18AWG (0.75 mm²) Tray Rated Cable CF140US Series Shielded

18AWG (0.75 mm²) Tray Rated Multi-Conductor Flexing Control Cable Specifications (Shielded)			
Conductors Gauge & Stranding	18AWG (0.75 mm²) 24/30 Finely stranded bundled bare copper wires. Designed in accordance with ASTM B174-95	***Conductor Markings***	"#1-ONE", "2-TWO", "3-THREE", etc... @ 4.5 inch intervals, ICEA Method 4
Voltage Ratings	600V per UL	***Inner Jacket***	Low-adhesion PVC
		Overall Shield	Tinned copper braid. 85% optical coverage
	Tested to 3300V	***Outer Jacket***	Oil-resistant UV-resistant Gray PVC, low-adhesion blend, adapted to the requirements of the Energy Chain®.
Min. Bend Radius	e-Chain®, 10.0 x diameter	***UV Resistance***	Medium
	Flexible, 8.0 x diameter	***Oil Resistance***	Oil resistant (according to DIN EN 60811-2-1, DIN EN 50363-4-1, Class 4
	Fixed, 7.5 x diameter	***Flame Resistance***	CSA AWM: FT4
Temperature Ratings	e-Chain, +41°F to +176°F (5°C to +80°C)	***Silicone-free***	Free from silicone which can affect paint adhesion (following PV 3.10.7 – status 1992
	Flexible, +23°F to +176°F (-5°C to +80°C)	***Approvals***	UL; 22-10 AWG: UL Type MTW (Machine Tool Wire) 18-10 AWG: UL Type TC (Tray Cable) Lead Free; 2002/95/EC CE; In accordance with European Council Directive 73/23/EEC UL AWM: 2587 90 °C 600V CSA AWM: I/II A/B 90 °C 600V FT4
	Fixed, -4°F to +194°F (-20°C to +90°C)		
Max. Velocity	Unsupported, 9.84 ft/s (3 m/s)		
	Gliding, 6.56 ft/s (2 m/s)		
Max. Acceleration	65.6 ft/s² (20 m/s²)		
Length of Travel	Unsupported travel distances and for gliding applications up to 30ft (9m)	***Sample Print Legend***	IGUS P/N CF140US-07-## 18 AWG XX/C SHIELDED E223775 (UL) TYPE TC-ER 90C DRY 75°C WET 600V SUN RES DIR BUR OIL RES I OR MTW OR WTTC 1000V OR AWM 2587 --- LL257958 CSA AWM I/II A/B 90C 600V FT4 - CE J DDD/YY
Conductor Insulation	Mechanically high-quality, PVC/Nylon, black with white numbers, one green-yellow		

e-Chain® is a trademarked flexible cable carrier by igus®. igus® cable can be used in any suitable cable carrier.

18AWG (0.75 mm²) Tray Rated Multi-Conductor Flexing Control Cable (Shielded)

Part Number	*Number of Conductors (includes ground)*	*AWG*	*Strand (## x AWG)*	*Maximum O.D. (Inches ±10%)*	*Minimum Cut Length (ft)**	*Approximate Weight (lb/ft)*	*Price per foot*
							
CF140US-07-04-1	4	18AWG (0.75 mm²)	24 x 30	0.40	20	0.09	$3.67
							
CF140US-07-05-1	5	18AWG (0.75 mm²)	24 x 30	0.43	20	0.10	$4.30
							
CF140US-07-12-1	12	18AWG (0.75 mm²)	24 x 30	0.57	20	0.20	$7.60
							
CF140US-07-18-1	18	18AWG (0.75 mm²)	24 x 30	0.66	20	0.27	$9.12

** See web store for maximum cut lengths*

Please Note: Our prices on Flexing Control Cable are closely tied to the market price for copper. This allows us to offer the best savings possible if conditions are favorable; however, it also means that our prices may increase if market conditions warrant.

