Fiber Optic Rotary Joints
Fast Ethernet Converter

CONDUCTIX
wampfler

CFO-A 1 | Single Channel Fiber Optic Rotary Joint

The Conductix-Wampfler FORJ type CFO-A 1 provides light transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc.

Its rugged construction from stainless steel, with F-SMA connectors and a high-density polyethylene (PE-HD) protective sheath makes it ideal for extreme environmental conditions.

Main Features

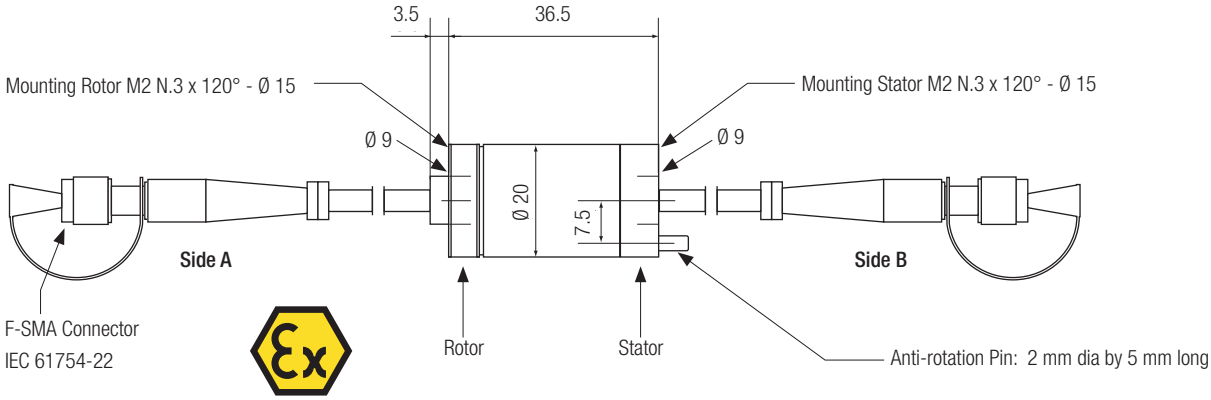
Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths. Pre-installed optical cable with connectors.

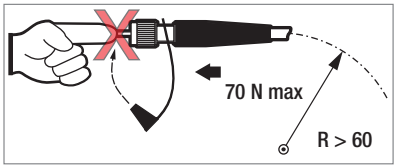
CFO-A 1 / 0 / ** / ** / **

- Fiber length of each channel:
- Side A [m] (*)
- Side B [m] (*)
- Versions: ST = Standard; OS = Off Shore

* Total fiber length per channel (side A + side B) ≤ 50 m
The code 00 means 0.5 m of fiber on the specific side

Example: **CFO-A 1 / 0 / 08 / 10 / ST** = 1 Passive optical channel / 8 m POF side A / 10 m POF side B / Standard Version





- All dimensions are in millimeters.
- Always secure the two parts of the FORJ in a flexible manner.
- Do not match the FORJ to a laser light.
- Avoid contacting the Plastic Optical Fiber with fingers, alcohol, solvents, oils, greases, dust. Always apply the protective plastic cap.

General Data	
No. of passive optical channels	1
Fiber type	Plastic Optical Fiber (POF)
Fiber core/cladding diameter	980/1000 µ m
Fiber bandwidth	30 MHz * 100 m
Fiber attenuation @ 650 nm	150 dB / km
Fiber numerical aperture	0.46
External sheath of the optical cable	PE-HD type M1, yellow, D=4mm
Standard length of the optical cables	(0.5 + 0.5) m
Connectors	F-SMA (IEC 61754-22)
Weight	90 g
Housing material - standard / off shore	303 Grade / 316 Grade Stainless Steel
Optical Characteristics	
Max. attenuation @ 650 nm (red light), connectors and POF excluded, variations included	< 3 dB
Attenuation variation (@650 nm)	0.5 dB

Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revolutions
Max. pulling force of the cables	70 N
Bending radius of the optical cable	> 60 mm
Start up torque	0.03 Nm
Vibration test	EN 60068-2-64 (5-300 Hz random / 10 g)
Structural shock test	EN 60068-2-27; MIL-STD-810F; (semisinus 200 g / 6 ms)
ATEX marking	Ex II 1GD c IIC T5 IP65 -25°C<Ta<+70°C
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C
Degree of protection	IP65

CFO 1 | Single Channel Fiber Optic Rotary Joint

The Conductix-Wampfler FORJ type CFO 1 provides light transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc.

