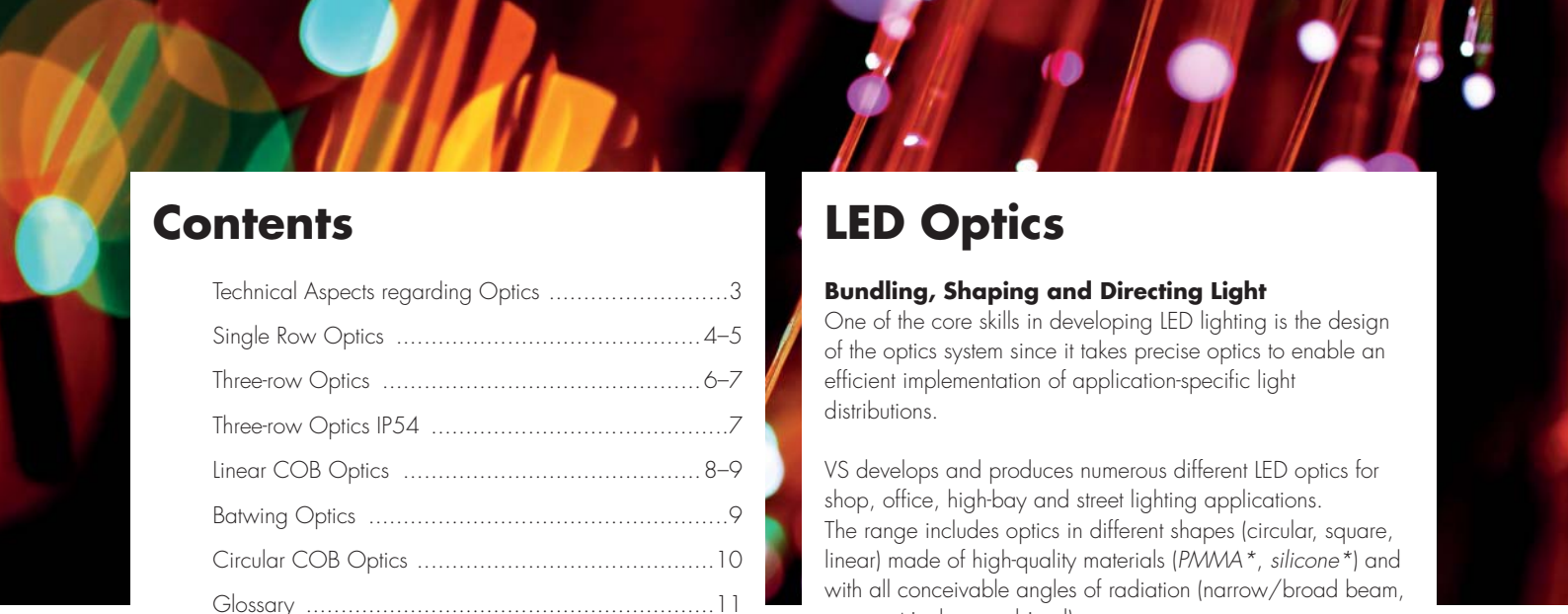
LIGHTING SOLUTIONS

Product News – Optics

Bundling, Shaping and Directing Light



Contents

LED Optics

Bundling, Shaping and Directing Light
One of the core skills in developing LED lighting is the design of the optics system since it takes precise optics to enable an efficient implementation of application-specific light distributions.

VS develops and produces numerous different LED optics for shop, office, high-bay and street lighting applications.
The range includes optics in different shapes (circular, square, linear) made of high-quality materials (*PMMA**, *silicone**) and with all conceivable angles of radiation (narrow/broad beam, asymmetrical or combined).

Thanks to a brand new injection moulding process, VS can now even produce three-dimensional optics of up to 2 m in length.

Vossloh-Schwabe's bespoke optics design service makes it possible to create highly specific lighting characteristics.

DEVELOPMENT & SIMULATION

Individual LED optics for lighting technology are designed in our R&D departments. Optical simulations as well as in-depth experience in the design of injection-moulded plastic components number among VS' core competencies. In-house production of STL models and prototyping tools make it possible to test the results of development work using near-mass-production prototypes and to trial their performance at the customer's premises with the actual application.