16AWG (1.5 mm²) Flexing Control Cable CF140US Series Shielded

16AWG (1.5 mm²) Tray Rated Multi-Conductor Flexing Control Cable Specifications (Shielded)			
Conductors Gauge & Stranding	16AWG (1.5 mm²) 30/30 Finely stranded bundled bare copper wires. Designed in accordance with ASTM B174-95	***Conductor Markings***	"#1-ONE", "2-TWO", "3-THREE", etc... @ 4.5 inch intervals, ICEA Method 4
Voltage Ratings	600V per UL	***Inner Jacket***	Low-adhesion PVC
		Overall Shield	Tinned copper braid. 85% optical coverage
	Tested to 3300V	***Outer Jacket***	Oil-resistant UV-resistant Gray PVC, low-adhesion blend, adapted to the requirements of the Energy Chain®.
Min. Bend Radius	e-Chain®, 10.0 x diameter	***UV Resistance***	Medium
	Flexible, 8.0 x diameter	***Oil Resistance***	Oil resistant (according to DIN EN 60811-2-1, DIN EN 50363-4-1, Class 4
	Fixed, 7.5 x diameter	***Flame Resistance***	CSA AWM: FT4
Temperature Ratings	e-Chain, +41°F to +176°F (5°C to +80°C)	***Silicone-free***	Free from silicone which can affect paint adhesion (following PV 3.10.7 – status 1992
	Flexible, +23°F to +176°F (-5°C to +80°C)	***Approvals***	UL; 22-10 AWG: UL Type MTW (Machine Tool Wire) 18-10 AWG: UL Type TC (Tray Cable) Lead Free; 2002/95/EC CE; In accordance with European Council Directive 73/23/EEC UL AWM: 2587 90 °C 600V CSA AWM: I/II A/B 90 °C 600V FT4
	Fixed, -4°F to +194°F (-20°C to +90°C)		
Max. Velocity	Unsupported, 9.84 ft/s (3 m/s)		
	Gliding, 6.56 ft/s (2 m/s)		
Max. Acceleration	65.6 ft/s² (20 m/s²)		
Length of Travel	Unsupported travel distances and for gliding applications up to 30ft (9m)	***Sample Print Legend***	IGUS P/N CF140US-15-## 16 AWG XX/C SHIELDED E223775 (UL) TYPE TC-ER 90C DRY 75°C WET 600V SUN RES DIR BUR OIL RES I OR MTW OR WTTC 1000V OR AWM 2587 --- LL257958 CSA AWM I/II A/B 90C 600V FT4 - CE J DDD/YY
Conductor Insulation	Mechanically high-quality, PVC/Nylon, black with white numbers, one green-yellow		

e-Chain® is a trademarked flexible cable carrier by igus®. igus® cable can be used in any suitable cable carrier.

16AWG (1.5 mm²) Tray Rated Multi-Conductor Flexing Control Cable (Shielded)

Part Number	*Number of Conductors (includes ground)*	*AWG*	*Strand (## x AWG)*	*Maximum O.D. (Inches ±10%)*	*Minimum Cut Length (ft)***	*Approximate Weight (lb/ft)*	*Price per foot*
							
CF140US-15-03-1	3	16AWG (1.5 mm²)	30 x 30	0.41	20	0.09	$4.14
							
CF140US-15-04-1	4	16AWG (1.5 mm²)	30 x 30	0.43	20	0.11	$4.65

** For 7 conductor cable with travel distance ≥ 5m (16.4ft) requires bending radius ≥ 17 x diameter*

*** See web store for maximum cut lengths*

Please Note: Our prices on Flexing Control Cable are closely tied to the market price for copper. This allows us to offer the best savings possible if conditions are favorable; however, it also means that our prices may increase if market conditions warrant.