Its rugged construction from stainless steel, with F-SMA connectors and a polyurethane (PUR) protective sheath makes it ideal for extreme environmental conditions.

Main Features

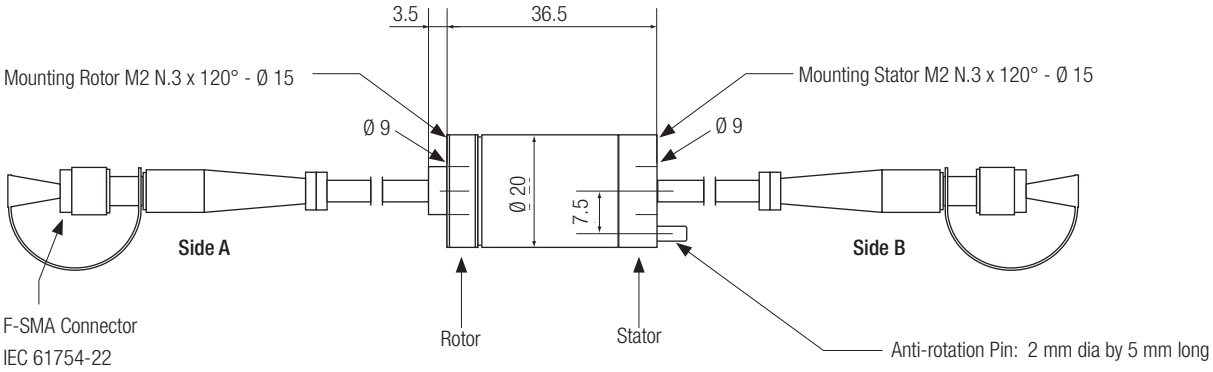
Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths. Pre-installed optical cable with connectors.

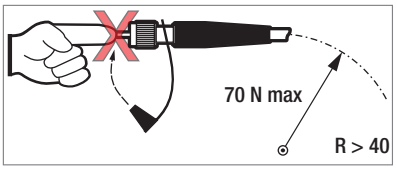
CFO 1 / 0 / ** / ** / **

- Fiber length of each channel:
- Side A [m] (*)
- Side B [m] (*)
- Versions: ST = Standard; OS = Off Shore

* Total fiber length per channel (side A + side B) ≤ 50 m
The code 00 means 0.5 m of fiber on the specific side

Example: **CFO 1 / 0 / 08 / 10 / ST** = 1 Passive optical channels / 8 m POF side A / 10 m POF side B / Standard version





- All dimensions are in millimeters.
- Always secure the two parts of the FORJ in a flexible manner.
- Do not match the FORJ to a laser light.
- Avoid contacting the Plastic Optical Fiber with fingers, alcohol, solvents, oils, greases, dust. Always apply the protective plastic cap.

General Data	
No. of passive optical channels	1
Fiber type	Plastic Optical Fiber (POF)
Fiber core/cladding diameter	980/1000 µ m
Fiber bandwidth	30 MHz * 100 m
Fiber attenuation @ 650 nm	150 dB / km
Fiber numerical aperture	0.46
External sheath of the optical cable	PUR, orange, D = 4 mm
Standard length of the optical cables	(0.5 + 0.5) m
Connectors	F-SMA (IEC 61754-22)
Weight	90 g
Housing material - standard / off shore	303 Grade / 316 Grade Stainless Steel
Optical Characteristics	
Max. attenuation @ 650 nm (red light), connectors and POF excluded, variations included	< 3 dB
Attenuation variation (@ 650 nm)	0.5 dB

Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revolutions
Max. pulling force of the cables	70 N
Bending radius of the optical cable	> 40 mm
Start up torque	0.03 Nm
Vibration test	EN 60068-2-64 (5-300 Hz random / 10 g)
Structural shock test	EN 60068-2-27; MIL-STD-810F; (semisinus 200 g / 6 ms)
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C
Degree of protection	IP65

