



## FOC tool kit for 125 µm GI

Order-No: 20 99 000 3015

Tool kit containing all the tools necessary for assembling fibre optic cables 125µm GI with optical connectors F-SMA, FH-ST, F-SC and Han multicontact module.

### Contents:

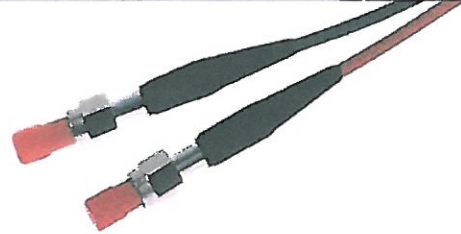
1. A pair of cable scissors
2. Cable stripping knife
3. Crimping tool for connector strain relief  
(hex 3.8; 4.3 und 4.95) 20 99 000 1031
4. Stripping tool 0.18/0.30 mm 20 99 000 1046
5. Stripping tool 0.30 mm 20 99 000 1041
6. Stripping tool 0.40 mm
7. Curing oven 230V, 24x ; locator 2x F-SMA; locator 2x FH-ST  
locator 2x SC / contacts of multicontact module
8. Cleaving tool
9. Polishing tool for F-SMA 20 99 000 1091
10. Polishing tool for FH-ST 20 99 000 1095
11. Polishing tool for contacts of multicontact module 20 99 000 1092
12. Polishing tool for F-SC 20 99 000 1097
13. Polishing plate
14. Polishing paper 9µm (2 sheets) 20 80 001 9912
15. Polishing paper 1µm (2 sheets) 20 80 001 9913
16. epoxy adhesive for glass fibre (4g) 20 80 001 9902
17. syringe
18. Inspection microscope (100x)
19. Locator F-SMA for inspection microscope
20. Locator FH-ST / F-SC for inspection microscope
21. Optical test transmitter (OLS), for 850nm (1x F-SMA und 1x FH-ST)
22. Optical power meter (OLM), for 660nm and 850 nm
23. Locator F-SMA for optical power meter (OLM)
24. Locator FH-ST for optical power meter (OLM)
25. FO-test cable 1m; 50/125µm; F-SMA / F-SMA
26. FO-test cable 1m; 50/125µm; FH-ST / Fh-ST
27. FO-test cable 1m; 50/125µm; FH-ST / F-SC
28. FO-test cable 1m; 50/125µm; FH-ST / male contact for Han multicontact module
29. FO-test cable 1m; 50/125µm; FH-ST / female contact for Han multicontact module
30. Coupling sleeve F-SMA
31. Coupling sleeve FH-ST

The corresponding assembly instructions and manuals are enclosed

# F-SMA Connector



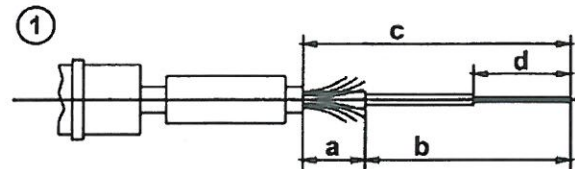
Part-Number: 20 10 125 1212



for FOC inner cable 50/125  $\mu$ m and 62.5/125  $\mu$ m with 2.8 mm cable jacket

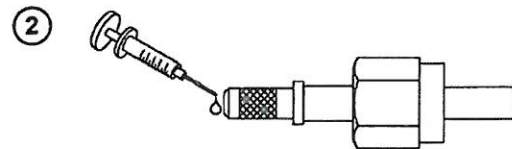
## Assembly Manual

1. Slide bending protection and crimping ferrule on the cable. Strip the outer jacket to a length of 47 mm (c). Strip the strain relief to a length of 7 mm (a). Strip the compact fibre with a 0.3 mm stripping tool to a length of 40 mm (b). The primary protective coating of the fibre has to be stripped with a 0.18 mm stripping tool to a length of 28 mm (d).

