligned. The tubes have a total length of 465 mm and are fitted with a 1.5 m long PMMA fibre (4.5 mm diameter). The 9 mm common end requires the use of an adapter. The light itself is emitted through a medium-beam lens.
Decorative light outlets
(“crystal light heads”)

These three decorative crystal light outlets reveal the multi-faceted nature of light. Light is refracted inside them in a similar way as in ice crystals or a kaleidoscope, and this produces a truly special look somewhat similar to the starry sky effect. The crystal light outlets are supplied by optical fibres having a diameter from 1 to 3 mm. Installation using retaining clips ensures that they can be removed easily if the ceiling has to be repainted, for instance.
Light outlets

Light outlets for damp areas

STARFLEX is ideal for use in rooms where this is high humidity, as outdoor lighting, and for use near water or in water. A large number of recessed light outlets and spotlight components are available.

Recessed luminaires

These provide accent lighting points in walls and floors. Recessed luminaires are made of special steel and available as three models:
- Clear with 52° diffuse radiation characteristic;
- Opal with extremely wide 113° beam and good glare control;
- Focus with lens: the fibre is fixed at a precisely defined distance from the glass cover.

Spotlights

This range of spotlights can be used to illuminate:
- Heat-sensitive items from close up (foodstuffs, freezer chests);
- Monuments and façade details, especially where legislation regarding their protection prevents the use of conventional luminaires;
- Waterfalls, fountains or ponds, in or under water.

The spotlights made of special steel are watertight and meet IP68 protection requirements. The following models are available:

<table>
<thead>
<tr>
<th>Diameter of Optical Fibres</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 6 mm</td>
<td>Spotlight, wide-angle, Spotlight focus; Focus range 9° to 31°.</td>
</tr>
<tr>
<td>8 mm to 10 mm (PMMA)</td>
<td>Large spotlight, wide-angle, Wide spotlight focus; Focus range 18° to 34°.</td>
</tr>
</tbody>
</table>

Light outlets with IP protection
A starry sky effect enhances a room, bringing a special, decorative note to the entire environment. Allow at least 20 to 25 light points per m² in order to achieve an appropriate effect. Various modular sets ensure maximum creative design scope. One engine and one fibre bundle are used in each case; optional light outlets and engine accessories are available in order to bring dynamic, coloured and visual accent lighting to the starry sky.

### STARFLEX starry sky set No. 1 (basic set)

*For ceiling surface areas 2 m² to 3 m²*

<table>
<thead>
<tr>
<th>Engines</th>
<th>Engine accessories (optional)</th>
<th>Fibre bundle</th>
<th>Light outlets (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>50 W QR-CBC engine</strong></td>
<td><strong>Colour wheel module</strong></td>
<td><strong>Fibre bundle</strong></td>
<td>Basic set does not include decorative light outlets</td>
</tr>
<tr>
<td>S2 313 000</td>
<td>S2 313 070 (only in conjunction with transformer S2 313 540)</td>
<td>S2 313 590 comprising:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 50 individual PMMA Ø 1 mm fibres, length of individual fibres 2.5 m;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fibre closure “Starry sky effect, simple”;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 30 mm common end.</td>
<td></td>
</tr>
<tr>
<td><strong>Sparkle-effect wheel module</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2 313 090 (only in conjunction with transformer S2 313 540)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Static colour filter element</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow  S2 313 240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green   S2 313 250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue    S2 313 260</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red     S2 313 270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pink    S2 313 280</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turquoise S2 313 290</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magenta S2 313 300</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Decorative and romantic
### Starry sky sets

STARFLEX starry sky set No. 2 (compact set)
For ceiling surface areas 3 m² to 4 m²

<table>
<thead>
<tr>
<th>Engines</th>
<th>Engine accessories (optional)</th>
<th>Fibre bundle</th>
<th>Light outlets (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 W QR-CBC engine S2 313 000</td>
<td>Colour wheel module S2 313 070 50 W QR-CBC S2 313 000 and 35 W CRI S2 313 550 engines (only in conjunction with transformer S2 313 540)</td>
<td>Fibre bundle S2 313 600 with simple starry sky closure, comprising: • 76 individual PMMA Ø 1 mm fibres, 38 x 3 m long, 38 x 4 m long; • Fibre closure “starry sky effect, simple”; • 30 mm common end.</td>
<td>Crystal light outlet, 12.5 mm long Cover, polished brass S2 310 920 coated white S2 310 910</td>
</tr>
<tr>
<td>100 W QR-CB ECO engine S2 313 020</td>
<td>Sparkle-effect wheel module S2 313 090 50 W QR-CBC S2 313 000 and 35 W CRI S2 313 550 engines (only in conjunction with transformer S2 313 540)</td>
<td>Fibre bundle S2 313 610 with closure for light outlet, comprising: • 76 individual PMMA Ø 2 mm fibres, 38 x 3 m long, 38 x 4 m long; • Fibre closure for light outlet; • 30 mm common end.</td>
<td>Crystal light outlet, 31 mm long Cover, polished brass S2 310 960 coated white S2 310 950</td>
</tr>
<tr>
<td>100 W QR-CB engine S2 313 010</td>
<td>Static colour filter element Yellow S2 313 240 Green S2 313 250 Blue S2 313 260 Red S2 313 270 Pink S2 313 280 Turquoise S2 313 290 Magenta S2 313 300</td>
<td></td>
<td>Crystal light outlet, 18.5 mm diameter Cover, polished brass S2 310 940 coated white S2 310 930</td>
</tr>
<tr>
<td>35 W CRI engine S2 313 550</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Decorative and romantic
Starry sky sets
STARFLEX starry sky set No. 3 (large set)
For ceiling surface areas from 10 m² to 12 m²

<table>
<thead>
<tr>
<th>Engines</th>
<th>Engine accessories (optional)</th>
<th>Fibre bundle</th>
<th>Light outlets (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 W QR-CB ECO engine S2 313 020</td>
<td>Colour wheel module S2 313 070 (35 W-CRI S2 313 550 engine only in conjunction with transformer S1 313 540)</td>
<td>Fibre bundle S2 313 620 with simple starry sky closure, comprising: • 250 individual PMMA Ø 1 mm fibres, 125 x 4 m long, 125 x 5 m long; • Fibre closure “starry sky effect, simple”; • 30 mm common end.</td>
<td>Crystal light outlet, 12.5 mm long Cover, polished brass S2 310 920 coated white S2 310 910</td>
</tr>
<tr>
<td>100 W QR-CB engine S2 313 010</td>
<td>Sparkle-effect wheel module S2 313 090 (35 W-CRI S2 313 550 engine only in conjunction with transformer S1 313 540)</td>
<td>Fibre bundle S2 313 630 with closure for light outlet, comprising: • 250 individual PMMA Ø 2 mm fibres, 125 x 4 m long, 125 x 5 m long; • Fibre closure for light outlet; • 30 mm common end.</td>
<td>Crystal light outlet, 31 mm long Cover, polished brass S2 310 960 coated white S2 310 950</td>
</tr>
<tr>
<td>35 W CRI engine S2 313 550</td>
<td>Static colour filter element Yellow S2 313 240 Green S2 313 250 Blue S2 313 260 Red S2 313 270 Pink S2 313 280 Turquoise S2 313 290 Magenta S2 313 300</td>
<td></td>
<td>Crystal light outlet, 18.5 mm diameter Cover, polished brass S2 310 940 coated white S2 310 930</td>
</tr>
</tbody>
</table>