14AWG (2.5 mm²) Flexing Control Cable CF140US Series Shielded

14AWG (2.5 mm²) Tray Rated Multi-Conductor Flexing Control Cable Specifications (Shielded)			
Conductors Gauge & Stranding	14AWG (2.5 mm²) 50/30 Finely stranded bundled bare copper wires. Designed in accordance with ASTM B174-95	***Conductor Markings***	"#1-ONE", "2-TWO", "3-THREE", etc... @ 4.5 inch intervals, ICEA Method 4
Voltage Ratings	600V per UL	***Inner Jacket***	Low-adhesion PVC
		Overall Shield	Tinned copper braid. 85% optical coverage
	Tested to 3300V	***Outer Jacket***	Oil-resistant UV-resistant Gray PVC, low-adhesion blend, adapted to the requirements of the Energy Chain®.
Min. Bend Radius	e-Chain®, 10.0 x diameter	***UV Resistance***	Medium
	Flexible, 8.0 x diameter	***Oil Resistance***	Oil resistant (according to DIN EN 60811-2-1, DIN EN 50363-4-1, Class 4
	Fixed, 7.5 x diameter	***Flame Resistance***	CSA AWM: FT4
Temperature Ratings	e-Chain, +41°F to +176°F (5°C to +80°C)	***Silicone-free***	Free from silicone which can affect paint adhesion (following PV 3.10.7 – status 1992
	Flexible, +23°F to +176°F (-5°C to +80°C)	***Approvals***	UL; 22-10 AWG: UL Type MTW (Machine Tool Wire) 18-10 AWG: UL Type TC (Tray Cable) Lead Free; 2002/95/EC CE; In accordance with European Council Directive 73/23/EEC UL AWM: 2587 90 °C 600V CSA AWM: I/II A/B 90 °C 600V FT4
	Fixed, -4°F to +194°F (-20°C to +90°C)		
Max. Velocity	Unsupported, 9.84 ft/s (3 m/s)		
	Gliding, 6.56 ft/s (2 m/s)		
Max. Acceleration	65.6 ft/s² (20 m/s²)		
Length of Travel	Unsupported travel distances and for gliding applications up to 30ft (9m)	***Sample Print Legend***	IGUS P/N CF140US-25-## 14 AWG XX/C SHIELDED E223775 (UL) TYPE TC-ER 90C DRY 75°C WET 600V SUN RES DIR BUR OIL RES I OR MTW OR WTTC 1000V OR AWM 2587 --- LL257958 CSA AWM I/II A/B 90C 600V FT4 - CE J DDD/YY
Conductor Insulation	Mechanically high-quality, PVC/Nylon, black with white numbers, one green-yellow		

e-Chain® is a trademarked flexible cable carrier by igus®. igus® cable can be used in any suitable cable carrier.

14AWG (2.5 mm²) Tray Rated Multi-Conductor Flexing Control Cable (Shielded)							
Part Number	***Number of Conductors (includes ground)***	***AWG***	***Strand (## x AWG)***	***Maximum O.D. (Inches ±10%)***	***Minimum Cut Length (ft)****	***Approximate Weight (lb/ft)***	***Price per foot***
							
CF140US-25-04-1	4	14AWG (2.5 mm²)	50 x 30	0.46	20	0.14	$6.25

** See web store for maximum cut lengths*

Please Note: Our prices on Flexing Control Cable are closely tied to the market price for copper. This allows us to offer the best savings possible if conditions are favorable; however, it also means that our prices may increase if market conditions warrant.

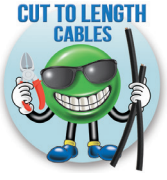
12AWG (4.0 mm²) Flexing Control Cable CF140US Series Shielded