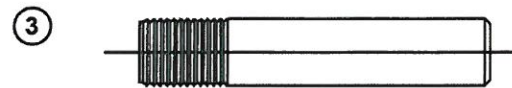


Stripping tool 20 99 000 1046

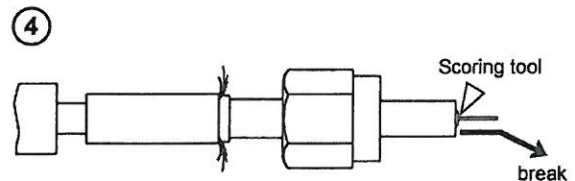
2. Take a 1 ml syringe and press 1.5 - 2 units of glue into the connector. Clean the fibre with spirit. Slide the fibre with the cable into the connector and turn it slightly. Slide the crimping ferrule onto the connector and fix it with the crimping tool (20 99 000 1031).



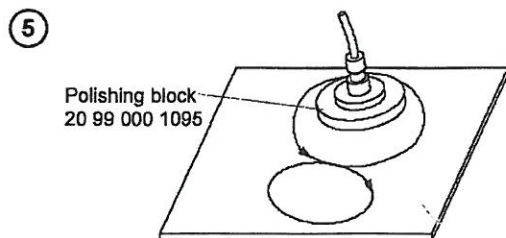
3. Slide the SH-ST-heating box adapter on the connector. Cure the connector for ca. half an hour in the heating box.



4. Score fibre carefully. Bend fibre slightly pull and break it.



4. The very tip of the contact has to be polished first with a 9  $\mu$  grain size polishing paper and then with a 1  $\mu$  grain size polishing paper.



Polishing paper  
20 80 001 9912



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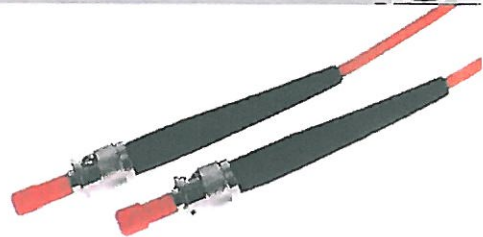
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FOC Assembly Manual F-SMA-GI

# F-ST Connector



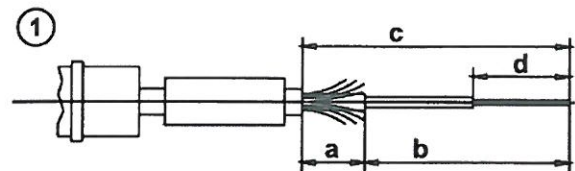
Part-Number: 20 10 125 2212



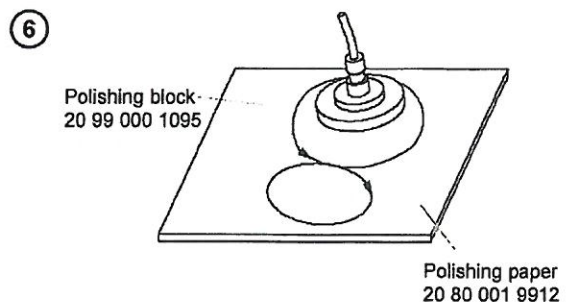
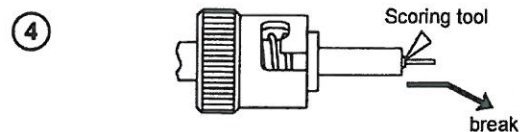
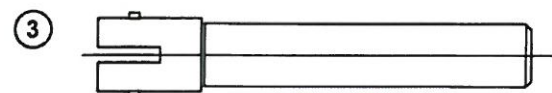
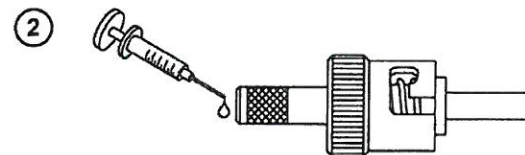
for FOC inner cable 50/125  $\mu\text{m}$  and 62.5/125  $\mu\text{m}$  with 2.8 mm cable jacket

## Assembly Manual

1. Slide bending protection and crimping ferrule on the cable. Strip the outer jacket to a length of 47 mm (c). Strip the strain relief to a length of 7 mm (a). Strip the compact fibre with a 0.3 mm stripping tool to a length of 40 mm (b). The primary protective coating of the fibre has to be stripped with a 0.18 mm stripping tool to a length of 28 mm (d).
2. Take a 1 ml syringe and press 1.5 - 2 units of glue into the connector. Clean the fibre with spirit. Slide the fibre with the cable into the connector and turn it slightly. Slide the crimping ferrule onto the connector and fix it with the crimping tool (20 99 000 1031).
3. Slide the SH-ST-heating box adapter on the connector. Cure the connector for ca. half an hour in the heating box.
4. Score fibre carefully. Bend fibre slightly then pull and break it.
5. The very tip of the contact has to be polished first with a 9 $\cdot$  grain size polishing paper and then with a 1 $\cdot$  grain size polishing paper.
6. Inspect the polishing quality using a 100x microscope.