Other fibre bundle configurations are available on request.
A combination of different fibre diameters in order to form fixed stars or entire star patterns within a starry sky are especially attractive.
Projection using optical fibres

Projection heads supplied by optical fibres support an abundance of interesting applications. Their relatively compact design, low weight and impressive illumination output allow projection both indoors and outdoors independently of electric power and heat. Because light is supplied by a PMMA fibre, the projector head is never live and can even be exposed to occasional rain. No fan is needed and the STARFLEX projection head is therefore totally silent. One engine can service several projection heads as a central light dispenser, and this has a positive effect on both procurement and operating costs. Side-radiating fibres use “residual light” for projection, simultaneously producing a decorative line of light. Fibre diameters from 11 to 14 mm are effective. If only projection is required, fibres with terminal light emission having a diameter of 8 mm or 10 mm are used. Because the projection head requires a minimum luminous flux, the use of thin diameter fibres is not recommended. Illuminance levels are determined by the system configura-
Fibre length, number of individual fibres, their active diameters and the nature of the entire configuration all influence the lit appearance. Besides standard types, STARFLEX projection heads can also be adapted to suit specific projects. They can be “packaged” project-specifically in a ceiling-recessed housing in order to fit into their surroundings better, and it is also possible to fit the heads with various lenses to achieve museum or exhibition lighting which accentuates sharp edges or softer outlines.

Projection at the Zumtobel Staff Light Forum, Lemgo

The production of artwork when using STARFLEX projection is especially easy: standard 53.5 mm diameter metal gobos can be used, or users can produce the image themselves quite easily and independently of suppliers by using slides.

Applications are wide ranging e.g. a welcome sign, a simple picture, a company logo, the name of a visitor, news of a special event. The engines can also be regulated to introduce a dynamic element to the projection.
Arguments for LED technology

- Restrained lighting in niche applications where the main priority is the effect of the light point rather than the high-intensity illumination of objects;
- Static, decorative light points to accentuate, decorate and provide guidance;
- Dynamic light points or wide-area backlighting of areas and objects where maximum flexibility in terms of light colours is required;
- Lighting installations with a long service life where light sources can be replaced in house.

Arguments for STARFLEX

- Consistent separation of light and electricity;
- Installed lighting generates minimal fire load;
- Glass fibre system in areas where the ambient temperature is high (sauna, steam bath, industry);
- Absolutely maintenance-free light points, light source is easily accessible for servicing at a central location;
- Makes it possible to install lighting systems in areas which are completely inaccessible;
- Long service life: taking light source maintenance cycles into account, STARFLEX has a useful life in excess of 20 years;
- Light points can be modified subsequently from a central location in terms of colour temperature, brightness or light colour;
- Light points with extremely high intensity.

LED technology which allows static or dynamic punctiform, linear and surface lighting is an alternative to STARFLEX light guide technology for various applications. The technical differences between STARFLEX and LED must be clearly understood from the outset at the project planning stage in order to make the right decision.

STARFLEX and LED technology complement each other perfectly in lighting design.
**Indoor installation**

**Cleanliness**

Meticulous cleanliness is a must to obtain trouble-free STARFLEX operation. It is important to check that all components are clean, especially the optical connector, particularly in locations where plaster or other materials which release large quantities of dust have been processed. Dust deposited on the connector absorbs light energy and converts it into heat which inevitably leads to rapid burnout of glass and PMMA optical fibres. Light engines must also be inspected for contamination and dust when lamps are replaced, especially the connector and the UV/IR reduction filter. The system will only operate perfectly if this filter is clean.

**Ambient temperature**

The engines are suitable for a temperature range of –10 °C to +40 °C. This range applies when the system is switched on, and must never be exceeded.

**Cooling**

The engines must be cooled in order to comply with the recommended temperature range and ensure a long service life. This is achieved by supplying fresh air through ventilation slots in the housing. Surface cooling is generally sufficient for lower-powered engines up to 70 W, whereas higher wattages require fans and an appropriate electronic control system in order to recirculate fresh air. The minimum volumes of air and minimum lateral clearances to prevent inadequate air circulation and overheating are shown in the table below (approximate values only).

Make sure, at the planning stage, that the system does not exceed a temperature of 40 °C under normal operating conditions.

**Order no.** | **STARFLEX light engine** | **Minimum mounting space per engine** | **Minimum clearance (mm) between engine and wall (B,C)** | **Minimum clearance (mm) ceiling (A)** |
--- | --- | --- | --- | --- |
S2 313 550 | 35 W CRI | 0,15 m³ | 50 | 50 |
S2 313 000 | 50 W | 0,15 m³ | 50 | 50 |
S2 313 560 | 70 W CRI | 0,30 m³ | 50 | 50 |
S2 313 010 | 100 W | 0,30 m³ | 50 | 50 |
S2 313 020 | 100 W ECO | 0,30 m³ | 50 | 50 |
S2 313 030 | 150 W* | 0,60 m³ | 100 | 100 |
S2 313 050 | 250 W* | 0,90 m³ | 100 | 100 |

*150 W and 250 W standard and DMX
Protection against humidity

STARFLEX light engines have been designed for use in dry areas and incorporate IP20 protection. Only engines which offer IP54 protection should be used for outdoor applications or in rooms where there is high humidity.

Mounting position

The mounting positions shown in the table (page 53) must be observed without fail for heat dissipation reasons and must be taken into account during project planning. Engines must not be stacked because otherwise they would heat each other up; this may lead to overheating and/or emergency switch-off.

Noise produced by ventilation fans

The noise produced by light engines must be minimised in museums and other quiet rooms in particular. The 50W light engine and CRI 35W and 70W engines are surface cooled and are therefore completely silent. The intelligent fan control in all the other light engines with IP20 protection keeps noise levels as low as possible depending on the ambient temperature. The table below shows the noise produced by ventilation fans fitted in engines depending on the ambient temperature.

<table>
<thead>
<tr>
<th>Engine</th>
<th>100 W</th>
<th>100 W/Eco</th>
<th>150 W HIT</th>
<th>250 W HIT</th>
<th>150 W HIT DMX</th>
<th>250 W HIT DMX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S2 313 010</td>
<td>S2 313 020</td>
<td>S2 313 030</td>
<td>S2 313 050</td>
<td>S2 313 040</td>
<td>S2 313 060</td>
</tr>
<tr>
<td>25</td>
<td>32</td>
<td>33</td>
<td>37</td>
<td>37</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>30</td>
<td>33</td>
<td>34</td>
<td>40</td>
<td>38</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>35</td>
<td>35</td>
<td>36</td>
<td>42</td>
<td>44</td>
<td>52</td>
<td>51</td>
</tr>
<tr>
<td>40</td>
<td>37</td>
<td>40</td>
<td>49</td>
<td>51</td>
<td>54</td>
<td>52</td>
</tr>
</tbody>
</table>

Sound measurements were performed in an acoustic laboratory at a distance of one metre.