12AWG (4.0 mm²) Tray Rated Multi-Conductor Flexing Control Cable Specifications (Shielded)			
Conductors Gauge & Stranding	12AWG (4.0 mm²) 56/28 Finely stranded bundled bare copper wires. Designed in accordance with ASTM B174-95	***Conductor Markings***	"#1-ONE", "2-TWO", "3-THREE", etc... @ 4.5 inch intervals, ICEA Method 4
Voltage Ratings	600V per UL	***Inner Jacket***	Low-adhesion PVC
		Overall Shield	Tinned copper braid. 85% optical coverage
	Tested to 3300V	***Outer Jacket***	Oil-resistant UV-resistant Gray PVC, low-adhesion blend, adapted to the requirements of the Energy Chain®.
Min. Bend Radius	e-Chain®, 10.0 x diameter	***UV Resistance***	Medium
	Flexible, 8.0 x diameter	***Oil Resistance***	Oil resistant (according to DIN EN 60811-2-1, DIN EN 50363-4-1, Class 4
	Fixed, 7.5 x diameter	***Flame Resistance***	CSA AWM: FT4
Temperature Ratings	e-Chain, +41°F to +176°F (5°C to +80°C)	***Silicone-free***	Free from silicone which can affect paint adhesion (following PV 3.10.7 – status 1992
	Flexible, +23°F to +176°F (-5°C to +80°C)	***Approvals***	UL; 22-10 AWG: UL Type MTW (Machine Tool Wire) 18-10 AWG: UL Type TC (Tray Cable) Lead Free; 2002/95/EC CE; In accordance with European Council Directive 73/23/EEC UL AWM: 2587 90 °C 600V CSA AWM: I/II A/B 90 °C 600V FT4
	Fixed, -4°F to +194°F (-20°C to +90°C)		
Max. Velocity	Unsupported, 9.84 ft/s (3 m/s)		
	Gliding, 6.56 ft/s (2 m/s)		
Max. Acceleration	65.6 ft/s² (20 m/s²)		
Length of Travel	Unsupported travel distances and for gliding applications up to 30ft (9m)	***Sample Print Legend***	IGUS P/N CF140US-40-## 12AWG XX/C SHIELDED E223775 (UL) TYPE TC-ER 90C DRY 75°C WET 600V SUN RES DIR BUR OIL RES I OR MTW OR WTTC 1000V OR AWM 2587 --- LL257958 CSA AWM I/II A/B 90C 600V FT4 - CE J DDD/YY
Conductor Insulation	Mechanically high-quality, PVC/Nylon, black with white numbers, one green-yellow		

e-Chain® is a trademarked flexible cable carrier by igus®. igus® cable can be used in any suitable cable carrier.

12AWG (4.0 mm²) Tray Rated Multi-Conductor Flexing Control Cable (Shielded)							
Part Number	***Number of Conductors (includes ground)***	***AWG***	***Strand (## x AWG)***	***Maximum O.D. (Inches ±10%)***	***Minimum Cut Length (ft)****	***Approximate Weight (lb/ft)***	***Price per foot***
							
CF140US-40-04-1	4	12AWG (4.0 mm²)	56 x 28	0.57	20	0.20	$8.01

** See web store for maximum cut lengths*



Please Note: Our prices on Flexing Control Cable are closely tied to the market price for copper. This allows us to offer the best savings possible if conditions are favorable; however, it also means that our prices may increase if market conditions warrant.

Tray Rated Continuous Flexing Control Cable

AutomationDirect is pleased to offer the igus CF130US and CF140US series tray rated cable for continuous flexing applications. These cables are available in sizes from 18AWG to 12AWG with 4 to 25 unshielded (CF130US series) or 4 to 18 shielded (CF140US series) conductors. Individual conductors are bare copper and stranded for flexing applications. Conductor insulation is a mechanically high-quality black PVC mixture with a nylon outer layer and individual conductors are marked with white numbers for easy identification. A convenient ground conductor is included in the conductor count of each cable and has green-yellow insulation. The cable's outer jacket is a low-adhesion pressure extruded PVC mixture that provides resistance to sunlight, oil penetration, and is flame resistant.

The igus CF130US and CF140US tray rated continuous flexing control cables are specifically designed, tested, and manufactured for use in both continuous flexing and fixed tray application. The UL TC-ER rating of our igus CF130US and CF140US series cables makes it ideally suited for most all control cable application.