Stripping tool 20 99 000 1046



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2003-08-15

FOC Assembly Manual F-ST-GI

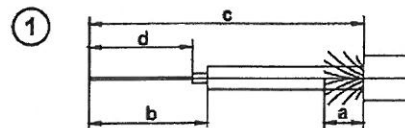


for FOC inner cable 50/125 µm and 62.5/125 µm with 2.8 mm cable jacket

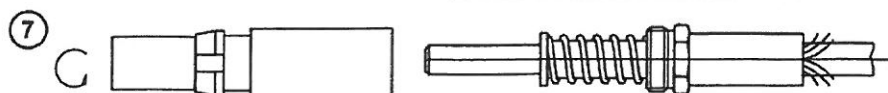
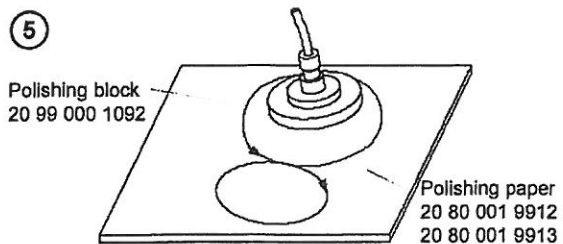
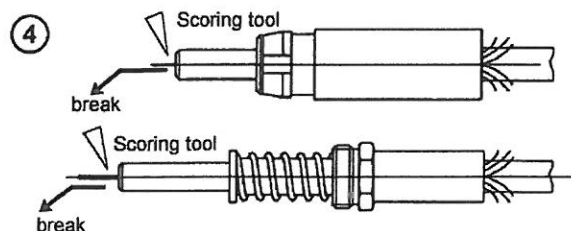
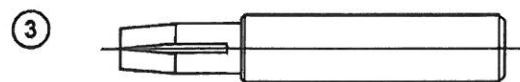
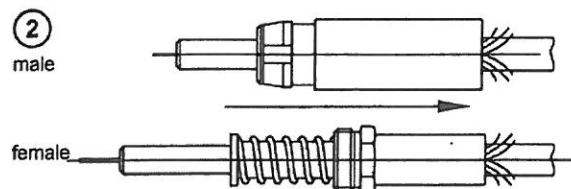
Suitable for Han multi contact module	Part-Number (m)	Part-Number (f)
Metal ferrule	20 10 125 4211	20 10 125 4221
Ceramic ferrule	20 10 125 4212	20 10 125 4222

## Assembly Manual

- Strip the outer jacket to a length of 22 mm (f) and 32 mm (m) (c). Strip the strain relief to a length of 5 mm (a). Strip the compact fibre with a 0.3 mm stripping tool to a length of 20 mm (b). The primary protective coating of the fibre has to be stripped with a 0.18 mm stripping tool to a length of 18 mm (d). Stripping lengths are the same for both male and female insert.
- Take a 1 ml syringe and press glue into the connector. Clean the fibre with spirit. Apply also glue on the fibres of the strain relief (kevlar). Slide the fibre with the cable into the connector and turn it slightly.
- Slide the SH-ST-heating box adapter on the connector. Cure the connector for ca. half an hour in the heating box.
- Score fibre carefully. Bend fibre slightly then pull and break it.
- The very tip of the contact has to be polished first with a 9• grain size polishing paper and then with a 1• grain size polishing paper.
- Inspect the polishing quality using a 100x microscope.
- Finally screw the ferrule onto the female insert.