CFO 1-TB | Single Channel Fiber Optic Rotary Joint

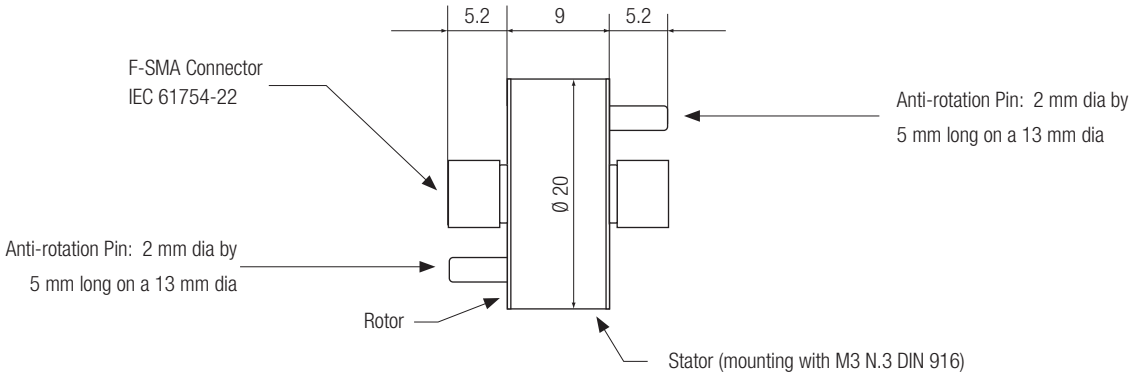
The Conductix-Wampfler FORJ type CFO 1-TB provides light transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc.

Its very small size make it suitable for integration in compact slip rings and applications where space is limited.

Main Features

Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths.

Ready-to-use Plastic Optical Fiber (POF) patches with the desired length could be easily connected to both sides of CFO 1-TB.



All dimensions are in millimeters.
Do not secure the two parts of the FORJ in a rigid manner.

General Data	
Fiber type	Plastic Optical Fiber (POF)
Connectors	F-SMA (IEC 61754-22)
Weight	20 g
Housing material	303 Grade Stainless Steel
Optical Characteristics	
Typical attenuation @ 650nm (red light), variations included	< 3 dB
Attenuation variation (@650nm)	≤ 0.5 dB

Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revs
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C

CFO 1-TBF | Single Channel Fiber Optic Rotary Joint

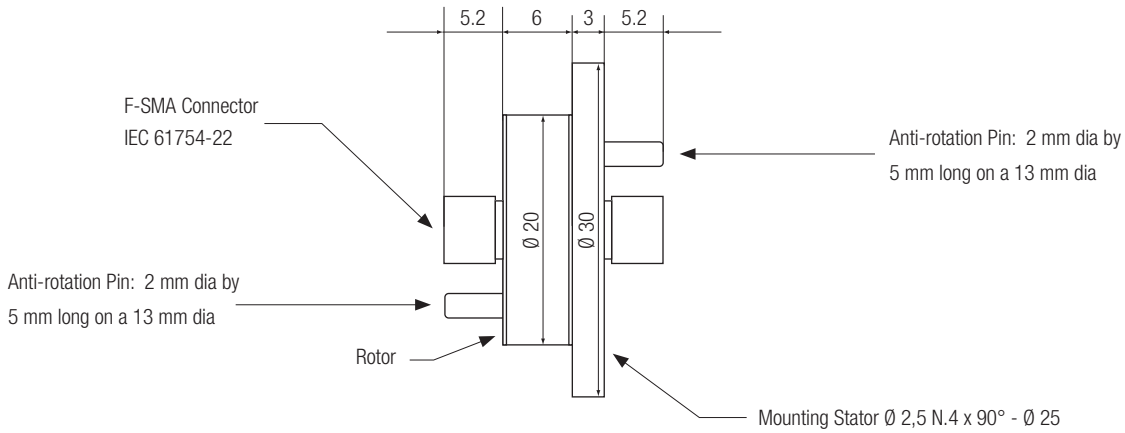
The Conductix-Wampfler FORJ type CFO 1-TBF provides light transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc.

