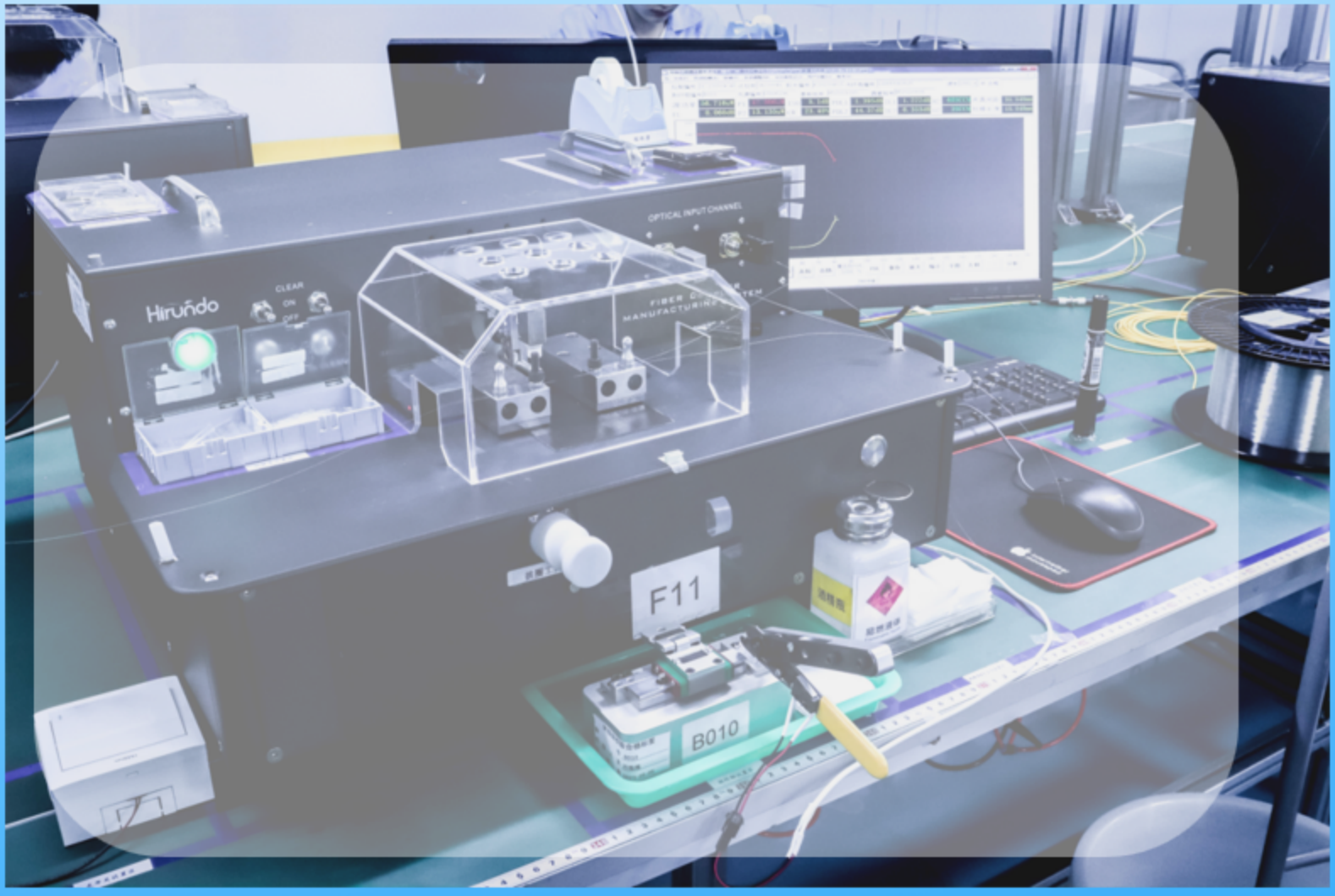
Hirundo

Develope ▪ Solution Design ▪ Manufacture

Passive Optical Solutions

FBT Coupler Series



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Hirundo