Stripping tool 20 99 000 1046



# SC Connector



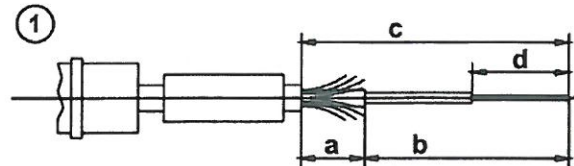
Part-Number: 20 10 125 5211



for FOC inner cable 50/125  $\mu\text{m}$  and 62.5/125  $\mu\text{m}$  with 2.8 mm cable jacket

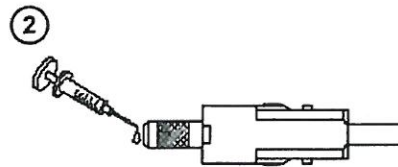
## Assembly Manual

1. Slide bending protection and crimping ferrule on the cable. Strip the outer jacket to a length of 48 mm (c). Strip the strain relief to a length of 8 mm (a). Strip the compact fibre with a 0.3 mm stripping tool to a length of 40 mm (b). The primary protective coating of the fibre has to be stripped with a 0.18 mm stripping tool to a length of 29 mm (d).

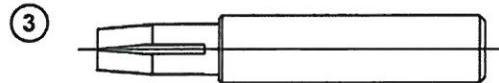


Stripping tool 20 99 000 1046

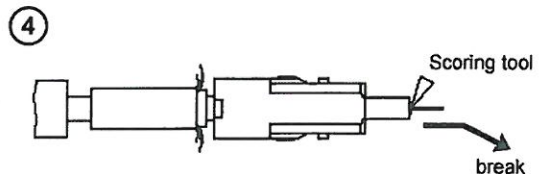
2. Take a 1 ml syringe and press 1.5 - 2 units of glue into the connector. Clean the fibre with spirit. Slide the fibre with the cable into the connector and turn it slightly. Slide the crimping ferrule onto the connector and fix it with the crimping tool (20 99 000 1031).



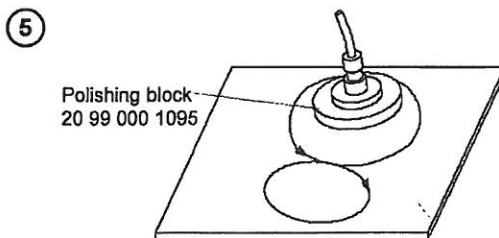
3. Slide the SH-ST-heating box adapter on the connector. Cure the connector for ca. half an hour in the heating box.



4. Score fibre carefully. Bend fibre slightly pull and break it.



4. The very tip of the contact has to be polished first with a 9 $\mu\text{m}$  grain size polishing paper and then with a 1 $\mu\text{m}$  grain size polishing paper.