Features

- 0.75 mm² to 4mm² (18AWG to 12AWG), 4 to 25 conductors including ground
- Unshielded and shielded constructions
- Individual conductors have black PVC/Nylon insulation and are marked with white identification numbers
- Low adhesion pressure extruded gray PVC mixture outer jacket that is sunlight and oil resistant and flame retardant
- Green/yellow ground wire included
- Rated for low duty continuous flexing and fixed tray applications
- Guaranteed service life between 1 million and 5 million cycles when operated within specified conditions
- UL Tray cable for exposed run (TC-ER)
- Cut to length in 1 foot increments
- Low 20 foot minimum length
- 3 year warranty*

**** CF130US and CF140US Series Guaranteed lifetime according to guarantee conditions***

CF130US Series Tray Rated Continuous Flexing Control Cable			
Cycles	**1 million**	**3 million**	**5 million**
Temperature, from/to [°F]	*R min. [factor x d]*	*R min. [factor x d]*	*R min. [factor x d]*
+23 / +59	10	12	13
+59 / +140	8	10	12
+140 / +176	10	12	13

CF140US Series Tray Rated Continuous Flexing Control Cable						
Cycles				**1 million**	**3 million**	**5 million**
Temperature, from/to [°F]	*V max. [ft/s] unsupported*	*A max. [ft/s]*	*Travel distance [ft]*	*R min. [factor x d]*	*R min. [factor x d]*	*R min. [factor x d]*
+23 / +59	9.84	6.56	≤ 29.52	12	13	15
+59 / +140				10	12	13
+140 / +176				12	13	15

Click on the above thumbnail or go to
https://www.automationdirect.com/VID-WD-0016
for a short introduction on our cut to length cable

Flexing Cable

Flexible Cable or Flexing Cable?

While it may seem there should be no difference between a cable described as flexible and one described as flexing, there are actually big differences in the design, manufacture, and application of flexible cable and flexing cable.

A flexible cable allows for easier installation in a control panel or machine as it can be easily bent and routed as needed. However, once routed and installed a flexible cable will generally be static during its service life.

A flexing (or more descriptively continuous flexing) cable during its service life will be exposed to continuous motion in the form of rolling, bending, torsional, or variable flexing operations. To provide a long service life under these rigorous applications especially when exposed to harsh industrial environmental conditions, special design and manufacturing characteristics are required to produce a continuous flexing rated cable.

Additionally, factors such as temperature, velocity, acceleration, travel distance, minimum bend radius, torsion, and minimum number of cycles must be considered when selecting a continuous flexing rated cable for a specific application.

Cable Failures

Misapplied flexible cables or poorly designed/manufactured flexing cables will quickly fail when exposed to the rigors of continuous flexing applications in harsh industrial environments.

Loss of continuity
The copper conductors can break or become severed causing a loss of continuity when insulated conductors are twisted with incorrect pitch length/direction. The cable core cannot absorb the mechanical load caused by the cable's flexing, transferring the force to the copper conductors and causing them to break under the increased tensile load.