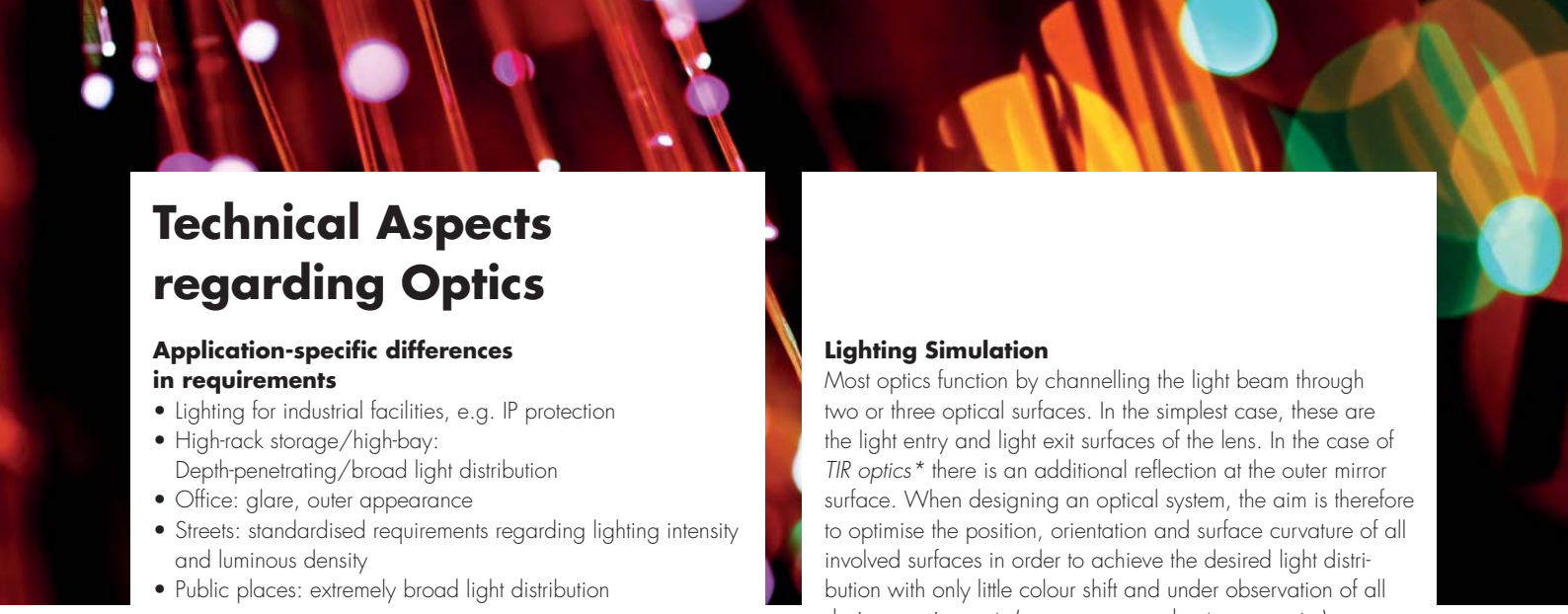
TOOL DESIGN & CONSTRUCTION

Producing the tools needed for making optical systems demands a high degree of experience and precision. VS has spent many years expanding its in-house tool production competence, a valuable resource that can be made available to leading companies within the lighting technology market.

Our modern machine park ensures mass tool production is both highly efficient and almost fully automated. Our tooling service covers production-ready optics design, tool blueprinting and manufacturing, simulation of the injection moulding process, manufacturing of the end products and their final installation. For our customers, this means high-quality and durable tools for the production of individual components or entire systems.

PRODUCTION

Our automated injection moulding production processes and modern machinery provide a basis for manufacturing optical components. Most lighting optics are produced using polymethyl methacrylate (PMMA) or polycarbonate (PC). And the high standards applied to material selection also extend to a flawless finish.
Thanks to a new technology – a combination of extrusion and injection moulding called exjection – we can now even produce optics with several degrees of light-technology freedom and in continuous lengths of up to 2 m.



Technical Aspects regarding Optics

Application-specific differences in requirements

- Lighting for industrial facilities, e.g. IP protection
- High-rack storage/high-bay: Depth-penetrating/broad light distribution
- Office: glare, outer appearance
- Streets: standardised requirements regarding lighting intensity and luminous density
- Public places: extremely broad light distribution

Lighting with High Anti-Glare Requirements

Glare is chiefly caused by portions of light with angles of incidence that lie between approx. 45° and 85°. To reduce glare, the emitted bundle of light must be precisely limited by the optics, in which regard those with low *UGR values** also feature a lower angle of incidence. However, with regard to this kind of application, the aim is generally to achieve the broadest possible angle of incidence with the smallest possible UGR value. Glare can further be reduced by enlarging the light emitting surface of the optical system. In this respect, our three-row optics, for example, deliver a fundamental advantage over the smaller one-row optics.

Lighting with Design Requirements

While drafting the structure of the optical system, it is also possible to incorporate design aspects. Within certain limits, the outer form of the lens can be varied: square, circular, elliptical, x-form or rectangular shapes can be used to produce numerous different light distributions. In addition, multifaceted lens surfaces can be used to achieve a *"sparkling" effect**. It is also possible to add a matte finish or a special pattern to the outer surfaces of the lens.

Material Selection for Optics

Only materials that specifically suit the respective requirements and/or customer specifications are used: impact-proof, highly heat-resistant silicone, sturdy polycarbonate or highly transparent PMMA. The ideal material is selected for each application and the design of the optics is modified to suit the material.