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2003-08-15

FOC Assembly Manual SC



# INSTRUCTION SHEET

## Four Point Concentric Crimping Tool for fibre optics

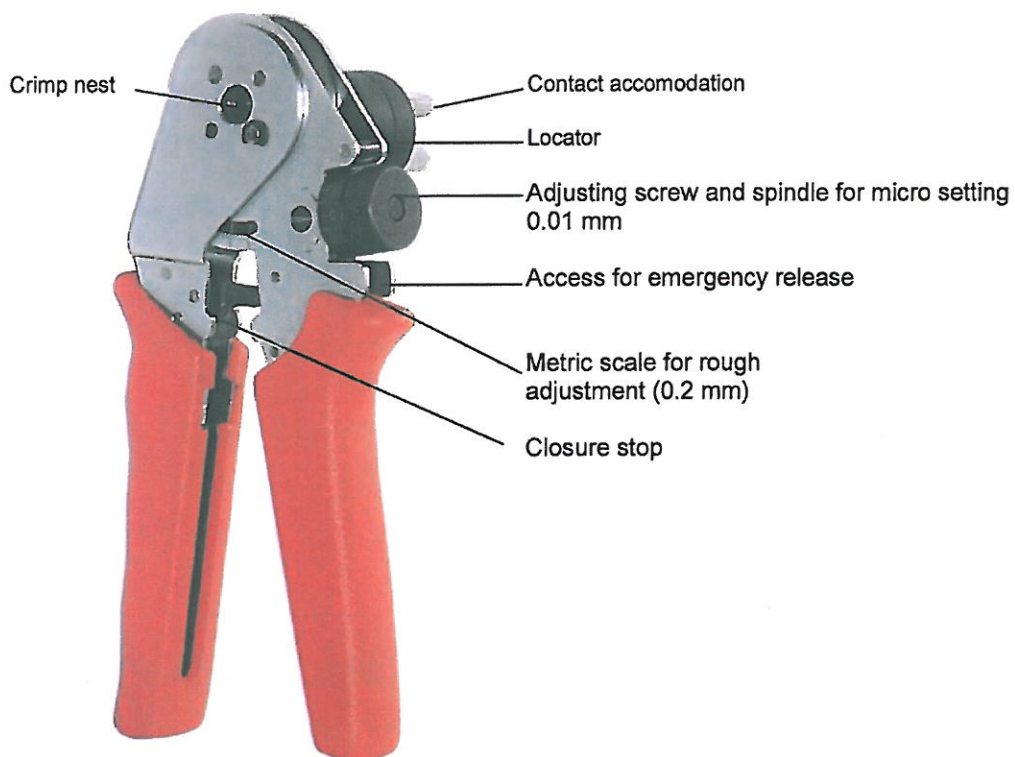
Art.- No. 20 99 000 1035



### Basic safety instructions

Designed and manufactured pursuant to up-to-date technical requirements and latest safety standards, the HARTING crimping tool for POF applications and should only be used in strict compliance with existing safety rules.

The tool has only to be used for the application described in the reference table below, i.e. for crimping POF cable with turned contacts. The manufacturer is not liable for damages caused by improper use or unauthorized technical modifications of the tool.



### Operation

- select and set correct locator position for the contact to be crimped acc. to the reference table
- select depth of indenters for the contact to be crimped acc. to the reference table and adjust it with the setting screw
- place the locator by side lifting into the position indicated in the reference table  
**please take care, that the contact accommodations are unlocked**
- press the contact accommodation into the locator and lock it by a 90° rotation
- insert the contact into crimp nest as far as possible and close handles to the first lock-in position
- insert the stripped cable into the arrested contact as far as possible, then press cable + connector against the back stop and close tool completely
- remove the crimped connector
- before selecting a new locator position, first unlock the contact accommodation used before

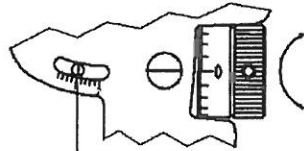
### Adjustment of crimp depth

Crimp depth to be adjusted as follows:

Adjusting screw to be turned **clockwise for reducing the crimp depth and anti clockwise for increasing the crimp depth**

Adjustment tolerances:

- 1 scale spacing on the screw = adjustment by 0.01 mm
- 1 full rotation of screw = adjustment by 0.2 mm (indication on the screw as well as on the rough scale)
- 5 rotations of the screw = adjustment by 1 mm (indication on the rough scale)



crimp depth -

adjusting screw with 0.01 mm tolerance

crimp depth +

rough scale indicating 0.2 mm tolerances

### Control of crimp depth

Crimp tool adjustment is done in the factory, but under permanent use periodic gauging is recommended to insure accurate calibration. This is easily accomplished with a gauge  $\varnothing$  2.0 mm as follows:

A crimp depth of 2.0 mm is set by means of the adjusting screw (scale mark at "2", screw mark at "0" as shown in the fig. above) and the tool is to close. After insertion of gauge, it must be just enough space for moving the gauge inside the entry hole. If the indenter closure is too small or too large to exactly match the gauge, the deviation (+/-) can be checked by the precision setting of the screw. In case the deviation exceeds the tolerances requested by the contact manufacturer, please contact the latter.

### Setting parameters (reference table)

Contact type	Art.-No.	Locator position	Crimp depth setting
POF pin contact 1mm/2.2mm POF for Han DD, Han K	2010 001 3211	1	1.48 mm
POF pin contact 1mm/2.2mm POF for Han D, Han U	2010 001 3212	1	1.48 mm
POF pin contact 1mm/2.2mm POF for Han E	2010 001 3311	1	1.48 mm
	2010 001 3213	1	1.48 mm
POF bush contact 1mm/2.2mm POF for Han DD, Han K	2010 001 3221	2	1.48 mm
POF bush contact 1mm/2.2mm POF for Han D, Han U	2010 001 3222	2	1.48 mm
POF bush contact 1mm/2.2mm POF for Han E	2010 001 3321	2	1.48 mm
POF end sleeve 1mm/2.2mm POF	2010 001 3232	3	1.8 mm
POF pin contact 1mm/2.2mm POF for Han multi contact module	2010 001 4211	3	1.8 mm
POF bush contact 1mm/2.2mm POF for Han multi contact module	2010 001 4221	3	1.8 mm
FH ST plug connector 1mm/2.2mm POF	2010 001 2211	3	2.0 mm
F-SMA plug connector 1mm	2010 001 1211	3	2.0 mm
F-SMA plug connector 1mm	2010 001 1221	3	2.0 mm
F-SMA plug connector 1mm	2010 001 1223	3	2.0 mm
F-SMA plug connector 1mm	2010 001 1241	3	2.0 mm
F-SMA plug connector 1mm	2010 001 1243	3	2.0 mm

### Maintenance and repair

Keep the tool clean and properly stored when not in service. The joints need to be oiled regularly and the circlips securing the bolts have to be always in place.

