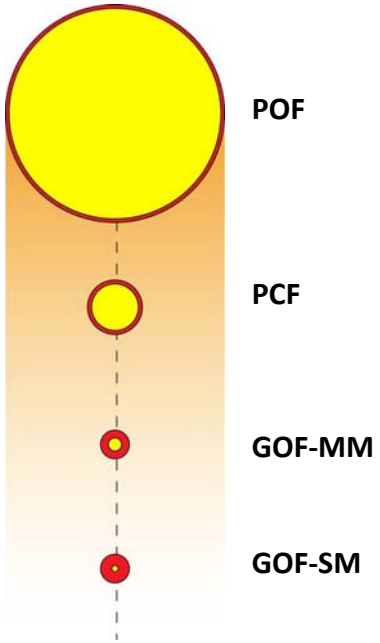
POF –
smart solutions for automation technology

Bernd Horrmeyer, 2014-09

Phoenix Contact

Overview POF
Types of fibre

	Polymer Optical Fibre	Hard Cladded Silica	Multimode	Singlemode
Shortform	POF	PCF	GOF-MM	GOF-SM
Standard IEC 60793-2	A4a	A3c	A1a/ A1b	B1
Absorption [db/km] with λ [nm]	230 660	6 850	3,0/ 3,5 850	0,5 1300
Core diameter [μm]	980	200	50/ 62,5	9



POF

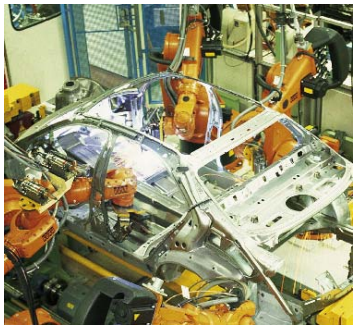
- optimized for short distances
- easy termination

Environmental conditions

commercial:

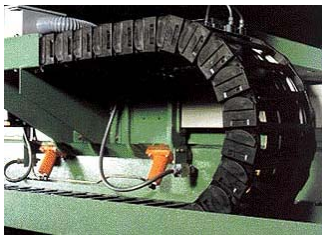
MICE	1 = Commercial environment covered by IEC 11801	2 = Light industrial environment	3 = Heavy industrial environment
Mechanical	M_1	M_2	M_3
Ingress	I_1	I_2	I_3
Chemical	C_1	C_2	C_3
EMC	E_1	E_2	E_3

industrial:



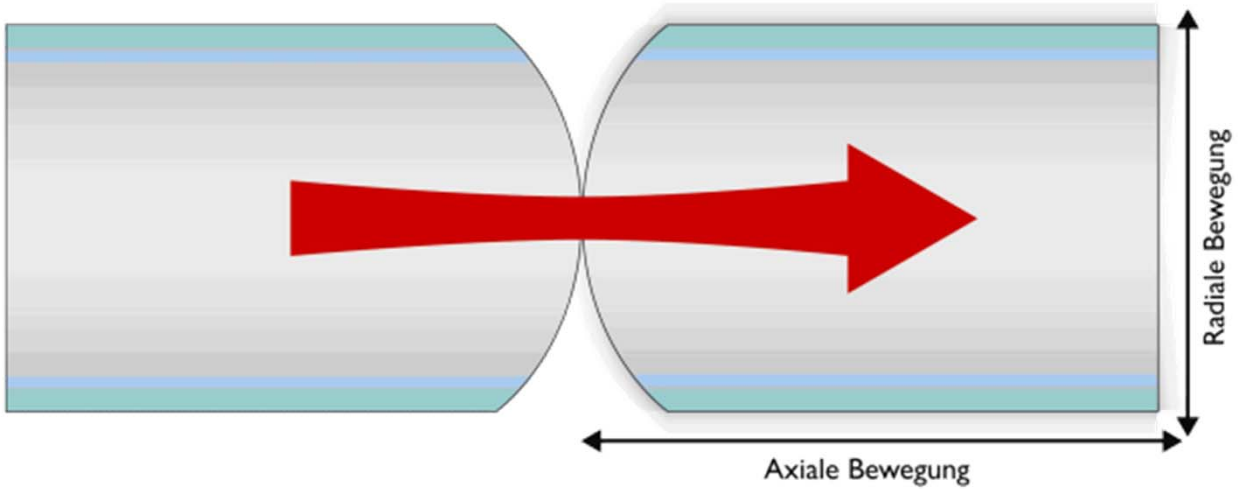
Three alternatives:

1. reinforce, e.g. with IP67-components
   ⇨ the trend with local automation
2. Isolation, e.g. with housings
3. seperation, e.g. in seperatet rooms



Tough solutions will be required in automation technology!