Its very small size together with an easy-to-use flange make it suitable for integration in compact slip rings and applications where space is limited.

Main Features

Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths.

Ready-to-use Plastic Optical Fiber (POF) patches with the desired length could be easily connected to both sides of CF0 1-TBF.



- All dimensions are in millimeters.
- Secure the two parts of the FORJ in a flexible manner.

General Data	
Fiber type	Plastic Optical Fiber (POF)
Connectors	F-SMA (IEC 61754-22)
Weight	30 g
Housing material	303 Grade Stainless Steel
Optical Characteristics	
Typical attenuation @ 650 nm (red light), variations included	< 3 dB
Attenuation variation (@ 650 nm)	≤ 0.5 dB

Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revs
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C

CFO 2 | Dual Channel Fiber Optic Rotary Joint

The Conductix-Wampfler FORJ type CFO 2 provides true dual channel data transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc.

Its rugged construction from stainless steel, with F-SMA connectors and a polyurethane (PUR) protective sheath makes it ideal for extreme environmental conditions.

Main Features

Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths with low channel crosstalk and high channel isolation. Pre-installed optical cable with connectors - up to 50 m total length.

Also available as a package with our CFC media converters (see pages 12-13) for industrial real time Fast Ethernet (100 Mbps) transmission. Compatible with industry standard media converters (e.g. Profibus).

OEM Supply or Field Replacement

Conductix-Wampfler offers the FORJ with customizable POF length for individual OEM requirements or alternatively as a direct replacement for existing electrical or optical joints.

Full Duplex Data Transmission up to 100 Mbps

- Dual channel
- Guaranteed real time operation with CFC media converter package
- Maintenance free
  - No wear debris generation
  - No lubrication required
  - No periodic inspections required
- Wide operating temperature
- Lower life cycle cost
- High reliability
- Consistent performance over lifetime
- High speed capability - up to 300 rpm
- High quality / low loss POF fiber
  - Transmission rate up to 100 Mbps up to 50 m length using CFC and Conductix-Wampfler fiber optics

CFO 2 / 0 / ** / ** / **

- Fiber length of each channel:
- side A [m] (*)
- side B [m] (*)
- Versions: ST = Standard; OS = Off Shore

* Total fiber length per channel (side A + side B) ≤ 50 m
The code 00 means 0.5 m of fiber on the specific side

E.g. CFO 2 / 0 / 08 / 10 / ST = 2 Passive optical channels / 8 m POF side A / 10 m POF side B / Standard version