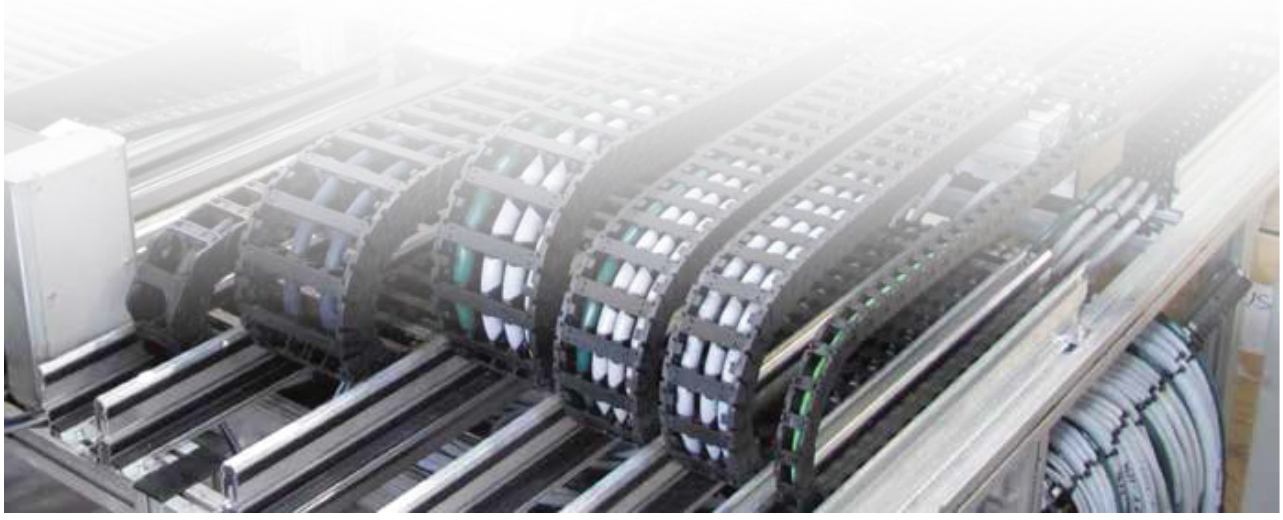
Insulation damage
Insulation damage occurs when the insulation integrity of a cable's conductors are compromised. This is caused by material fatigue under constant bending stress, abrasion within the cable structure and/or conductor strand breakage, which in turn perforates the insulation.

Corkscrewing
This failure type is named for its easily recognizable mechanical deformation of the entire cable. The corkscrew, sometimes called pigtail, effect is caused when the torsional forces incurred during the cabling process are allowed to release during continuous-flexing operation. These forces are released because the cable configuration, pitch length and pitch direction are incorrect. Cables constructed using the layering process are typically more susceptible to corkscrewing.

Jacket abrasion
When the outer jacket of a cable wears through to the underlying layers of shielding or conductors, jacket abrasion occurs. This mechanical failure is common when soft jacket materials or a thin jacket extrusion is used.

Jacket swelling/cracking
A cable's outer jacket usually swells because of exposure to oil or chemicals the cable was not designed to withstand. Jacket cracking occurs when the jacket breaks so that the shield can be seen, and is an effect of excessively high/low temperatures.

Shielding losses/EMC problems
Increased electromagnetic interfaces (EMI) occurs when the shield designed to protect the cable signals from electromagnetic fields break and abrade due to continuous flexing. To avoid this, the tensile load of the shield wires along the outer radius of the cable must be considered in the cable design and manufacturing. If an unfavorable braiding angle is added, the tensile load can increase even further causing shield wire breakage. This breakage can result in reduced shielding properties or short circuits if the sharp broken wires penetrate into the conductors.



Flexing Cable

igus® Cable Design and Testing

Based on more than 25 years of experience and testing, various design principles for igus Chainflex® cables have been developed to prevent premature cable failures in demanding continuous flexing applications.

Strain-relieving center element
The center core is filled with a high-quality, high tensile strength center element to protect conductors from falling into the center of the cable.

Conductor structure
The copper stranding in Chainflex® continuous-flex cables is chosen in accordance with tested and proven designs. The test results from the igus® lab indicate that a medium to fine conductor strand diameter is preferable. Many competitive cable manufacturers will employ an extra-fine conductor strand, which has the tendency to kink when subjected to a high number of cycles. Using findings from long-term cable testing, igus® uses a combination of conductor strand diameter, pitch-length, and pitch direction to achieve the best service life and performance, even in the most demanding applications.