During project planning, make allowance for the fact that noise levels also depend on mounting base and its acoustic resonance.
Installation in damp areas or outdoors

Only light engines with IP54 protection are suitable for use in damp locations or outdoors.

Mounting position

The engine must be installed upright in order to ensure correct fan operation and prevent ingress of water. Otherwise IP54 protection will be compromised.

Electrical connection

A separate phase must be provided to connect the heating circuit. The heating circuit is controlled by the built-in thermostat and operates independently of the lighting circuit.

Ventilation system

Air filters protect the air intake and air outlet grilles. Clean grilles to remove dust, pollen or insects at regular intervals in order to ensure that the ventilation system operates properly.

If a lighting control system is implemented using any of the options listed in this brochure, the control components must be fitted in a housing available at a specialist wholesaler which affords the appropriate degree of protection.

Light engines: technical data

<table>
<thead>
<tr>
<th>Engine</th>
<th>50 W</th>
<th>100 W</th>
<th>100 W ECO</th>
<th>HIT 35 W</th>
<th>HIT 70 W</th>
<th>HIT 150 W</th>
<th>HIT 250 W</th>
<th>HIT 150 W DMX/1–10V</th>
<th>HIT 250 W DMX/1–10V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp</td>
<td>QR-CBC</td>
<td>QR-CB</td>
<td>QR-CB</td>
<td>HIT-CE-TC</td>
<td>HMR (BLV) CDM-SA/R (P)</td>
<td>HSD 250/2</td>
<td>HMR (BLV) CDM-SA/R (P)</td>
<td>HSD 250/2 (Osram)</td>
<td></td>
</tr>
<tr>
<td>Lamp luminous flux</td>
<td>930 lm</td>
<td>2,200 lm</td>
<td>2,200 lm</td>
<td>3,300 lm</td>
<td>6,400 lm</td>
<td>12,700 lm</td>
<td>13,000 lm</td>
<td>17,000 lm</td>
<td>12,700 lm</td>
</tr>
<tr>
<td>Average lamp service life</td>
<td>2,000 h</td>
<td>2,000 h</td>
<td>2,000 h</td>
<td>6,000 h</td>
<td>4,000 h</td>
<td>3,000 h</td>
<td>4,000 h</td>
<td>3,000 h</td>
<td></td>
</tr>
<tr>
<td>Lamp colour temperature</td>
<td>3,000 K</td>
<td>3,000 K</td>
<td>3,000 K</td>
<td>3,000 K</td>
<td>4,200 K</td>
<td>4,400 K</td>
<td>7,800 K</td>
<td>4,200 K</td>
<td>4,400 K</td>
</tr>
<tr>
<td>Ballast/transformer</td>
<td>ETR</td>
<td>ETR</td>
<td>ETR</td>
<td>EVG</td>
<td>EVG</td>
<td>KVG</td>
<td>EVG</td>
<td>KVG</td>
<td></td>
</tr>
<tr>
<td>Mains frequency</td>
<td>50/60 Hz</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td>0/50/60 Hz</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Euro plug</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td>Inlet connector for non-heating appliance</td>
<td></td>
</tr>
</tbody>
</table>

ETR = Electric transformer
EVG = electronic ballast
KVG = conventional ballast
Optical fibres

A few instructions have to be followed when installing glass and PMMA optical fibres in order to ensure correct operation and technically acceptable lighting results:

- Bending or buckling fibres in excess of their permissible bending radius reduces luminous flux and may even break the fibres in worst cases;
- The maximum permissible temperature of the medium which surrounds the optical fibres must not be exceeded because this might damage the fibre. The maximum permissible ambient temperatures are 70 °C for PMMA fibres (side-radiating and with terminal light emission) and 110 °C for glass fibres;
- If optical fibres are spliced inside the connector, the section behind the connector with open light distribution must not be covered and the fibres with open light distribution must not be wrapped. This might cause charring and kinking of the fibres in the connector. An on-site solution must be devised in order to prevent unwanted scattered light;
- Optical fibres are laid on site by installing flexible or rigid conduit. This prevents damage to fibres, and subsequent insertion and replacement of fibre bundles is possible;
- When installing optical fibres in damp areas or in water, the end of the fibre must be sealed to make it watertight in order to prevent water being sucked back up towards the engine.

Special features of side-radiating PMMA optical fibres

Side-radiating STARFLEX optical fibres are of exceptional quality, highly flexible and offer very uniform illumination. This is achieved by using a special, patented production process (US Patent 5995702).

Side-radiating PMMA fibres can be used in damp areas and under water without any problem. Appropriate test methods have established resistance to UV light and algae. A watertight reflective cap on the end of the fibre optimises uniform, intensive illumination by reflecting light back into the fibre. However, this effect is not comparable to a tubular compact fluorescent lamp; STARFLEX fibres are therefore not suitable for achieving specific illuminances in niches or rooms.

Light outlets

Installing standard outlets

Light outlets for recessed mounting are fixed in the drilled holes provided by using springs; light outlets for surface mounting are fixed in position by means of a locknut.

Focusing capabilities

Light outlets with lenses have a variable radiation angle. To achieve individual focusing, use the grub screw in the light outlet to set the desired distance between the fibre closure and lens.
STARFLEX 50 W QR-CBC engine

Engine for 50 W halogen lamp
- Aluminium housing
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- Mains voltage: 230/240 V, 50 Hz
- Lamp voltage: 12 V
- Can be adapted for external dimming, with halogen reverse-phase dimmer
- Absolutely noise-free
- No-tool relamping
- Prepared for no-tool installation of locked colour filters and colour-temperature correction filters
- Connecting cable: 2 m with Euro connector (not suitable for GB)
- Scope of supply includes light source

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light engine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/50 W QR-CBC 51</td>
<td>1.0</td>
<td>S2 313 000</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapter CE 30 to CE 9 mm</td>
<td>0.1</td>
<td>S2 313 350</td>
</tr>
<tr>
<td>Lamp QR-CBC 51 50 W/38° GU5.3 12 V</td>
<td>0.1</td>
<td>20 756 124</td>
</tr>
<tr>
<td>Locked colour-filter element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue</td>
<td>0.1</td>
<td>S2 313 260</td>
</tr>
<tr>
<td>yellow</td>
<td>0.1</td>
<td>S2 313 240</td>
</tr>
<tr>
<td>green</td>
<td>0.1</td>
<td>S2 313 230</td>
</tr>
<tr>
<td>magenta</td>
<td>0.1</td>
<td>S2 313 300</td>
</tr>
<tr>
<td>pink</td>
<td>0.1</td>
<td>S2 313 280</td>
</tr>
<tr>
<td>red</td>
<td>0.1</td>
<td>S2 313 270</td>
</tr>
<tr>
<td>turquoise</td>
<td>0.1</td>
<td>S2 313 290</td>
</tr>
</tbody>
</table>

Colour temperature correction filter available upon request.