Mechanical load

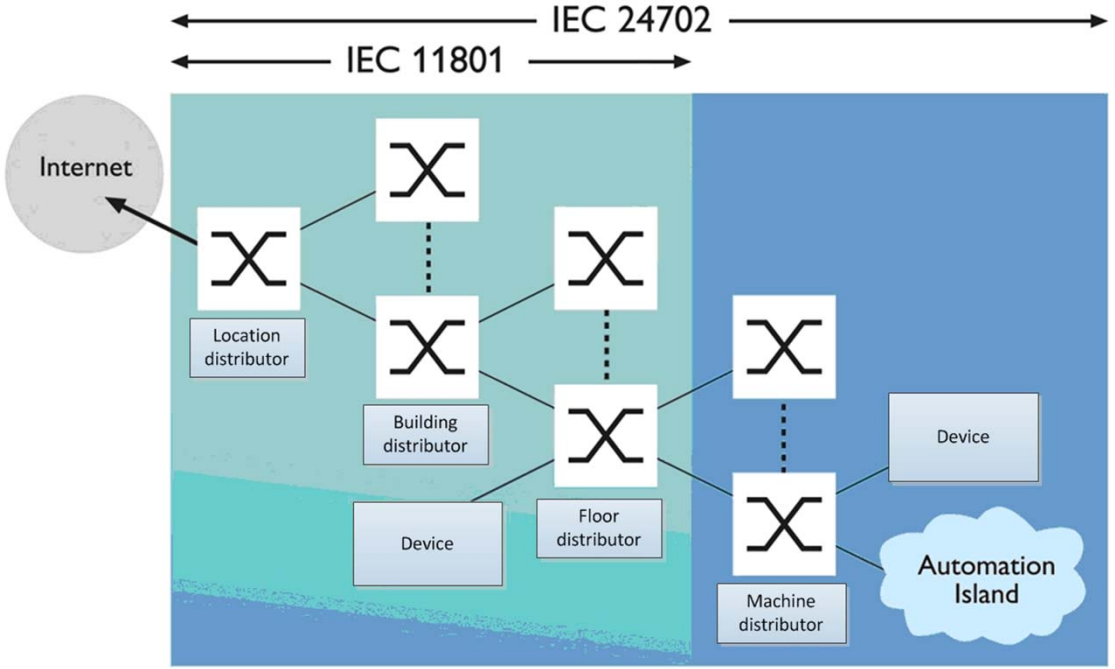


- Fibre displacement caused by:
  - Shock ⇒ Fibre displacement causes higher absorbtion
  - Vibration ⇒ loss of connection
  - Offset-temperature ⇒ the higher the fibre diameter, the lower the offset

POF – fibre with benefits

Generic Cabling

- Cabling as defined in IEC 11801 requires a channel length of 100 m
  - ➢ No POF defined
- Industrial cabling as defined in IEC 24702 defines POF-Channel:



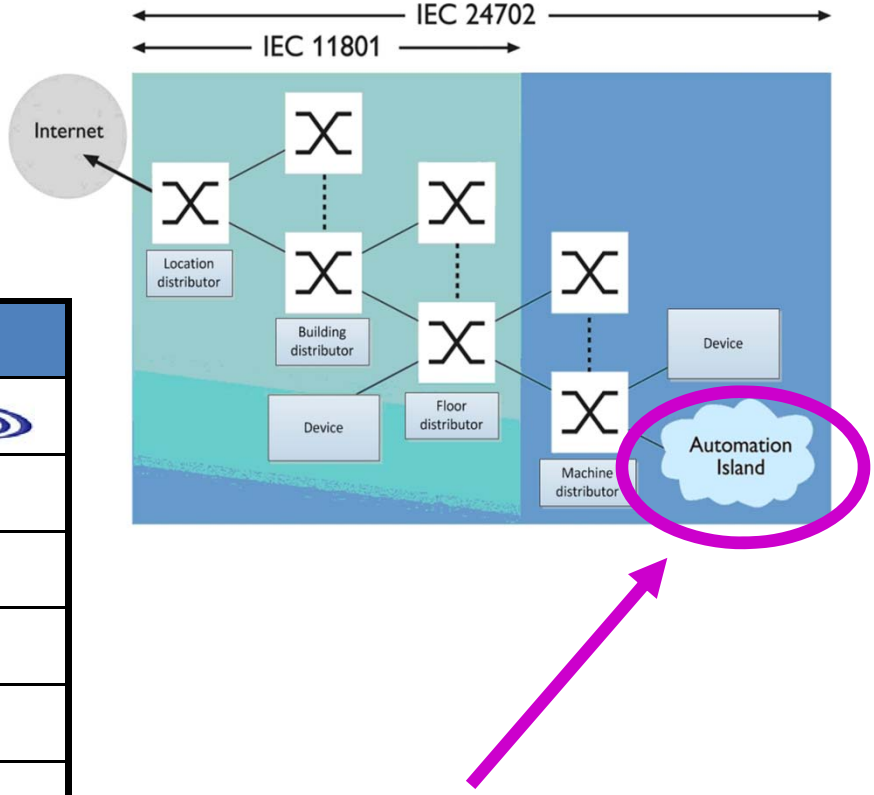
Type	Length	Type of Fibre	fibre diameter∅
OF25	25 m	A4d	1000 µm → like A4a
OF50	50 m	A4f	490 µm → unusual, expensive, difficult termination