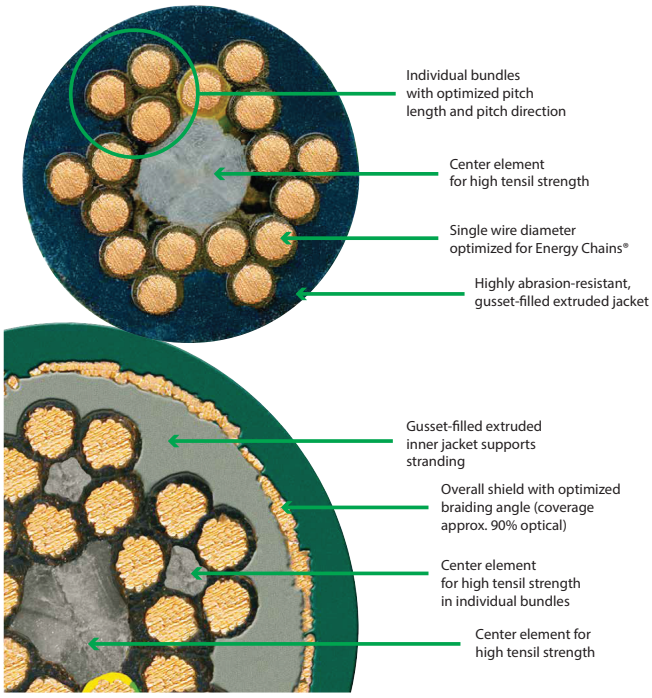
Conductor insulation
Igus uses only the highest quality high-pressure extruded PVC or TPE conductor insulation materials to support the stranded individual wires of the conductor and help prevent the conductors from adhering to one another within the cable.

Cable core
Individual conductors are bundled into groups, which are cabled together in a single layer surrounding the cable core. This design enables pulling and compressing forces of the bending motion to balance and cancel out torsional forces. Special attention is given to pitch length and direction. The cable's inner jacket will also help to maintain the integrity of the cable core and provide a continuous surface for the shield.

Inner jacket
A pressure extruded inner jacket is used in igus continuous flexing cables, as opposed to inexpensive fleece wrap or filler. This extruded inner jacket both ensures that the insulated conductors are efficiently guided, as well as maintaining the integrity of the cable core and providing a continuous surface for the overall shield.

Shield design
A high-quality braided shield provides electromagnetic interference (EMI) protection for the cable. An optimized braid angle prevents the shield strands from breaking over the linear axis and increases torsional stability. The shield has an optical coverage of approximately 90%, providing maximum shield effectiveness.

Outer jacket
Igus outer jacket material is resistant to UV radiation, abrasion, oils, and chemicals, as well as being cost-effective. Additionally the outer jacket is resistant to abrasion, and remains flexible while providing support of the cable for dynamic applications. For best wear rates and service life, igus outer jackets are extruded under pressure compared to other cables which are extruded as a "tube" that does not support the conductors during constant bending.



Flexing Cable

Cycles Selection Tables - Guaranteed Service Life

For each Chainflex cable system, you will find a lifetime calculation table, expressed in cycles, using technical
parameters for the specific cable series. For the Chainflex Guarantee to remain valid, the cables must be used in accordance with these parameters.

1. **Temperature, from/to °F**
2. **Velocity, v max. unsupported/gliding ft/s**
3. **Acceleration, a max. ft/s**
4. **Travel in ft.**
5. **Min. bend radius [factor x diameter] at 5, 7.5 or 10 million cycles**

Example: Selection table "Guaranteed Lifetime"

Cycles			3	4	5 million	7.5 million	10 million
Temperature, from/to [°F]	v max. [ft/s] unsupported	v max. [ft/s] gliding	a. max [ft/s²]	Travel distance [ft]	R min. [factor x d]	R min. [factor x d]	R min. [factor x d]
-31 / -13					6.8	7.5	8.5
1 -13 / +194	32.81 (2)	19.69	328.1	> 1,312	5	6	5 7
+194 / +212					6.8	7.5	8.5

Example:
You operate a cable with a diameter of 12 mm in an Energy Chain® with a radius of 100 mm. This results in a bending factor of 8.3 (100 mm/12 mm). You now want to know what the guaranteed service life is.
To find this out, select the technical framework conditions from areas 1-4. In area 5, you can now see that when using 8.3 x d the effective bending factor is above the limit of 7 and the cable has a guaranteed service life for 10 million cycles.
If the temperature is higher or lower, the number of guaran - teed cycles falls to 7.5 million.
This statement creates dependability and planning reliability for your entire system.