For repair please send the tool back to the manufacturer.



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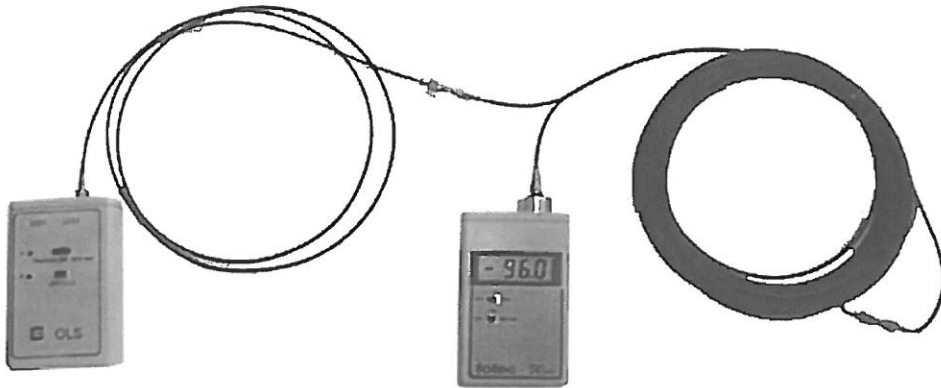


Technical documentation

Measurements with OLS and OLM

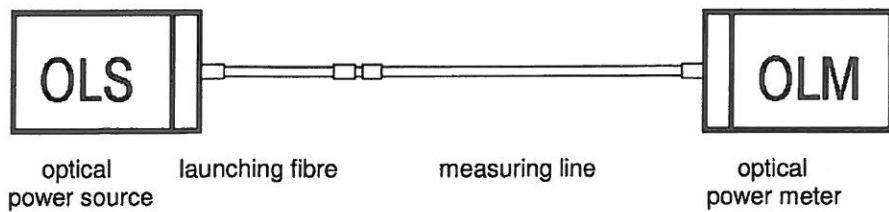
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# Measurements with OLS and OLM



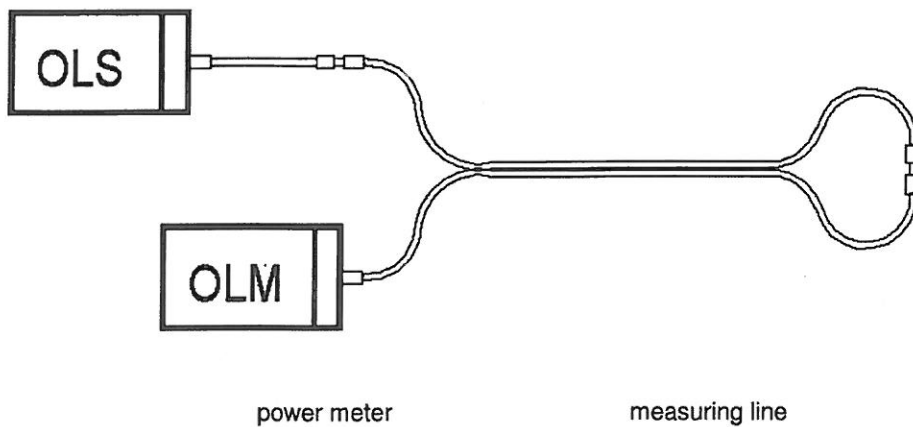
## Measurement procedure

Test program for simplex cable:



Test program for duplex cable:

optical power source      launching fibre



## Measurement method

At first the attenuation of the launching fibre must be determined. After that, the launching fibre, which is connected to the optical power source, has to be connected to the measuring line with a coupling sleeve.

At the other end of the measuring line the optical power meter is connected.

The OLM shows now the attenuation of both fibres. To get the attenuation of the measuring line, the attenuation of the launching fibre must be subtracted from the measured value.