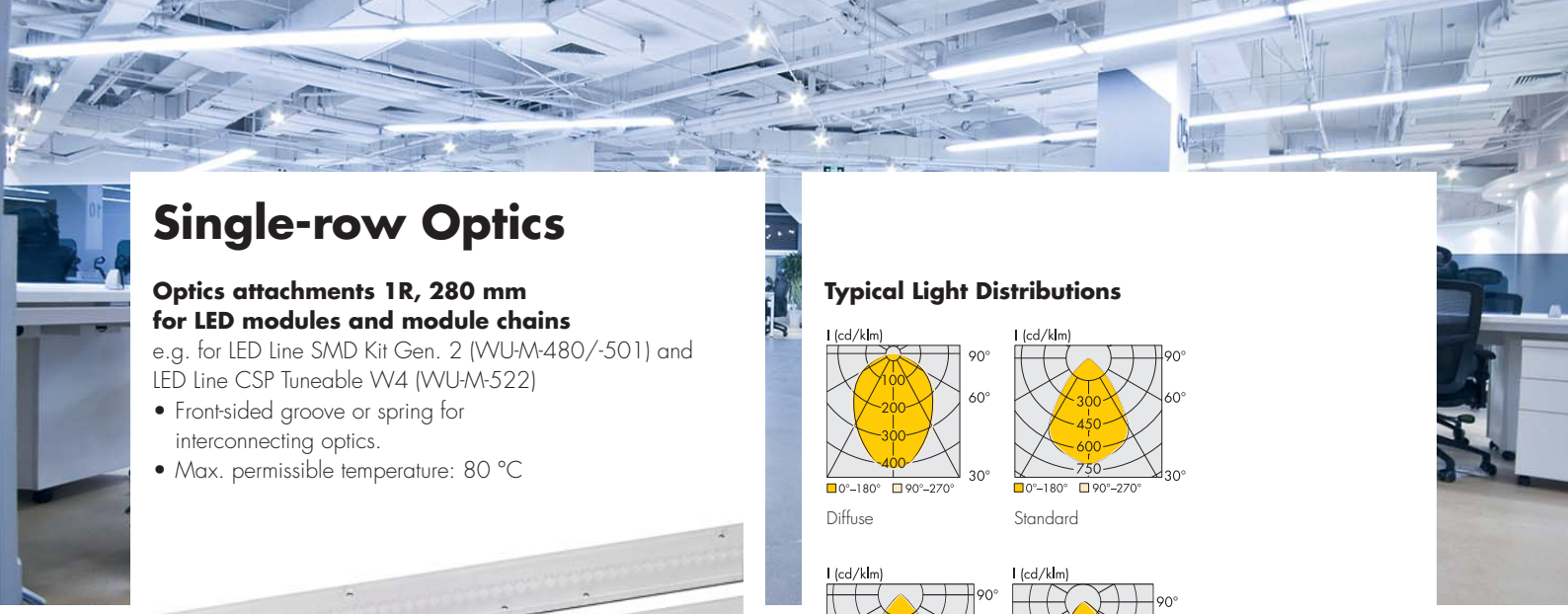
Lighting Simulation

Most optics function by channelling the light beam through two or three optical surfaces. In the simplest case, these are the light entry and light exit surfaces of the lens. In the case of *TIR optics** there is an additional reflection at the outer mirror surface. When designing an optical system, the aim is therefore to optimise the position, orientation and surface curvature of all involved surfaces in order to achieve the desired light distribution with only little colour shift and under observation of all design requirements (appearance and outer geometry).

Colour Homogeneity Requirements

When combined with optics, currently available mid-power LEDs tend to produce light with split colours (yellow rim). This is because in the LED itself the blue light source (chip) and the yellow light source (phosphorous) are not identical, which means that the chip only emits light in the centre of the LED, while the phosphorous emits light over the entire surface. The colour splitting effect can only be minimised with the help of a specially modified optics design, which in turn demands high standards in terms of simulation, design and production.

** See glossary on page 11*



Single-row Optics

Optics attachments 1R, 280 mm
for LED modules and module chains

e.g. for LED Line SMD Kit Gen. 2 (WU-M-480/-501) and LED Line CSP Tuneable W4 (WU-M-522)

- Front-sided groove or spring for interconnecting optics.
- Max. permissible temperature: 80 °C

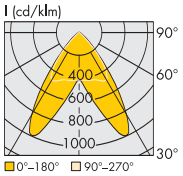
- Material: PMMA
- Dimensions (L x W x H): 280 x 43 x 9.5 mm

Light Distribution	**Ref. No.**	Efficiency %
Standard	**555437**	95
Diffusee	**559972**	88
Extra broad 90°	**560570**	95
Broad 60°	**560573**	95
Narrow 30°	**560571**	95
Retail SYM	**555438**	95
Retail ASYM	**555439**	95