STARFLEX 100 W QR-CB engine

Engine for 100 W halogen lamp
- Aluminium housing
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- Mains voltage: 230/240 V, 50 Hz
- Lamp voltage: 12 V
- Dimming function integrated
- Can be adapted for external dimming
- Electronic fan control for adapting fan speed according to ambient temperature fluctuations, incl. emergency switch-off and automatic restart
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool relamping
- Prepared for no-tool installation of colour or sparkle-effect wheel modules as well as locked colour filters and colour-temperature correction filters
- Connecting cable: 1.5 m with safety plug (not suitable for CH and GB)
- Scope of supply includes light source

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light engine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/100 W QR-CB 51</td>
<td>1.5</td>
<td>S2 313 010</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapter CE 30 to CE 9 mm</td>
<td>0.1</td>
<td>S2 313 350</td>
</tr>
<tr>
<td>Lamp QR-CB 51 100 W GZ6.35 12 V</td>
<td>0.1</td>
<td>24 134 173</td>
</tr>
<tr>
<td>Locked colour-filter element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue</td>
<td>0.1</td>
<td>S2 313 260</td>
</tr>
<tr>
<td>yellow</td>
<td>0.1</td>
<td>S2 313 240</td>
</tr>
<tr>
<td>green</td>
<td>0.1</td>
<td>S2 313 230</td>
</tr>
<tr>
<td>magenta</td>
<td>0.1</td>
<td>S2 313 300</td>
</tr>
<tr>
<td>pink</td>
<td>0.1</td>
<td>S2 313 280</td>
</tr>
<tr>
<td>red</td>
<td>0.1</td>
<td>S2 313 270</td>
</tr>
<tr>
<td>turquoise</td>
<td>0.1</td>
<td>S2 313 290</td>
</tr>
</tbody>
</table>

Colour temperature correction filter available upon request. Connecting cable 1.5 m with T12 safety plug, please order separately (60 800 181).
STARFLEX 100 W QR-CB ECO engine

Engine for 100 W “ECO” halogen lamp
- Aluminium housing
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- Mains voltage: 230/240 V, 50 Hz
- Lamp voltage: 12 V
- Easy electronic control of fan incl. reversible thermal fuse in transformer for emergency switch-off and automatic restart
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool relamping
- Prepared for no-tool installation of colour or sparkle-effect wheel modules as well as locked colour filters and colour-temperature correction filters
- Connecting cable: 1.5 m with safety plug (not suitable for CH and GB)
- Scope of supply includes light source

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light engine</td>
<td>1/100 W QR-CB 51 ECO</td>
<td>2.4</td>
</tr>
<tr>
<td>Accessories</td>
<td>Adapter CE 30 to CE 9 mm</td>
<td>0.1</td>
</tr>
<tr>
<td>Lamp QR-CB 51 100 W GZ6.35 12 V</td>
<td>0.1</td>
<td>S2 313 173</td>
</tr>
</tbody>
</table>

Locked colour-filter element
- blue: 0.1 | S2 313 260 |
- yellow: 0.1 | S2 313 240 |
- green: 0.1 | S2 313 250 |
- magenta: 0.1 | S2 313 300 |
- pink: 0.1 | S2 313 280 |
- red: 0.1 | S2 313 270 |
- turquoise: 0.1 | S2 313 290 |

Colour temperature correction filter available upon request. Connecting cable 1.5 m with T12 safety plug, please order separately (60 800 181).

STARFLEX 35/70 W HIT engine

Engine for 35/70 W metal halide lamp
- Aluminium housing
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- Mains voltage: 230/240 V, 50 Hz
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool relamping
- Prepared for no-tool installation of colour or sparkle-effect wheel modules as well as locked colour filters and colour-temperature correction filters
- Connecting cable: 1.5 m with Euro plug (not suitable for GB)
- Scope of supply includes light source

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light engine</td>
<td>1/35 W HIT</td>
<td>1.0</td>
</tr>
<tr>
<td>1/70 W HIT</td>
<td>1.0</td>
<td>S2 313 560</td>
</tr>
<tr>
<td>Accessories</td>
<td>Adapter CE 30 to CE 9 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Locked colour-filter element
- blue: 0.1 | S2 313 260 |
- yellow: 0.1 | S2 313 240 |
- green: 0.1 | S2 313 250 |
- magenta: 0.1 | S2 313 300 |
- pink: 0.1 | S2 313 280 |
- red: 0.1 | S2 313 270 |
- turquoise: 0.1 | S2 313 290 |

Colour temperature correction filter available upon request.
STARFLEX colour-wheel module QR-CB/35/70 W HIT engine

Surface-mounted module for QR-CB/35/70 W HIT engine
- 7 colour-filter elements plus one blank field “white”
- Aluminium housing
- No-tool installation/disassembly
- Plug-in connection to engine
- 1 r/min
- Switch-on/switch-off of motor
- Colour filter elements can be replaced on site

STARFLEX sparkle-effect wheel module QR-CB/35/70 W HIT engine

Surface-mounted module for QR-CB/35/70 W HIT engine
- Sparkle-effect wheel made of aluminim perforated in a regular pattern
- Aluminium housing
- No-tool installation/disassembly
- Plug-in connection to engine
- 1 r/min
- Switch-on/switch-off of motor

STARFLEX 150 W HIT engine

Engine for 150 W metal halide lamp
- Aluminium housing
- Colour: titanium
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- Mains voltage: 230/240 V, 50 Hz
- Electronic fan control for adapting fan speed according to ambient temperature fluctuations, incl. emergency switch-off and automatic restart
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool replacement of lighting module
- Prepared for no-tool installation of colour or sparkle-effect wheel modules as well as locked colour filters and colour-temperature correction filters
- Colour wheel module switched on at engine, or decentralised switching via female contact
- Connecting cable: 1.5 m with safety plug (not suitable for CH and GB)
- Please order lighting module separately

Accessories

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour-wheel module</td>
<td>0.3</td>
<td>S2 313 070</td>
</tr>
<tr>
<td>Plug-in power unit 230/12 V, 50 Hz, 5 W, 2 m cable*</td>
<td>1.0</td>
<td>S2 313 540</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sparkle-effect wheel module</td>
<td>0.3</td>
<td>S2 313 090</td>
</tr>
<tr>
<td>Plug-in power unit 230/12 V, 50 Hz, 5 W, 2 m cable*</td>
<td>1.0</td>
<td>S2 313 540</td>
</tr>
</tbody>
</table>

* Plug-in power pack for operating colour-wheel or sparkle-effect wheel module independently from engine (50 W QR-CBC/35/70 W HIT). Not suitable for GB.
**STARFLEX 250 W HIT engine**