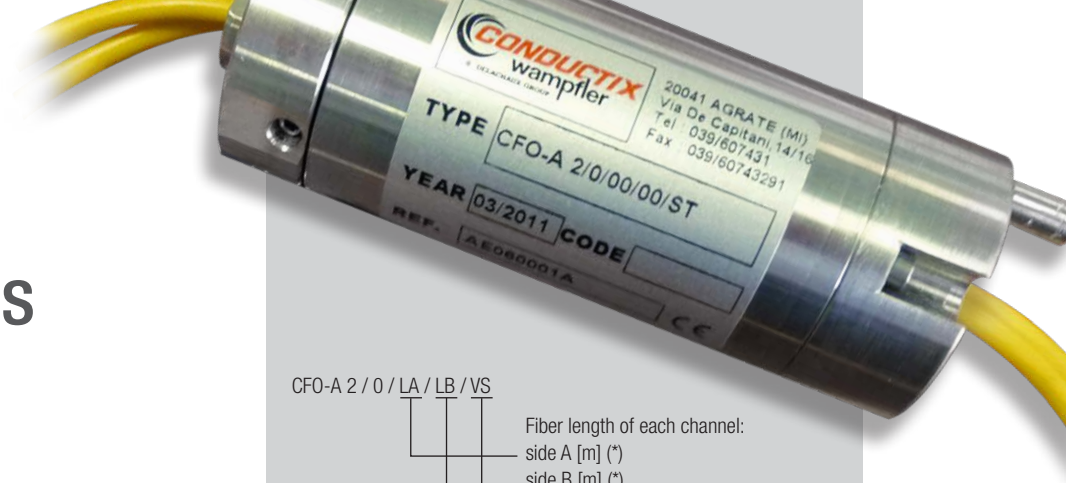
General Data	
No. of passive optical channels	2
Fiber type	Plastic Optical Fiber (POF)
Fiber core/cladding diameter	980/1000 µm
Fiber bandwidth	30 MHz * 100 m
Fiber attenuation @ 650 nm	150 dB / km
Fiber numerical aperture	0.46
External sheath of the optical cable	PUR, orange, D = 4 mm
Standard length of the optical cables	2 × (0.5 + 0.5) m
Connectors	F-SMA (IEC 61754-22)
Weight	800 g
Housing	L 105 mm × Dia 40 mm
Housing material - standard / off shore	303 Grade / 316 Grade Stainless Steel
Optical Characteristics	
Max. attenuation Ch1 @ 650 nm, connectors and POF excluded, variations included	10 dB
Max. attenuation Ch2 @ 650 nm, connectors and POF excluded, variations included	6 dB
Attenuation variation Ch1 (@ 650 nm)	1.5 dB
Attenuation variation Ch2 (@ 650 nm)	2.5 dB
Cross talk	> 30 dB
Insulation	> 30 dB
Bandwidth @ -3dB; CFO2/00/00 (decreases with the POF length)	> 600 MHz (Gigabit Ethernet Ready)
Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revs
Max. tension on optical cables	80 N
Bending radius of the optical cable	> 40 mm
Start up torque	0.1 Nm
Vibration test	EN 60068-2-64 (5-300 Hz random/10 g)
Structural shock test	EN 60068-2-27; MIL-STD-810F; (semisinus 200 g / 6 ms)
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C
Degree of protection	IP65

CFO-A 2 | Dual Channel Fiber Optic Rotary Joint

The Conductix-Wampfler FORJ type CFO-A 2 provides true dual channel data transmission over rotating joints in all industrial automation applications, including machine tools, automated packaging, rotary stages, wind turbines, offshore rigs, materials handling, etc. where explosion-proof products are needed.

Its rugged construction from stainless steel, with F-SMA connectors and a high-density polyethylene (PE-HD) protective sheath makes it ideal for extreme environmental conditions.

Main Features



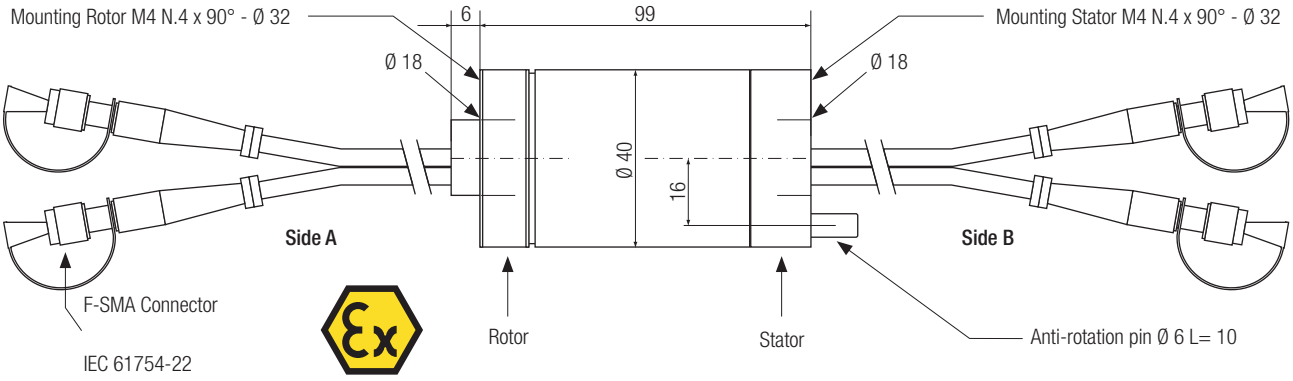
CFO-A 2 / 0 / LA / LB / VS

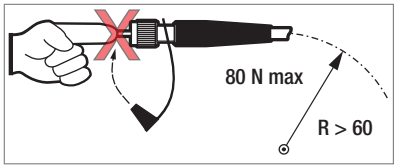
- Fiber length of each channel:
- side A [m] (*)
- side B [m] (*)
- Versions: ST = Standard; OS = Off Shore

* Total fiber length per channel (side A + side B) ≤ 50 m
The code 00 means 0.5 m of fiber on the specific side

E.g. CFO-A 2 / 0 / 08 / 10 / ST = 2 Passive optical channels / 8 m POF side A / 10 m POF side B / Standard version

Excellent optical performance for blue 470 nm, green 525 nm and red 650/660 nm wavelengths with low channel crosstalk and high channel isolation. Pre-installed optical cable with connectors - up to 50 m total length.