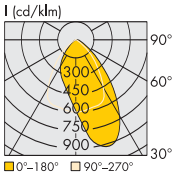
Typical Light Distributions

Diffuse

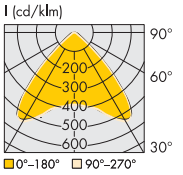
Standard



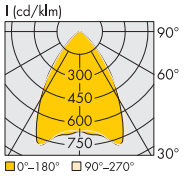
Retail SYM



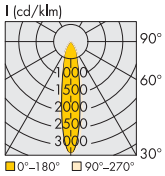
Retail ASYM



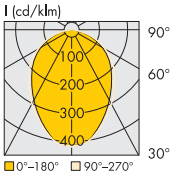
ExtraWide 90°



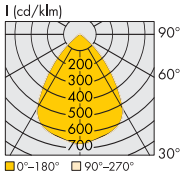
Wide 60°



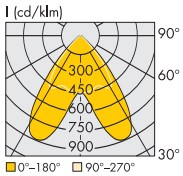
Narrow



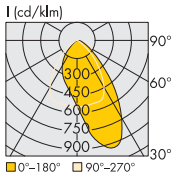
HB – Diffuse



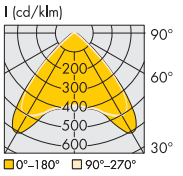
HB – Standard



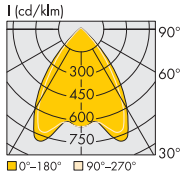
HB – Retail SYM



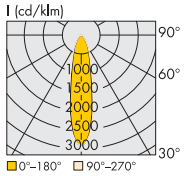
HB – Retail ASYM



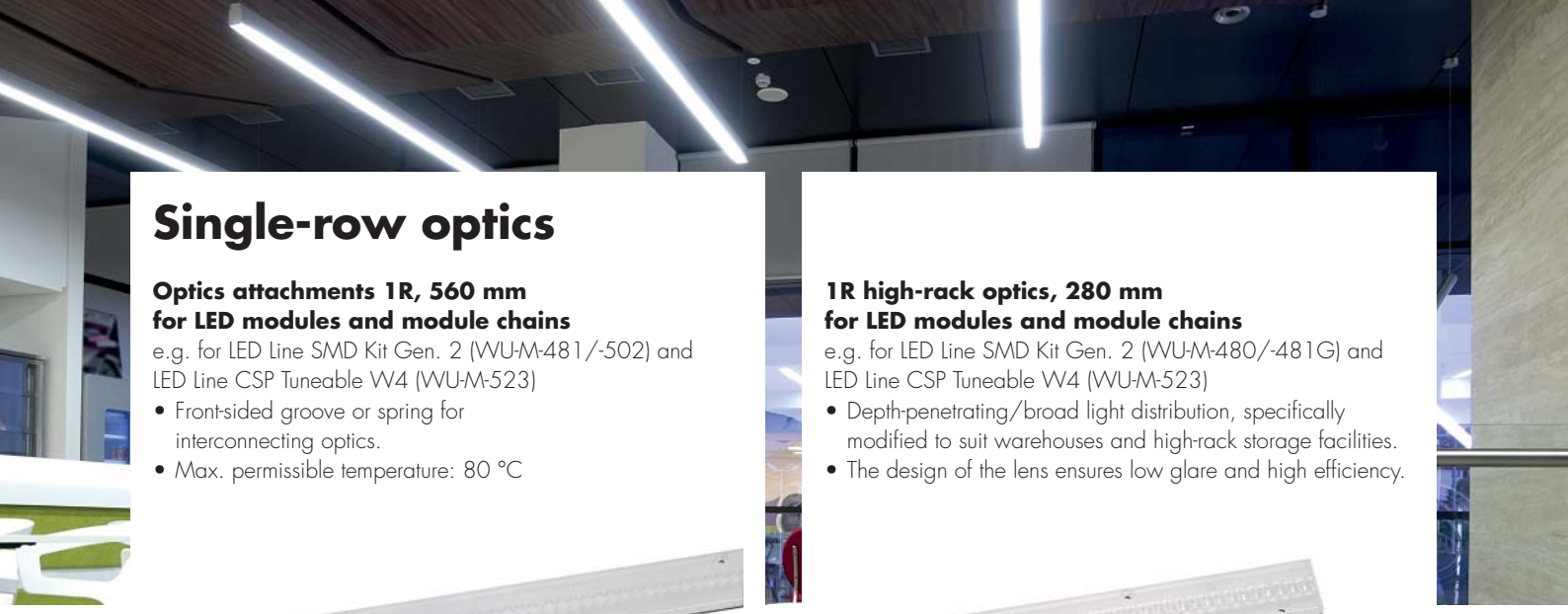
HB – ExtraWide 90°



HB – Wide 60°



HB – Narrow



Single-row optics

Optics attachments 1R, 560 mm for LED modules and module chains

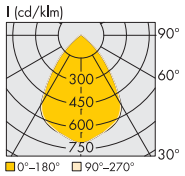
e.g. for LED Line SMD Kit Gen. 2 (WU-M-481/-502) and LED Line CSP Tuneable W4 (WU-M-523)

- Front-sided groove or spring for interconnecting optics.
- Max. permissible temperature: 80 °C

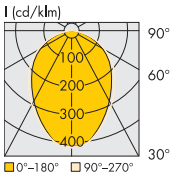
- Material: PMMA
- Dimensions (L x W x H): 560 x 43 x 9,5 mm

Light Distribution	**Ref. No.**	Efficiency %
Standard	**562984**	95
Diffusee	**562985**	88
Retail SYM	**563524**	95

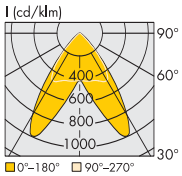
Typical Light Distributions



Standard



Diffuse



Retail SYM

1R high-rack optics, 280 mm for LED modules and module chains

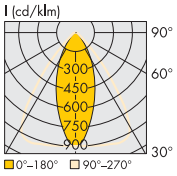
e.g. for LED Line SMD Kit Gen. 2 (WU-M-480/-481G) and LED Line CSP Tuneable W4 (WU-M-523)

- Depth-penetrating/broad light distribution, specifically modified to suit warehouses and high-rack storage facilities.
- The design of the lens ensures low glare and high efficiency.

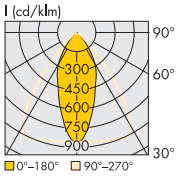
- Material: PMMA
- Dimensions (L x W x H): 280 x 43 x 9.5 mm