Engine for 250 W metal halide lamp
- Aluminium housing
- Colour: titanium
- Common end spigot Ø 30 mm
- HIT 250 W: Only for use of PMMA optical fibre sealed in connector
- Mains voltage: 230/240 V, 50 Hz
- Electronic fan control for adapting fan speed according to ambient temperature fluctuations, incl. emergency switch-off and automatic restart
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool replacement of lighting module
- Prepared for no-tool installation of colour or sparkle-effect wheel modules as well as locked colour filters and colour-temperature correction filters
- Colour wheel module switched on at engine, or decentralised switching via female contact
- Connecting cable: 1.5 m with safety plug (not suitable for CH and GB)

**Light engine**
1/250 W HIT       7.8  S2 313 050
Lighting module
250 W HIT lighting module 0.5  S2 313 200
Accessories
Adapter CE 30 to CE 9 mm 0.1  S2 313 350
Locked colour-filter element
- blue       0.1  S2 313 450
- green      0.1  S2 313 440
- magenta    0.1  S2 313 460
- pink       0.1  S2 313 470
- red        0.1  S2 313 460
- turquoise  0.1  S2 313 480
- yellow     0.1  S2 313 430

**STARFLEX 150/250 W DMX engine**

Engine for metal halide lamp, DMX-controlled
- Aluminium housing
- Colour: titanium
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- HIT 250 W: Only for use of PMMA optical fibre sealed in connector
- Mains voltage: 230/240 V, 50 Hz
- Can be controlled via 1–10 V or DMX signal
- Can be controlled via Luxmate with accessories (2 ANAS module)
- 7 colour-filter elements plus one blank field “white”
- Manual dimming via aluminium disc with corresponding perforation
- Electronic fan control for adapting fan speed according to ambient temperature fluctuations, incl. emergency switch-off and automatic restart
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool replacement of lighting module
- Connecting cable: 1.5 m with safety plug (not suitable for CH and GB)

**Light engine**
1/150 W HIT DMX-controlled 6.0  S2 313 040
1/250 W HIT DMX-controlled* 9.4  S2 313 060
Lighting module
150 W HIT BLV lighting module 0.3  S2 313 190
150 W HIT CDM SA/R lighting module 0.3  S2 313 170
250 W HIT lighting module 0.5  S2 313 200
Accessories
Adapter CE 30 to CE 9 mm 0.1  S2 313 350
DMX control line (1–10 V), 3 m 0.2  S2 313 530
DMX control line, 2 m 0.3  S2 313 550
DMX input unit 1.1  S2 313 510
DMX recorder 0.9  S2 313 520

* Only for use with PMMA optical fibre sealed in connector.

Light engine only functions with lighting module, please order separately. Colour temperature correction filter and colour temperature correction wheel available on request.

To specify e.g.: STARFLEX 250 W HIT engine 1/250 W HIT  S2 313 050
**STARFLEX IP54 150/250 W HIT engine**

- IP54 engine for metal halide lamp
- Housing made of V4A stainless-steel
- Common end spigot Ø 30 mm
- For glass and PMMA fibre strings
- HIT 250 W: Only for use of PMMA optical fibre sealed in connector
- Mains voltage: 230/240 V, 50 Hz
- Protection type IP54
- Internal heating system to prevent condensation of water
- Includes dust protection filter against dirt and insects
- UV/IR blocking filters can be removed without tools for cleaning
- No-tool replacement of lighting module
- Electrical connection: separate phases for lighting circuit and heating system; clamped on
- Wall-mounting
- Please order lighting module separately
- For further technical description, please refer to STARFLEX 150/250 W HIT or 150/250 W HIT DMX engine

### Lighting module

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/150 W HIT</td>
<td>15.0</td>
<td>S2 313 310</td>
</tr>
<tr>
<td>1/250 W HIT</td>
<td>17.0</td>
<td>S2 313 330</td>
</tr>
</tbody>
</table>

### Light engine, DMX-controlled

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/150 W HIT DMX-controlled</td>
<td>15.4</td>
<td>S2 313 320</td>
</tr>
<tr>
<td>1/250 W HIT DMX-controlled</td>
<td>17.4</td>
<td>S2 313 340</td>
</tr>
</tbody>
</table>

### Accessories

- Adapter CE 30 to CE 9 mm
- DMX control line (1–10 V) 3 m

### Light engine only functions with lighting module, please order separately. Colour temperature correction filter and colour temperature correction wheel available on request.

### STARFLEX colour-wheel module 150/250 W HIT engine

- Installation module for 150/250 W HIT engines
- 7 colour-filter elements plus one blank field “white”
- Frame in aluminium sheet steel
- Plug-in connection without use of tools
- 1 r/min
- Switch-on/switch-off of motor
- Colour filter elements can be replaced on site

### Accessories

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour-wheel module</td>
<td>0.2</td>
<td>S2 313 080</td>
</tr>
</tbody>
</table>
| Colour filter module
  - blue | 0.1 | S2 313 380 |
  - yellow | 0.1 | S2 313 360 |
  - green | 0.1 | S2 313 370 |
  - magenta | 0.1 | S2 313 420 |
  - pink | 0.1 | S2 313 470 |
  - red | 0.1 | S2 313 460 |
  - turquoise | 0.1 | S2 313 480 |

### STARFLEX sparkle-effect wheel module 150/250 W HIT engine

- Installation module for 150/250 W HIT engines
- Sparkle-effect wheel made of aluminium perforated in a regular pattern
- Frame in aluminium sheet steel
- Plug-in connection without use of tools
- 1 r/min
- Switch-on/switch-off of motor

### Accessories

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sparkle-effect wheel module</td>
<td>0.2</td>
<td>S2 313 100</td>
</tr>
</tbody>
</table>

* Only for use with PMMA optical fibre sealed in connector.

**To specify e.g.: STARFLEX IP54 150/250 W HIT engine 1/150 W HIT S2 313 310**
Recessed light outlet, open 60°/70°

Light outlets, stationary

- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Radiation angle: PMMA 60°/glass 70°
- Material: post-anodised aluminium resp. polished brass
- Installation: using spring clips, diameter of drilled hole ceiling cut-out = 18 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

Recessed light head, open 60°/70°

Cat. no. Order no.

Recessed light head, open 60°/70°

Cover, matt anodized S2 310 340
black anodized S2 311 020
Cover, white painted S2 311 030
Cover, polished brass S2 311 040

Recessed light outlet, lens 25–53°

Light outlets, stationary

- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Radiation angle ranges of lens (can be focussed) 25° to 53°, depending on fibre diameter
- Can be focussed using spacer sleeves supplied
- Material: post-anodised aluminium resp. polished brass
- Lens: silicate glass, polished
- Installation: using spring clips, diameter of drilled hole ceiling cut-out = 18 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

Recessed light head, with 25–53° lens D = 12 mm

Cat. no. Order no.

Recessed light head, with 25–53° lens D = 12 mm

Cover, matt anodized S2 310 350
Cover, black anodized S2 311 050
Cover, white painted S2 311 060
Cover, polished brass S2 311 070

Recessed light outlet, acrylic cone

Light outlets, stationary

- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Material: post-anodised aluminium resp. polished brass
- Acrylic cone (PMMA)
- Installation: using spring clips, diameter of drilled hole ceiling cut-out = 18 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

Recessed light outlet, with acrylic cone D = 7 mm

Cat. no. Order no.