All dimensions are in millimeters.

Do not secure the two parts of the FORJ in a rigid manner. Do not match the FORJ to a laser light.

Avoid contacting the Plastic Optical Fiber with fingers, alcohol, solvents, oils, greases, dust

(always apply the protective plastic cap).

General Data	
No of passive optical channels	2
Fiber type	Plastic Optical Fiber (POF)
Fiber core/cladding diameter	980/1000 µm
Fiber bandwidth	30 MHz * 100 m
Fiber attenuation @ 650 nm	150 dB / km
Fiber numerical aperture	0.46
External sheath of the optical cable	PE-HD type M1, yellow, D = 4 mm
Standard length of the optical cables	2 × (0.5 + 0.5) m
Connectors	F-SMA (IEC 61754-22)
Weight	800 g
Housing material - standard / off shore	Grade 303 / Grade 316 Stainless Steel
Optical Characteristics	
Max. attenuation Ch1 @ 650 nm	6 dB
Max. attenuation Ch2 @ 650 nm	10 dB
Attenuation variation Ch1 @ 650 nm	1.5 dB
Attenuation variation Ch2 @ 650 nm	2.5 dB

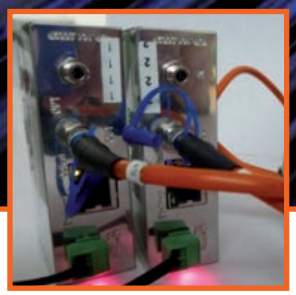
Mechanical Characteristics	
Max. rotating speed	300 rpm
Lifetime (min)	> 15 million revs
Max. pulling force of the cables	80 N
Bending radius of the optical cable	> 60 mm
Start up torque	0.1 Nm
Vibration test	EN 60068-2-64 (5-300 Hz random / 10g)
Structural shock test	EN 60068-2-27; MIL-STD-810F; (semisinus 200 g / 6 ms)
ATEX marking	Ex II 1GD c IIC T5 IP65 -25°C<Ta<+70°C
Environmental Characteristics	
Operating temperature	-25°C ... +70°C
Storage temperature	-40°C ... +85°C
Degree of protection	IP65

- Also available as a package with our CFC media converters (see datasheet CFC) for industrial real-time Fast Ethernet (100 Mbps) transmission
- Gigabit ethernet ready

CFC | Fast Ethernet Media Converter

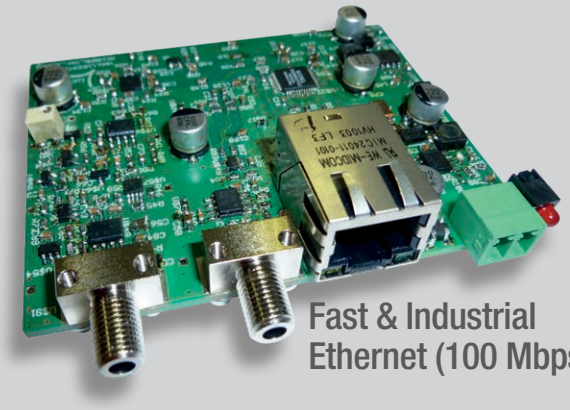
Specially designed to use with Fiber-Optic Rotary Joint CFO 2 for real time full duplex data transmission at 100 Mbps.

The Conductix-Wampfler Media Converter CFC provides dual channel data transmission in conjunction with rotating joints in all industrial automation applications such as machine tools, automated packaging, rotary stages, wind turbines, off-shore rigs, material handling, etc. Its construction with standard DIN-rail fitting and F-SMA connectors makes it ideal for all applications.