Light Distribution	**Ref. No.**	Efficiency %
High-rack	**563598**	95

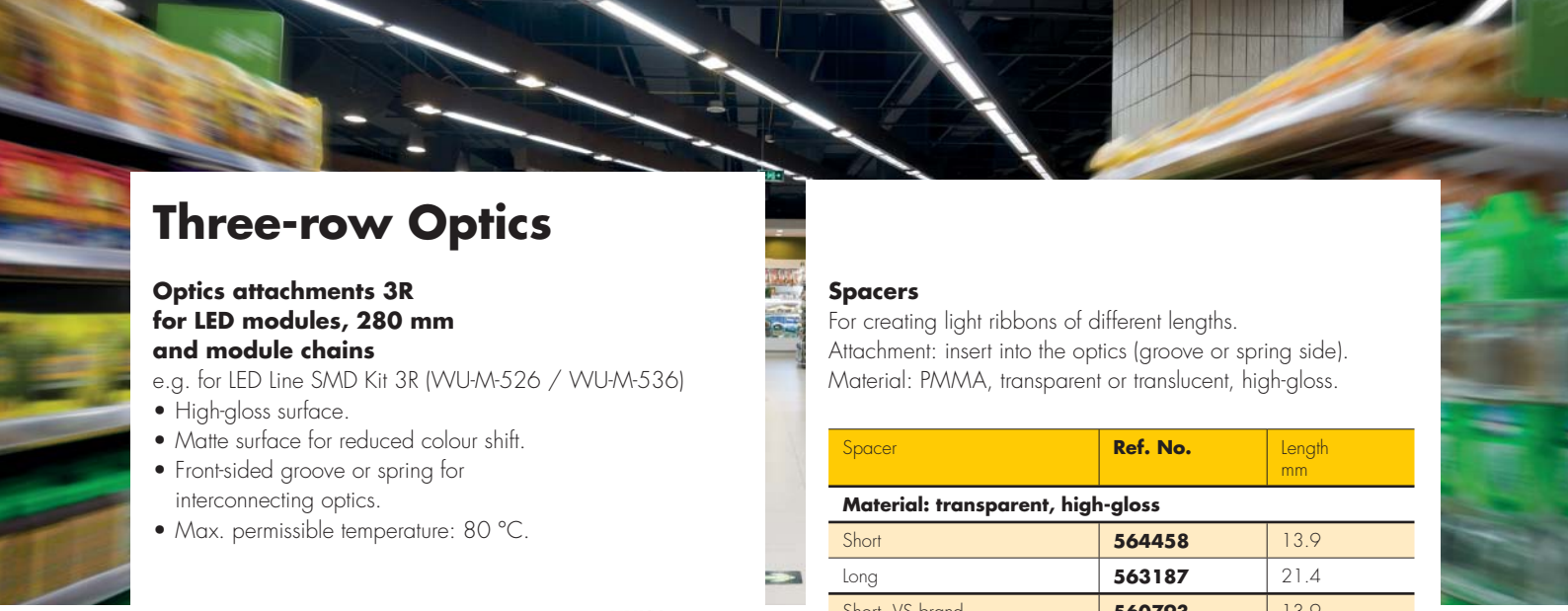
Typical Light Distributions



Standard



HB – Standard



Three-row Optics

Optics attachments 3R for LED modules, 280 mm and module chains

e.g. for LED Line SMD Kit 3R (WU-M-526 / WU-M-536)

- High-gloss surface.
- Matte surface for reduced colour shift.
- Front-sided groove or spring for interconnecting optics.
- Max. permissible temperature: 80 °C.

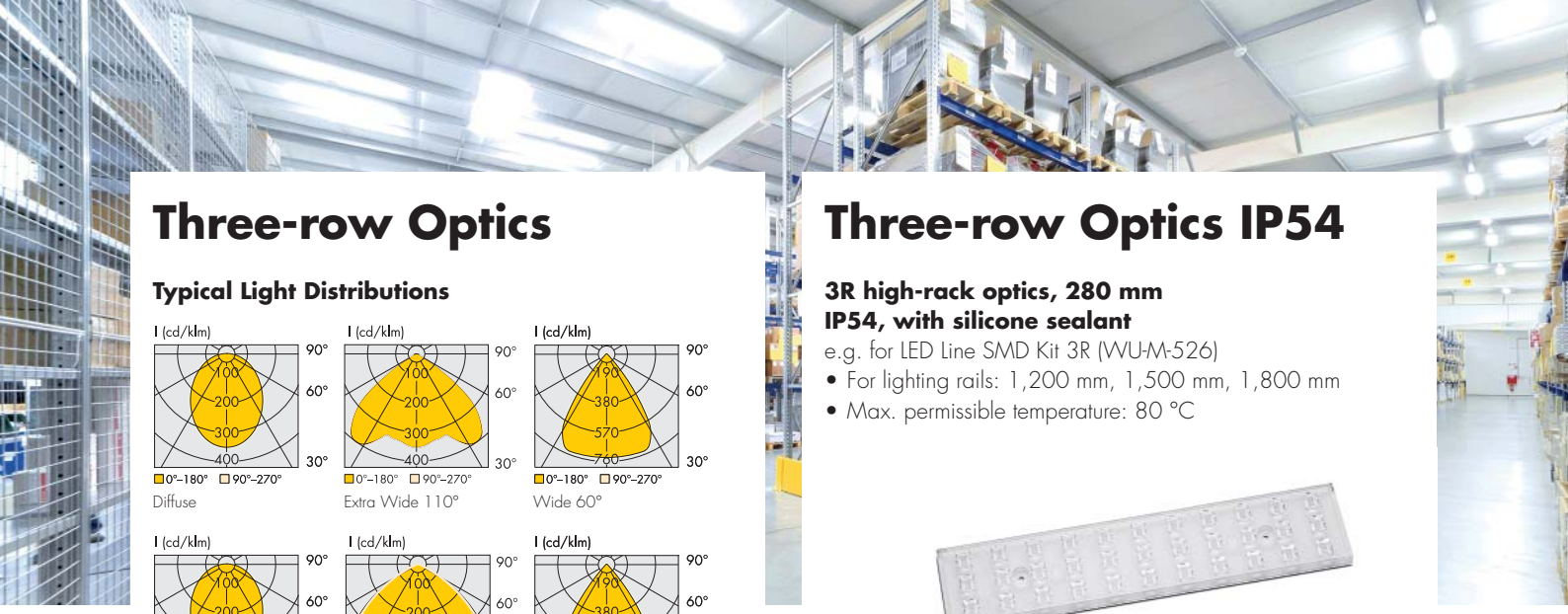
- Material: PMMA, transparent or translucent
- Dimensions (L x B x H): 285.4 x 62 x 11.25 mm

Light Distribution	**Ref. No.**	Efficiency %
Material: transparent, high gloss		
Extra broad 110°	**560371**	95
Broad 60°	**560372**	95
Narrow 30°	**560375**	95
Retail SYM	**560373**	95
Retail ASYM	**560374**	95
Material: transparent, matte		
Extra broad 110°	**564557**	95
Broad 90°	**564559**	95
Broad 60°	**563660**	95
Narrow 30°	**564558**	95
Retail SYM	**563337**	95
Retail ASYM	**563338**	95
Material: translucent, high-gloss		
Diffusee	**562543**	85

Spacers

For creating light ribbons of different lengths.
Attachment: insert into the optics (groove or spring side).
Material: PMMA, transparent or translucent, high-gloss.