Recessed light outlet, with acrylic cone D = 7 mm

Cover, matt anodized S2 310 360
Cover, black anodized S2 311 080
Cover, white painted S2 311 090
Cover, polished brass S2 311 100

To specify e.g.: Recessed light outlet, open 60°/70° Cover, matt anodized S2 310 340
Recased light outlet, glass cover 60°/70°

Light outlets, stationary
- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Radiation angle: PMMA 60°/glass 70°
- Material: post-anodised aluminium resp. polished brass
- Glass cover made of polished silicate glass
- Installation: using spring clips, diameter of drilled hole ceiling cut-out = 18 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

Cat. no. Order no.
Recased light head, with glass cover 60°/70°
Cover, matt anodized S2 310 370
Cover, black anodized S2 311 110
Cover, white painted S2 311 120
Cover, polished brass S2 311 130

Recased light outlet, pivoting, lens 7°–28°

Light outlets, pivoting
- Tilting angle up to 30°
- Radiation angle ranges of lens (can be focussed) 7° to 28°, depending on fibre diameter
- Can be focussed using spacer sleeves supplied
- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Material: post-anodised aluminium resp. polished brass
- Lens: silicate glass, polished
- No-tool installation
- Suitable for mounting panels 1 to 30 mm thick
- Diameter of drilled hole:
  S2 310 410/120/1210: DA = 40 mm,
  S2 310 420/1220/1230: ceiling cut-out = 27 mm

Cat. no. Order no.
Recased light head, with 7°–28° lens D = 26 mm
Cover, matt anodized S2 310 410
Cover, white painted S2 311 200
Cover, polished brass S2 311 210

Recased light outlet, pivoting, lens 25°–53°

Light outlets, pivoting
- Tilting angle up to 20°
- Radiation angle ranges of the lens (can be focussed) 25° bis 53°, depending on fibre diameter
- Can be focussed using spacer sleeves supplied
- For glass and PMMA fibre strings with active diameter of 1.0 to 6.0 mm with string closure for light outlets
- Material: post-anodised aluminium resp. polished brass
- Lens: silicate glass, polished
- No-tool installation
- Suitable for mounting panels 1 to 30 mm thick
- Diameter of drilled hole:
  S2 310 410/120/1210: DA = 40 mm,
  S2 310 420/1220/1230: ceiling cut-out = 27 mm

Cat. no. Order no.
Recased light head, with 25°–53° lens D = 12 mm
Cover, matt anodized S2 310 420
Cover, white painted S2 311 220
Cover, polished brass S2 311 230
Adjustable surface-mounted light outlet, lens 25–46°

Surface-mounted light outlets, adjustable
- Tilting angle up to 38°
- Radiation angle ranges of lens (can be focussed) 25° to 46°, depending on fibre diameter
- For glass and PMMA fibre strings with active diameter of 1.0 to 4.5 mm
- Material: post-anodised aluminium resp. polished brass
- Lenses: silicate glass, polished
- Adjust light emission angle by turning the lens part
- Installation: screw-fixing from behind, diameter/drilled hole = 10.5 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable light outlet with 25–46° lens</td>
<td></td>
</tr>
<tr>
<td>Aluminium, matt anodized</td>
<td>S2 310 260</td>
</tr>
<tr>
<td>Aluminium, black anodized</td>
<td>S2 310 980</td>
</tr>
<tr>
<td>Polished brass</td>
<td>S2 310 990</td>
</tr>
</tbody>
</table>

Adjustable surface-mounted light outlet, lens 7–25°

Surface-mounted light outlets, adjustable
- Tilting angle up to 38°
- Radiation angle ranges of lens (can be focussed) 7° to 25°, depending on fibre diameter
- For glass and PMMA fibre strings with active diameter of 1.0 to 4.5 mm
- Material: post-anodised aluminium resp. polished brass
- Lenses: silicate glass, polished
- Adjust light emission angle by turning the lens part
- Installation: screw-fixing from behind, diameter/drilled hole = 10.5 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable light outlet with 7–25° lens</td>
<td></td>
</tr>
<tr>
<td>Aluminium, matt anodized</td>
<td>S2 310 280</td>
</tr>
<tr>
<td>Aluminium, black anodized</td>
<td>S2 311 660</td>
</tr>
</tbody>
</table>

Adjustable surface-mounted light outlet, open 60°/70°

Surface-mounted light outlets, adjustable
- Tilting angle up to 38°
- Radiation angle: PMMA 60°/glass 70°
- For glass and PMMA fibre strings with active diameter of 1.0 to 4.5 mm
- Material: post-anodised aluminium resp. polished brass
- Installation: screw-fixing from behind, diameter/drilled hole = 10.5 mm
- Suitable for mounting panels 1 to 30 mm thick
- Special versions available on request: chromium-plated or brass-colour light outlets, special anodised finishes

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable light outlet open 60°/70°</td>
<td></td>
</tr>
<tr>
<td>Aluminium, matt anodized</td>
<td>S2 310 290</td>
</tr>
<tr>
<td>Aluminium, black anodized</td>
<td>S2 311 010</td>
</tr>
</tbody>
</table>
**Crystal lighting outlet, length: 12.5 mm**

**Light outlets**
- Length: 12.5 mm
- For light guides with active diameter 1–6 mm
- Material: cut glass
- Installed using leg spring
- Suitable for mounting panels 1 to 30 mm thick
- Diameter of drilled hole: ceiling cut-out = 18 mm

**Cat. no.**

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal light outlet</td>
<td>0.1</td>
<td>S2 310 920</td>
</tr>
<tr>
<td>Cover, polished brass</td>
<td>0.1</td>
<td>S2 310 910</td>
</tr>
</tbody>
</table>

**Crystal lighting outlet, length: 31 mm**

**Light outlets**
- Length: 31 mm
- For light guides with active diameter 1–6 mm
- Material: cut glass
- Installed using leg spring
- Suitable for mounting panels 1 to 30 mm thick
- Diameter of drilled hole: ceiling cut-out = 18 mm

**Cat. no.**

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal light outlet</td>
<td>0.1</td>
<td>S2 310 960</td>
</tr>
<tr>
<td>Cover, polished brass</td>
<td>0.1</td>
<td>S2 310 950</td>
</tr>
</tbody>
</table>

**Crystal lighting outlet, dia: 18.5 mm**

**Light outlets**
- Diameter: 18.5 mm
- For light guides with active diameter 1–6 mm
- Material: cut glass
- Installed using leg spring
- Suitable for mounting panels 1 to 30 mm thick
- Diameter of drilled hole: ceiling cut-out = 18 mm

**Cat. no.**

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal light outlet</td>
<td>0.1</td>
<td>S2 310 940</td>
</tr>
<tr>
<td>Cover, polished brass</td>
<td>0.1</td>
<td>S2 310 930</td>
</tr>
</tbody>
</table>