The launching fibre is used to „wipe off“ the peripheral modes, which are applied to the fibre by the transmitter.

For measuring duplex cable a coupling sleeve has to be connected at one end of the fibre.

Pay attention, that the wavelength-setup of both instruments are identical.

The GI- und SI-Fibre have to be measured with  $\lambda=850\text{nm}$ , for the polymer optical fibre the wavelength selector switch must be set to  $\lambda=660\text{nm}$ .

Typical attenuation values are:

Polymer optical Fibre (POF):  $\leq 2 \text{ dB}/10\text{m}$  (at 660nm)

GI-Fibre (50/125 $\mu$ ):  $\leq 3 \text{ dB}/\text{km}$  (at 850nm)

GI-Fibre (62,5/125 $\mu$ ):  $\leq 3,5 \text{ dB}/\text{km}$  (at 850nm)

HCS-Cable:  $\leq 6 \text{ dB}/\text{km}$  (at 850nm)

F-SMA Connector (GI/SI-Faser):  $\leq 1 \text{ dB}$

F-SMA Connector (POF):  $\leq 2,5 \text{ dB}$

FH-ST Connector (GI/SI-Faser):  $\leq 0,5 \text{ dB}$

FH-ST Connector (POF):  $\leq 2,5 \text{ dB}$

These statements are only reference values, the attenuation could be higher at connectors which are badly processed or of low quality.



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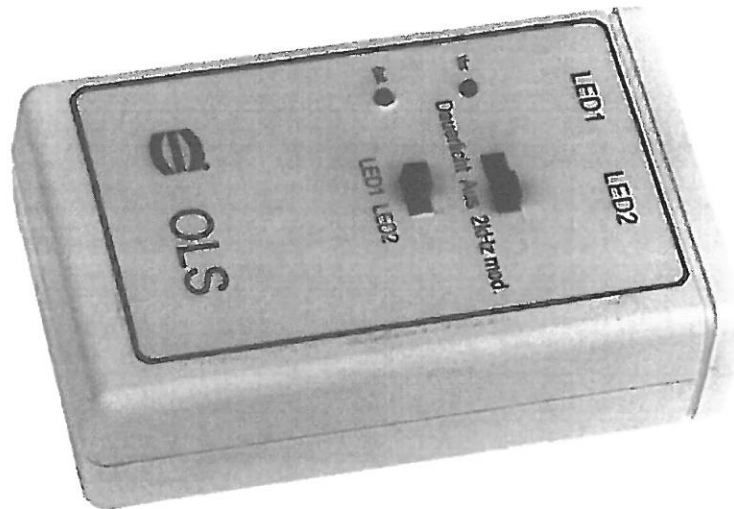
Technical documentation

Optical light source

OLS

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## OLS - Optical power source



### General discription

The optical power source (OLS) is applicable to apply a defined signal in a multimode fibre. A function selector switch makes it possible to change between continuous light and a 2kHz square pulse.

The selection of the transmitting diode occurs with the slider switch „LED1 LED2“.

The OLS is deliverable with the wavelenght  $\lambda=660\text{nm}$  and  $\lambda=850\text{nm}$ .

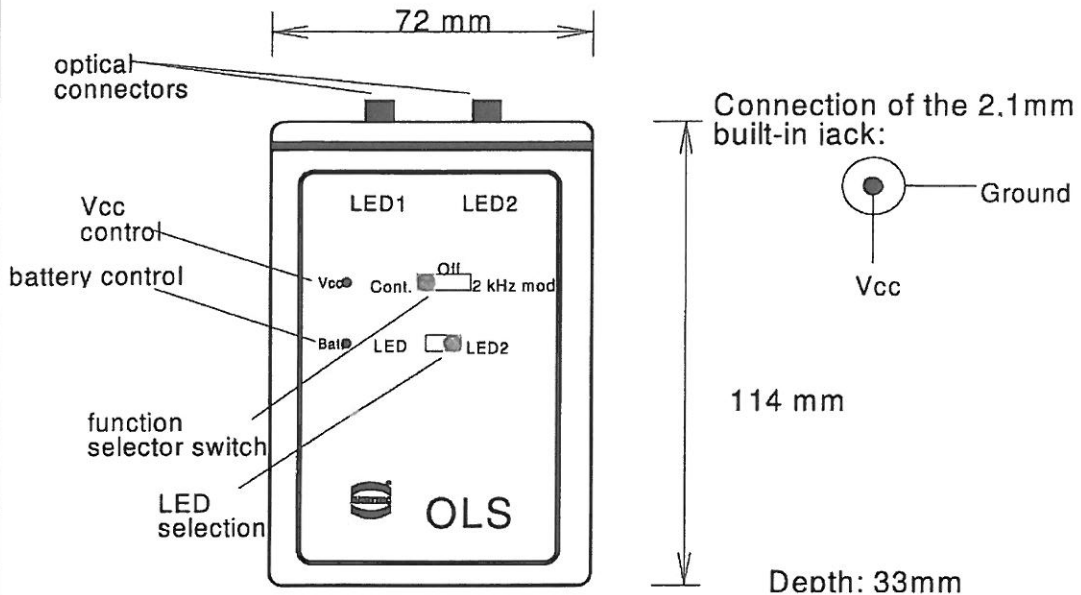
F-SMA, FH-ST, HP-Versatile Link and Toshiba Toshlink are the different types of optical connectors, which are available. The optical components are integrated in the optical power source and are not exchangeable.