Spacer	**Ref. No.**	Length mm
Material: transparent, high-gloss		
Short	**564458**	13.9
Long	**563187**	21.4
Short, VS brand	**560793**	13.9
Long, VS brand	**560789**	21.4
Material: translucent, high-gloss		
Short	**564459**	13.9
Long	**564457**	21.4
Short, VS brand	**564678**	13.9
Long, VS brand	**564677**	21.4



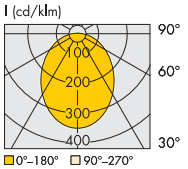
Three-row Optics

Typical Light Distributions

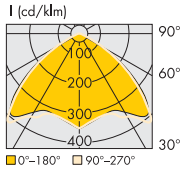
Diffuse

Extra Wide 110°

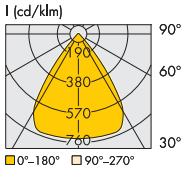
Wide 60°



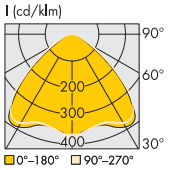
HB – Diffuse



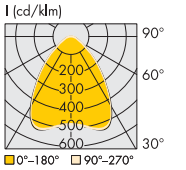
HB – Extra Wide 110°



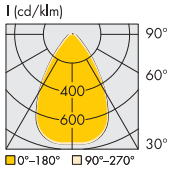
HB – Wide 60°



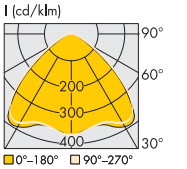
Extra Wide 110°
mat surface



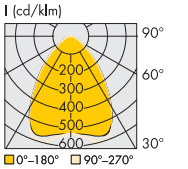
Wide 90°
mat surface



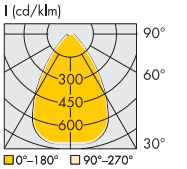
Wide 60°
mat surface



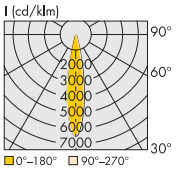
HB – Extra Wide 110°
mat surface



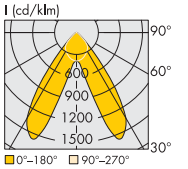
HB – Wide 90°
mat surface



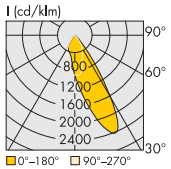
HB – Wide 60°
mat surface



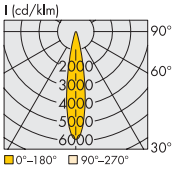
Narrow 30°



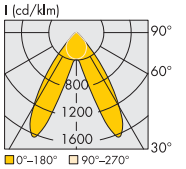
Retail SYM



Retail ASYM



HB – Narrow 30°



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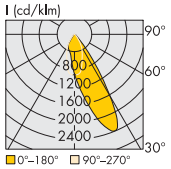

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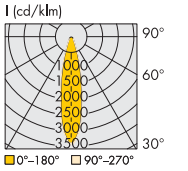
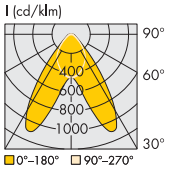
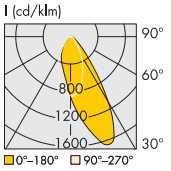


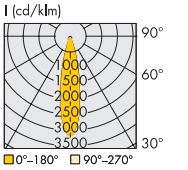
Narrow 30°
mat surface



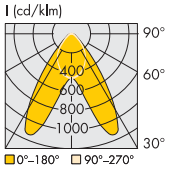
Retail SYM
mat surface



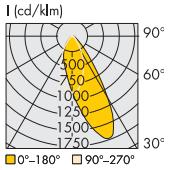
Retail ASYM
mat surface



HB – Narrow 30°
mat surface



HB – Retail SYM
mat surface



HB – Retail ASYM
mat surface

Three-row Optics IP54

3R high-rack optics, 280 mm
IP54, with silicone sealant

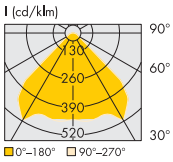
e.g. for LED Line SMD Kit 3R (WU-M-526)

- For lighting rails: 1,200 mm, 1,500 mm, 1,800 mm
- Max. permissible temperature: 80 °C

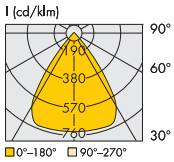
- Material: PMMA
- Dimensions: (L x W x H): 298 x 64 x 11.75 mm

Light Distribution	**Ref. No.**	Efficiency %
Extra broad 90°	**564168**	95
Broad 60°	**564166**	95
Narrow high-rack	**564167**	95

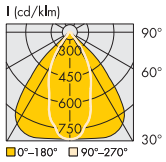
Typical Light Distributions



Wide 90°
(preliminary)



Wide 60°



Narrow High Rack

Linear COB Optics

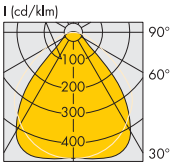
Office Optics

e.g. for LED Line AluFix LUGA and *NEW* LUGA RX

- Efficiency: 94%
- Material: PMMA

Type	Ref. No.	Dimensions (L x W x H) in mm		
		Length	Width	Height
89011	**554753**	305	36.2	15.2
89012	**563833**	586	36.2	15.2
89013	**563834**	867	36.2	15.2
89014	**563835**	1148	36.2	15.2
89015	**563836**	1429	36.2	15.2

Typical Light Distributions



Office

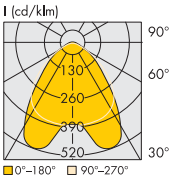
Retail Optics 1-SYM

e.g. for LED Line AluFix LUGA and *NEW* LUGA RX

- Efficiency: 94%
- Material: PMMA

Type	Ref. No.	Dimensions (L x W x H) in mm		
		Length	Width	Height
89021	**554758**	305	36.2	15.2
89022	**563837**	586	36.2	15.2
89023	**563838**	867	36.2	15.2
89024	**563839**	1148	36.2	15.2
89025	**563840**	1429	36.2	15.2

Typical Light Distributions



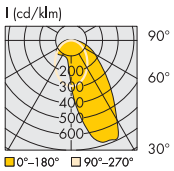
Retail 1-SYM

Linear COB Optics

Retail Optics 1-ASYM
e.g. for LED Line AluFix LUGA and *NEW* LUGA RX
- Efficiency: 94%
- Material: PMMA

Type	Ref. No.	Dimensions (L x W x H) in mm		
		Length	Width	Height
89031	**556413**	305	36.2	15.2
89032	**563841**	586	36.2	15.2
89033	**563842**	867	36.2	15.2
89034	**563843**	1148	36.2	15.2
89035	**563844**	1429	36.2	15.2

Typical Light Distributions



Retail 1-ASYM
(preliminary)

Batwing Optics

Batwing optics for LED PCBs W1.5
For lighting using wall washers and
for indirect lighting.