**Light outlet for staircase lighting**

**Light outlet**
- For fibre strings with active diameter of 1–6 mm
- Material: aluminium, anodised
- Installed using leg springs with additional cover ring

**Cat. no.**

<table>
<thead>
<tr>
<th></th>
<th>RD/RØ</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light outlet for staircase lighting</td>
<td>25/18</td>
<td>S2 311 640</td>
</tr>
</tbody>
</table>

**Light outlet for stairway/path lighting**

**Light outlet**
- Asymmetrical light outlet without glass lens, light exit 30°
- For fibre strings with active diameter of 2–3 mm
- Material: aluminium, anodised
- Installed using leg springs with additional cover ring

**Cat. no.**

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light outlet with asymmetrical light distribution</td>
<td>0.2</td>
<td>S2 312 230</td>
</tr>
<tr>
<td>Cover, anodized aluminium</td>
<td>0.2</td>
<td>S2 312 240</td>
</tr>
</tbody>
</table>

*To specify e.g.: Crystal lighting outlet, length: 12.5 mm Cover, polished brass S2 310 920*
**Light outlet for shelves**

- **Light outlet**
  - For installation in shelves, panels, etc.
  - No-tool installation
  - Can only be used with special fibre closure (99030005); must be ordered separately

**Cat. no.**

**Order no.**

---

**Light outlet curved tube**

- **Light outlet bent tube**
  - Rotates through: 360°
  - With built-in PMMA light guide
  - For optical strings with active diameter 1–3 mm (S2311650)/1–4.5 mm (S2312250)
  - Material: aluminium, anodised
  - Screw-fastened via sleeve insert for panel-mounting
  - Diameter of drilled hole: ceiling cut-out = 18 mm

**Cat. no.**

**H/Ø**

**Order no.**

---

**Double light outlet**

- **Double light outlet**
  - Consists of two flexible outlets on one PMMA fibre cable (fibre diameter = 4.5 mm)
  - With 12 mm glass lens
  - Material: metal, painted in black, tube diameter = 10 mm
  - With 1.5 m PMMA fibre cable to outlets and 9 mm feed connection
  - Surface-mounting using screw fixing (panel thickness = 10–25 mm)

**Cat. no.**

**L**

**Order no.**

---

**Light head spotlight, surface-mounted, IP68**

- **Light outlet spotlight, surface-mounted, IP68**
  - Material: stainless-steel
  - Protection type IP68
  - Screw-fastening incl. fixing screw
  - Rotates through 360°, pivots through 90°
  - S2 311 460/960: Please order separately for Ø 3–6 mm optical strings with IP67 or IP68 individual string closure (99 030 004)
  - S2 313 680/690: Please order separately for Ø 8–10 mm optical strings with individual string closure IP68

**Cat. no.**

**kg**

**Order no.**

---

To specify e.g.: **Light outlet for shelves**  \(D = 34\ mm\)  S2 311 950
**Recessed light outlet IP44**

- For direct installation in empty tubes PG 16 (FBY)
- For fibre strings with active diameter of 1–6 mm
- Housing and cover ring made of stainless-steel
- Protection type IP44
- Glass cover, transparent, opal or frosted
- Silicone gasket on site

**Projection attachment**

- Projection of geometrical patterns, static or dynamic
- Images can be projected onto surfaces using inserts (metal gobos D = 53.3 mm) or diapositives
- Illuminance dependent on configuration of system
- Indoor and outdoor application
- Absolutely noise-free

**PMMA fibre-bundle set**

- Preassembled PMMA fibre bundles with PMMA fibre diameter “D”, number of individual strings “n”, lengths of all strings “L”
- Further details regarding customised preassembled PMMA fibre bundles is available on request

**Installation duct for side-radiating fibres**

- Transparent plastic installation duct, open, with self-adh. tape
- For fibre cable D = 5 mm 2000 $2 310 850$
- For fibre cable D = 8 mm 2000 $2 310 860$
- Transparent plastic installation duct, with cover
- With drilled holes for fibre cable D = 14 mm* 2000 $2 310 880$
- With self-adhesive tape, for fibre cable D = 12 mm 2000 $2 310 870$

**Accessories**

- Fixing clamps (100 off), plastic, for all diameters $2 311 710$
- Hot knife for shortening PMMA fibres when configured on site $2 311 720$
- Polishing kit to polish PMMA fibres if they are configured on site $2 311 730$

* For screw-fastening

---

**Fibre optic system**

**Cat. no.** | **kg** | **Order no.**
---|---|---
**Recessed light outlet IP44**

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass, semi-frosted*</td>
<td>0.2</td>
<td>S2 313 670</td>
</tr>
<tr>
<td>Glass, opal</td>
<td>0.2</td>
<td>S2 312 220</td>
</tr>
<tr>
<td>Glass, transparent</td>
<td>0.2</td>
<td>S2 312 210</td>
</tr>
<tr>
<td>with lens 11–36°</td>
<td>0.2</td>
<td>S2 313 680</td>
</tr>
</tbody>
</table>

* S2 313 670: semi-frosted glass for reducing glare.

**Projection attachment**

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projection attachment with exchangeable lens</td>
<td>1.0</td>
<td>S2 313 650</td>
</tr>
<tr>
<td>with lens</td>
<td>1.0</td>
<td>S2 313 640</td>
</tr>
</tbody>
</table>

**PMMA fibre bundle CE 30 mm, starry sky-effect closure**

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>kg</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1: D = 1 mm, n= 50, L = 2.5 m</td>
<td>1.0</td>
<td>S2 313 590</td>
</tr>
<tr>
<td>Set 2: D = 1 mm, n1= 38, n2 = 38, L1 = 3 m, L2 = 4 m</td>
<td>1.0</td>
<td>S2 313 600</td>
</tr>
<tr>
<td>Set 4: D = 1 mm, n1= 125, n2 = 125, L1 = 4 m, L2 = 5 m</td>
<td>1.0</td>
<td>S2 313 620</td>
</tr>
<tr>
<td>PMMA fibre bundle CE 30 mm, string closure for light head</td>
<td>1.0</td>
<td>S2 313 610</td>
</tr>
<tr>
<td>Set 3: D = 2 mm, n1 = 38, n2 = 38, L1 = 3 m, L2 = 4 m</td>
<td>1.0</td>
<td>S2 313 630</td>
</tr>
<tr>
<td>Set 5: D = 2 mm, n1 = 125, n2 = 125, L1 = 4 m, L2 = 5 m</td>
<td>1.0</td>
<td>S2 313 640</td>
</tr>
</tbody>
</table>