The supply voltage is applied either by a plug-in power supply or a 9V battery.

When the OLS is working the green Vcc-LED shines.

When the red battery control-LED shines, the battery must be changed.

## Dimensions



## Specifications

Typical emitting power:

$\lambda=850\text{nm}$  (F-SMA and FH-ST): ..... 20 $\mu\text{W}$

$\lambda=660\text{nm}$  (F-SMA and FH-ST): ..... 600 $\mu\text{W}$

HP Versatile-Link: ..... 200 $\mu\text{W}$

Toshiba Toslink: ..... 220 $\mu\text{W}$

Weight: ..... 190g

Housing: ..... Polystyrol (UL94HB)

Dimensions (b x h x d): ..... 72 x 114 x 33 mm

Operating temperature range: ..... 0° to +50° C

Storing temperature range: ..... -10° to +70° C

Output signal: ..... continuous light and 2kHz modulated (pulse duty ratio 1:1),

..... switch-selectable by a slider switch

Working wavelenght: ..... 850 nm / 660 nm ( $\pm 5$  nm)

Power supply: ..... 9 Volt DC with plug-in power supply,

..... or 9 V battery (lifetime  $\approx$  10h)

Power consumption: ..... 55 mA

Pilot lamps: ..... LED green: operating voltage

LED red: battery control



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# Conversion of $\mu\text{W}$ , $\text{mW}$ and $\text{W}$ to $\text{dBm}$

10/01

Microwatt		Milliwatt		Watt	
$\mu\text{W}$	$\text{dBm}$	$\text{mW}$	$\text{dBm}$	$\text{W}$	$\text{dBm}$
1	-30.0	1	0.0	1	30.0
2	-27.0	2	3.0	2	33.0
3	-25.2	3	4.8	3	34.8
4	-24.0	4	6.0	4	36.0
5	-23.0	5	7.0	5	37.0
6	-22.2	6	7.8	6	37.8
7	-21.5	7	8.5	7	38.5
8	-21.0	8	9.0	8	39.0
9	-20.5	9	9.5	9	39.5
10	-20.0	10	10.0	10	40.0
20	-17.0	20	13.0	20	43.0
30	-15.2	30	14.8	30	44.8
40	-14.0	40	16.0	40	46.0
50	-13.0	50	17.0	50	47.0
60	-12.2	60	17.8	60	47.8
70	-11.5	70	18.5	70	48.5
80	-11.0	80	19.0	80	49.0
90	-10.5	90	19.5	90	49.5
100	-10.0	100	20.0	100	50.0
200	-7.0	200	23.0	200	53.0
300	-5.2	300	24.8	300	54.8
400	-4.0	400	26.0	400	56.0
500	-3.0	500	27.0	500	57.0
600	-2.2	600	27.8	600	57.8
700	-1.5	700	28.5	700	58.5
800	-1.0	800	29.0	800	59.0
900	-0.5	900	29.5	900	59.5
1000	0.0	1000	30.0	1000	60.0

$$\text{Leistung [Watt]} = 10^{(\text{dBm}/10)} \cdot 0,001$$

$$\text{Pegel [dBm]} = 10 \cdot \log(\text{Watt}/0,001)$$