- Dimensions (L x W x H)
  Type 91000: 560/1,800 x 24.7 x 31 mm
  Type 91010: 560/1,800 x 24.7 x 25 mm
- Idea for SMD PCBs types
  WU-M-499/WU-M-500 and for LUGA Line modules.

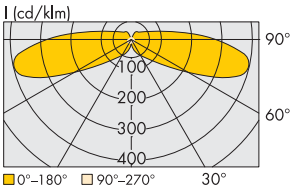
Typ 91000

Typ 91010

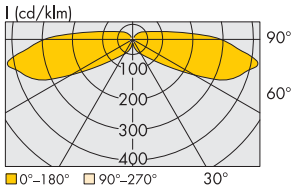
Material: PMMA

Type	Ref. No.	Length mm
For wall washers		
91000	**559587**	1,800 ±2
91000	**562895**	560 ±2
For indirect lighting		
91010	**559588**	1,800 ±2
91010	**562896**	560 ±2

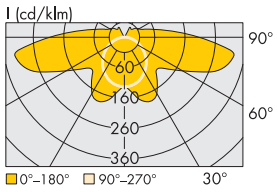
Typical Light Distributions



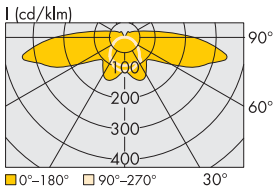
91000 – WU-M-499 / 500



91000 – LUGA Line



91010 – WU-M-499 / 500



91010 – LUGA Line

Circular COB Optics

LUGA COB Silicone Lenses M Class, Area

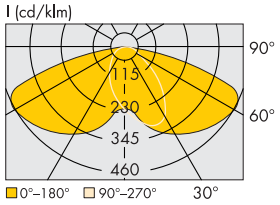
- M class: optics for lighting M class streets (in acc. with EN 13201).
- Area: optics for lighting public places.
- High temperature resistance.
- IK stability of silicone optics: IK 08.

Material: silicone, transparent
Dimensions M-class (incl. frame) Ø x H: 100 x 24 mm
Dimensions Area (incl. frame) Ø x H: 100 x 23 mm

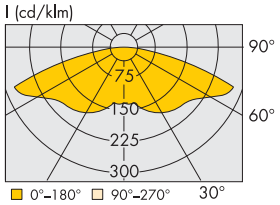
Type	Ref. No.	Efficiency %
M-class Optics, asymmetrical	**559042**	93
Area Optics, symmetrical	**562512**	96

Typical Light Distributions

Measured COB module: DMx11xxx



M Class



Area

Using COB LEDs made by other manufacturers can alter the light distribution shown here.

Holder

Material: PC, black
Ref. No. 558607

LUGA COB Silicone Lenses SYM II

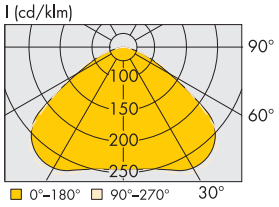
- Optics for industrial and high-bay lighting.
- High temperature resistance.
- IK stability of silicone optics: IK 08.

Material: silicone, transparent
Dimensions (incl. frame) Ø x H: 100 x 24.6 mm

Light Distribution	Ref. No.	Efficiency %
Optics SYM II, symmetrical	**562513**	97

Typical Light Distributions

Measured COB module: DMx11xxx



Using COB LEDs made by other manufacturers can alter the light distribution shown here.

Holder

Material: PC, black
Ref. No. 558607

Glossary

TIR Optics
So-called TIR optics, short for "total internal reflection", are used to ensure a light beam is emitted in a parallel manner. It is a combination of reflector and lens, which works with refraction and reflection to create a parallel beam of light like a parabolic mirror would. The TIR process is extremely efficient and can focus light energy coming from various directions. This makes it possible to create lighting with a concentrated beam (point lighting).

UGR Value
The abbreviation UGR stands for "Unified Glare Rating". The UGR value is a dimensionless index that says something about the physiological degree of glare produced by an indoor lighting system. UGR values are defined in steps for the region of 10 (no consciously perceived glare) up to 30 (very high degree of perceived glare). In accordance with DIN EN 12464-1:2011-08, these steps are defined as 13, 16, 19, 22, 25 and 28, and ultimately express the degree of glare experienced by numerous observers as a statistic.

In this regard, a UGR of 19 – for instance – means that approx. 65% of observers "will remain just under the threshold of being affected" by glare. However, this also means that the remaining 35% of observers will feel unpleasantly affected by glare. Therefore, the lower the UGR value is, the fewer observers will perceive direct glare. The lower the calculated UGR value is, the lower the degree of glare; the higher the UGR value is, the more strongly glare will be perceived.

IK Stability
The IK rating is a measure of the protection provided by a casing (of electrical components) against mechanical impact. It is standardised in accordance with CEIEN 50102 and describes how much impact energy (expressed in Joule) the casing will withstand without breaking, e.g. IK 08 = resistance against impact energy of up to 5 Joules.