**Installation duct for side-radiating fibres**

<table>
<thead>
<tr>
<th>Cat. no.</th>
<th>L</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent plastic installation duct, open, with self-adh. tape</td>
<td>2000</td>
<td>S2 310 850</td>
</tr>
<tr>
<td>For fibre cable D = 5 mm</td>
<td>2000</td>
<td>S2 310 860</td>
</tr>
<tr>
<td>For fibre cable D = 8 mm</td>
<td>2000</td>
<td>S2 310 880</td>
</tr>
<tr>
<td>Transparent plastic installation duct, with cover</td>
<td>2000</td>
<td>S2 310 870</td>
</tr>
<tr>
<td>With drilled holes for fibre cable D = 14 mm*</td>
<td>2000</td>
<td>S2 310 880</td>
</tr>
<tr>
<td>With self-adhesive tape, for fibre cable D = 12 mm</td>
<td>2000</td>
<td>S2 310 870</td>
</tr>
</tbody>
</table>

**Accessories**

- Fixing clamps (100 off), plastic, for all diameters $2 311 710$
- Hot knife for shortening PMMA fibres when configured on site $2 311 720$
- Polishing kit to polish PMMA fibres if they are configured on site $2 311 730$

To specify e.g.: **Recessed light outlet IP44** Glass, semi-frosted S2 313 670
Throughout the world, Zumtobel Staff is the competent reliable partner for innovative lighting solutions in all areas of application of professional interior lighting:

- Industry and Engineering
- Sport and Leisure
- Transit areas and Car parks
- Offices and Education
- Presentation and Retail
- Hotels and Catering
- Art and Culture
- Health & Care
- Orientation and Safety
- Active Light

With production plants in Austria, Germany, Australia and the USA, and sales organisations in all major European markets as well as commercial agencies in most regions of the world, Zumtobel Staff is one of the biggest international enterprises in the lighting sector.

As a leader in innovation, we guarantee our customers global competence in lighting consulting and design assistance, superior product quality and future-proof technologies – from individual luminaires to electronic lighting management systems.

**Corporate goal:** We want to use light to create worlds of experience, make work easier and improve communications and safety while remaining fully aware of our responsibility to the environment.
United Kingdom
Zumtobel Staff Lighting Ltd.
Unit 4 - The Argent Centre,
Pump Lane
Hayes/Middlesex UB3 3BL
Tel. +44/(0)20 8589 1800
Fax +44/(0)20 8756 4800
Email: enquiries@uk.zumtobelstaff.co.at

USA and Canada
Zumtobel Staff Lighting
3300 Route 9W
Highland, New York 12528
Tel. +1/(0)845/691 62 62
Fax +1/(0)845/691 62 89
www.zumtobelstaffusa.com

Australia and New Zealand
Zumtobel Staff (Australia) Pty. Ltd.
2 Wella Way
Somersby, NSW 2250
Tel. +61/(2)4340 3200
Fax +61/(2)4340 2108
Email: info@zumtobelstaff.com.au

Norway
Zumtobel Staff Jakobsson
Industriveien 11
1483 Skytta
Tel: +47/(0)67 06 22 30
Fax: +47/(0)67 06 22 69
Email: m.vidnes.jakobsson@zumtobelstaff.no

Sweden
Zumtobel Staff Jakobsson AB
Besöksadress: Norr Mälarstrand 8
Postadress: Box 22318
104 22 Stockholm
Tel: +46/(0)8 26 26 50
Fax: +46/(0)8-26 56 05
E-mail: info@zumtobelstaffjakobsson.se
www.zumtobelstaffjakobsson.se

Art.-No. 04 113 948-UK 05/03 © Zumtobel Staff
Technical data was correct at time of going to press.
We reserve the right to make technical changes without notice.
Please contact your local sales office for further information.
Printed on environmentally-friendly chlorine-free paper. Printed on Luxosamt Offset.
Applications
Indoors and outdoors  4 – 5
Art and culture  6 – 7
Presentation and retail  8 – 9
Wellness and fitness  10 – 11

System and effect  12 – 13

Light engines
Compact  14 – 19
High performance  20 – 21
Engines with IP protection  22 – 25
Control of engines  26 – 31

Optical fibres
Fibre optic lighting principles  32 – 33
Glass fibres  34
PMMA optical fibres  35
Pre-assembly of PMMA fibres  36 – 39

Light outlets
Recessed and surface-mounted light outlets  40 – 41
Special light outlets  42
Decorative light outlets  43
Light outlets with IP protection  44

Sets
Modular starry sky sets  45 – 47

Projection technology
Projection using slides and gobos  48 – 49

Fibre optic technology versus LED technology  50

Design hints
Installing light engines  51
Light engines: technical data  52 – 53
Installing optical fibres and light outlets  54

Product pages  55 – 65

References
Museums and exhibitions
“Art de Cartier” exhibition
Vitra Design Museum, Berlin
Egyptology Collection, Vienna
History of Art Collection, Vienna
“Libori” exhibition, Paderborn
“7 Hills” exhibition, Berlin
Instrument Museum, Brussels

Retail area lighting
Escada
Swatch
Douglas
Transparent factory, Volkswagen, Dresden

Interior design and architecture
Federal Chancellery, Berlin
Stock Exchange, Frankfurt/Main
Sprungturm, Bischofshofen
Hotel Side, Hamburg
Hotel Riders Palace, Laax
Points and lines of light which emphasise an entire building or architectural details both indoors and outdoors – this is the real fascination of STARFLEX. The spectrum ranges from relatively straightforward applications such as static light points through to precisely controlled colour and brightness changes for different lines of light. STARFLEX produces particularly striking effects in conjunction with water or under water – the safe combination of electricity, light and water makes this fibre optic system perfect for the task.
Dramatic effects

Exhibits in museums and exhibitions are often irreplaceably precious and need to be treated and lit with correspondingly great care. STARFLEX gently projects light with no UV or IR component onto paintings, sculptures and precious items without fading them or making them brittle.

And it does so with precision: STARFLEX sets the stage for even the fine details of the smallest exhibit – a ring, a tiara or a watch, and produces an exciting dramatic effect which brings individual pieces and their history just a little bit closer to the visitor.

HIT 150 W light engine with glass fibre (4.5 mm) and 14 recessed “pivoting” light outlets
STARFLEX has several tricks up its sleeve for the area of presentation and retail when it comes to underscoring the value of goods, stressing the prestige of a brand, or transforming shopping into an event:

- Heat-sensitive goods such as cosmetics and foodstuffs can be lit without generating any heat whatsoever;
- UV-free light prevents textiles from fading;
- Dynamic, multi-colour light sets the stage for textiles, high-tech products and trends;
- Side-radiating STARFLEX fibres outline the contours of shop façades and shelves, and are an ideal replacement for neon tubes used to illuminate company names and deliver messages;
- Projecting slides is child's play;
- The brightness and colour of lighting for shelves, showcases or in-store areas can be modified at the press of a button.

Eight controllable HIT 150W light engines and PMMA optical fibres (3 mm) produce 580 diffuse light points. Control is obtained by means of a LUXMATE® building management system.
Light for well-being

Decorative light points or variable-colour lines in swimming pools, colour therapy in saunas, decorative starry sky effects in bar and restaurant areas, attractive lighting of hotel lobbies – STARFLEX promotes a feeling of well-being and helps recharge our batteries. The product line ranges from simple systems which can be installed quickly through to complex lighting solutions teamed with background music.