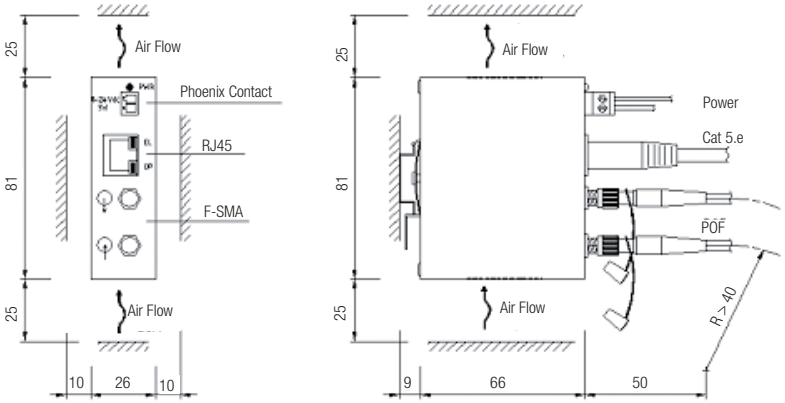
Main Features

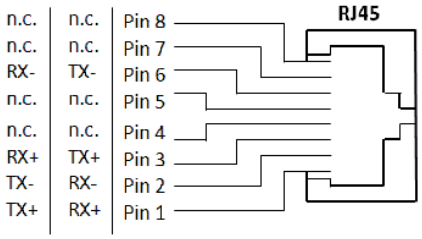
Available as a package with our CFO 2 Fiber-Optic Rotary Joint (see Pg. 10) for guaranteed real time Fast Ethernet transmission (100 Mbps). CFO 2 in conjuction with Conductix-Wampfler fiber optics, makes a total fiber length of up to 50 m possible.



Fast & Industrial Ethernet (100 Mbps)

- Dual channel
- Guaranteed real time operation with CFO 2 fiber-optic rotary joint
- Wide operating temperature -20 to + 60°C
- High reliability
- Blue light (462-472 nm)
- High quality / low loss plastic optical fiber (POF) Transmission rate at 100 Mbps up to 50 m length





General Data	
Part No.	DE350014A
Voltage	8...24 VDC (min 7 V; max 28 V including the peak ripple)
Polarity independence	Yes
Max. absorbed power	5 W
Green LED power	ON: Power On
Flying screw terminal block, included	Phoenix Contact MC1.2 / 2-ST-3.81; S< 1.5 mm² (AWG16)
Weight	150 g
Housing dimensions	26 mm × 81 mm × 71 mm without connectors
Cooling	Convection / space: 10 mm (left / right) and 25 mm (up / down)
Housing Material	Metallic
Mounting	35 mm DIN rail, zinc plated and passivated, connected to protective earth (ground) with low impedance
Environmental Characteristics	
Operating temperature	-20°C ... +60°C
Storage temperature	-25°C ... +75°C
Humidity	10... 90% no condensation
Degree of protection	IP30

Optical Fiber (POF) Interface		
Peak wavelength		462-472 nm (blue light)
Transmission length with fiber optic rotary joint CFO 2 (including system reserve of 3 dB and connectors)		Total of 50 m (rotor side + stator side of the same channel of the FORJ) of Plastic Optical Fiber with diameter = 980 / 1000 µm, numerical aperture NA = 0.46, bandwidth = 30 MHz * 100 m, attenuation (dB / km): 115 @ 470 nm / 100 @ 525 nm / 150 @ 650 nm
Bit error rate between two Cat5.e cables of the channel		$< 10^{-9}$
Optical connectors		F-SMA (IEC 61754-22)
Industrial Ethernet Interface (100Mbps)		
Protocol independence		Yes – tested with the following protocols: EtherCAT, Ethernet IP_CIP Motion, Ethernet Power Link, Profinet_RT, SafetyNETp, Sercos III, Modbus TCP
Connection		Female connector RJ45, shielded (ISO 8877)
Transmission length with shielded cable Cat5.e		_< 90 m
LEDs on RJ45	**EL (green)**	On: electric connection present Flashing: on-going traffic
	OP (yellow)	On: optical connection present Flashing: on-going traffic

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