Generic Cabling with POF is possible, but uncommon

Automation Island

Automation Island =
industrial network as defined in
IEC 61784-5

Subpart	Netzwerke
2	DeviceNet, ControlNet, EtherNet/IP
3	PROFIBUS, PROFINET
4	P-NET
6	INTERBUS
10	Vnet/IP
11	TCnet
12	EtherCAT Technology Group
14	EPA.Org.cn
15	Modbus



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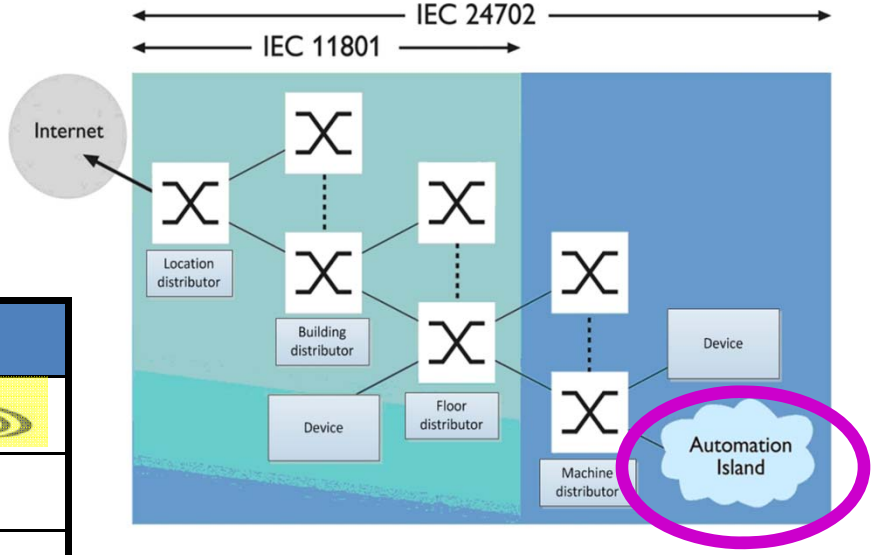

Network with variations for POF

Factors of success of POF in automation technology

Automatization requires:

- EMC-resistant systems
- Environment-resistant systems
- No galvanical connection
- Easy wiring
- Easy field connection
- Easy planning

POF fulfilles the requirements

Example robot cell in automotive industry

- Cablelength from the robot to the control cabinet
  typically 20 m
- Welding tools and drives cause EMC-troubles
- Rough environment
- Field cable termination necessary
- Data- and power cable very close
- Light weight

POF fulfilles the requirements perfectly

Termination of POF-Connectors

- Remove cable coating
- Pulling boot over wire

- Cut the wire

- Remove isolation

- Fixe connector in the intake

- Put wires in the boot
- Tighten the screws

- **Done!**

- **Attenuation max. 1,5 dB**
- **Fast**
- **process reliability**

Connectors for POF

Industry

FSMA

SC

SC-Duplex

ST

Entertaiment electronics

Simplex: F05

Duplex: F07

TOSLINK

SMI

Modern networks in automation use SCRJ:

- Duplex-Connector
- ∅ 2,5 mm ferrule
- resistant
- Space-saving (SFF)
- SC-compatible

POF automation networks

network	fibre	connector (Prio 1)
EtherNet/IP™	A4a, A4d	SCRJ
PROFIBUS PROCESS FIELD BUS	A4a	FSMA
PROFINET INDUSTRIAL ETHERNET	A4a	SCRJ
INTERBUS	A4a	SCRJ
EPA.Org.cn	A4a	SCRJ
Modbus	A4a	SCRJ

Planning networks with POF

Consider…

- …compatibility with other devices:
  wavelength, type of fibre, connector, …
- …environmetal requirement:
  MICE, drag chain, …
- …max. length named in network spezifications
- …reduction of length caused by additional connector:

Optical Channels	Additional plug connectors	Max. channellength			
		POF	PCF	GOF-MM	GOF-SM
	0	50 m	100 m	2.000 m	14.000 m
	1	43,5 m	100 m	2.000 m	14.000 m
	2	37 m	100 m	2.000 m	14.000 m

EQP: Equipment **TE**:Device  Plug connector  Plug connection

Industrial Communication systems

	Bandwidth	Electric	POF	Remark
Fieldbus	≤ 10 Mbit/s	RJ 485 CAN	≤ 70m	
Industrial Ethernet -Nowadays-	100 Mbit/s	100 BASE-T	≤ 50m	
Industrial Ethernet -Wish for the future-	100 Mbit/s 1000 Mbit/s		≤ 200m ≤ 50m	Replacement for PCF-fibre Solution for 1Gig trend in industrial automation

Conclusion

Automation technology has:

- Applications with short lengths

Automation requires:

- Robust solutions
- Easy field cable termination
- Easy rules

POF is the smart solution for communication systems in automation technology!

Thank you for your attention!

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