PMMA
Polymethyl methacrylate, PMMA for short (also known as acrylic glass, Plexiglas® or Limacryl®), is a synthetic, glass-like thermoplastic.
- Six times the impact strength of silicate glass.
- Very hard, scratch-proof.
- Highly transparent, completely colourless and high-gloss.
- Extremely good light fastness.
- Good electrical insulation properties.

Silicone
Silicone is a name given to a whole group of synthetic polymers. Due to their typically inorganic structure on the one hand as well as organic vestiges on the other, silicones occupy a midway position between inorganic and organic compounds. In a certain sense, these polymers are hybrids and come with a unique range of properties that no other synthetic is capable of replicating.
- Heat-resistant
- Hydrophobic
- Dielectric

Silicone must not be confused with silicon, which forms a component of silicone. The similar spellings often lead to errors in translation.

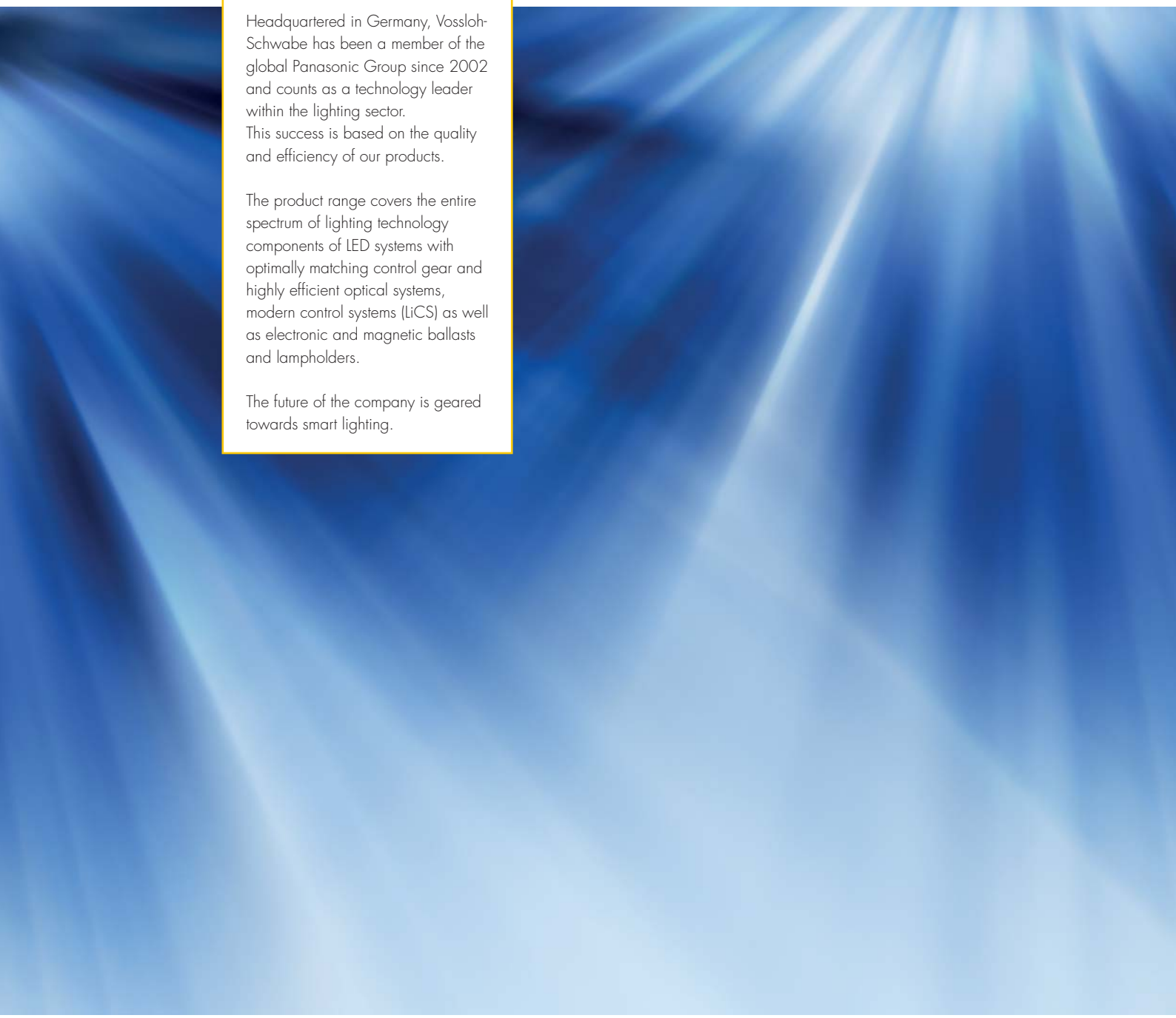
"Sparkling" Effect
The totally reflective way in which TIR lenses direct light is comparable to the light reflections seen with a cut diamond.
A reflection of the LED light source can usually be seen in the lens surfaces. If facets are then added to the mirrored surfaces of a lens, numerous LED reflections become visible at the same time. When the LED is switched off, any ambient light will be reflected by the numerous individual facets, which creates the diamond-like appearance of the optics, the so-called sparkling effect. Depending on the shape and position of the facets, numerous variations are possible.

Whenever a light goes on around the world, Vossloh-Schwabe is likely to have made a decisive contribution to ensuring everything works at the flick of a switch.

Headquartered in Germany, Vossloh-Schwabe has been a member of the global Panasonic Group since 2002 and counts as a technology leader within the lighting sector.
This success is based on the quality and efficiency of our products.

The product range covers the entire spectrum of lighting technology components of LED systems with optimally matching control gear and highly efficient optical systems, modern control systems (LiCS) as well as electronic and magnetic ballasts and lampholders.

The future of the company is geared towards smart lighting.



A member of the Panasonic group Panasonic

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LIGHTING SOLUTIONS

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