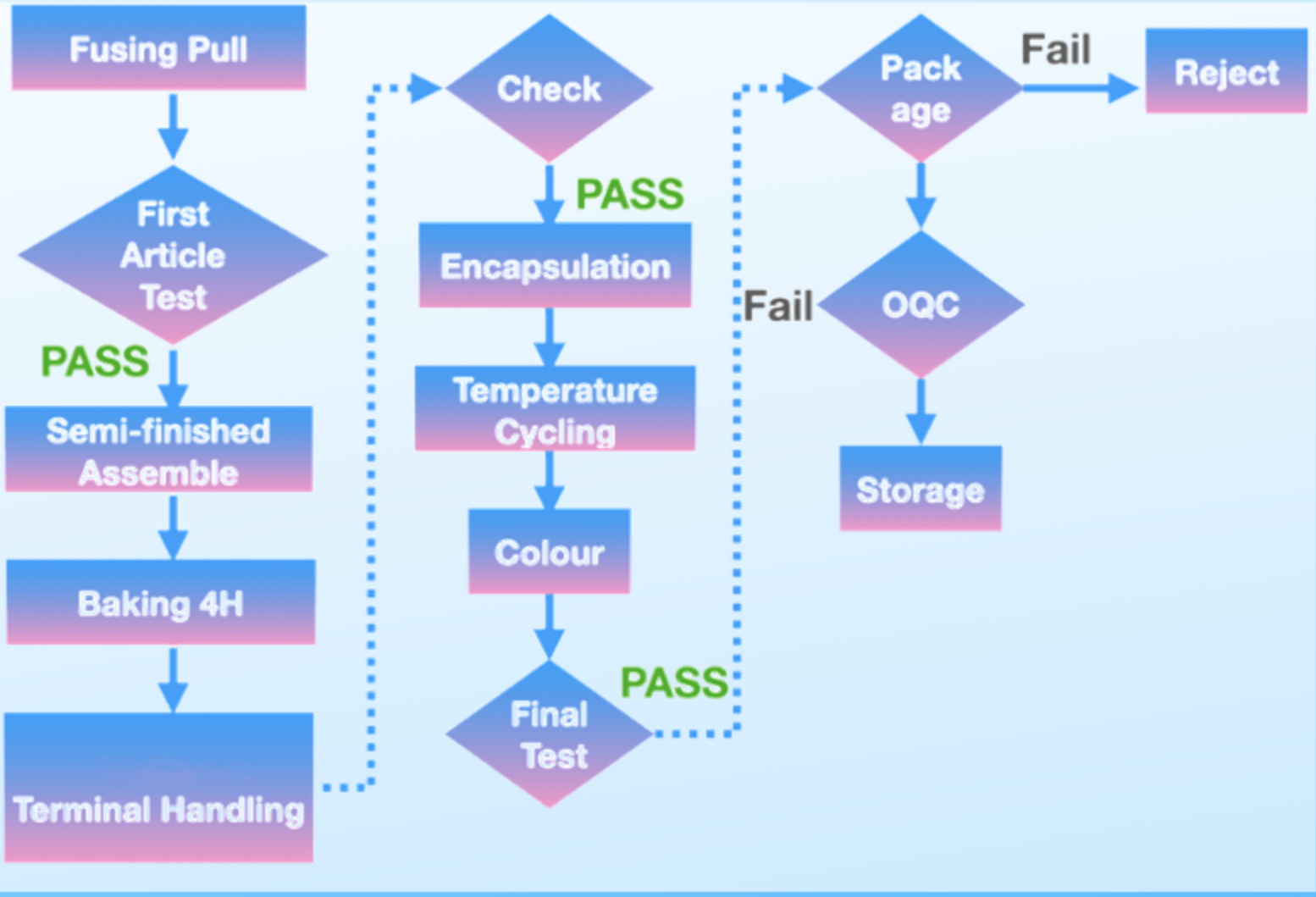
FBT Coupler Series

Contents

Coupler Product

- **Dual Window Coupler**
- **All Band Coupler**
- **Monolithic Multi-Mode Coupler**
- **PM Coupler**
- **High Power Coupler**

Coupler production process

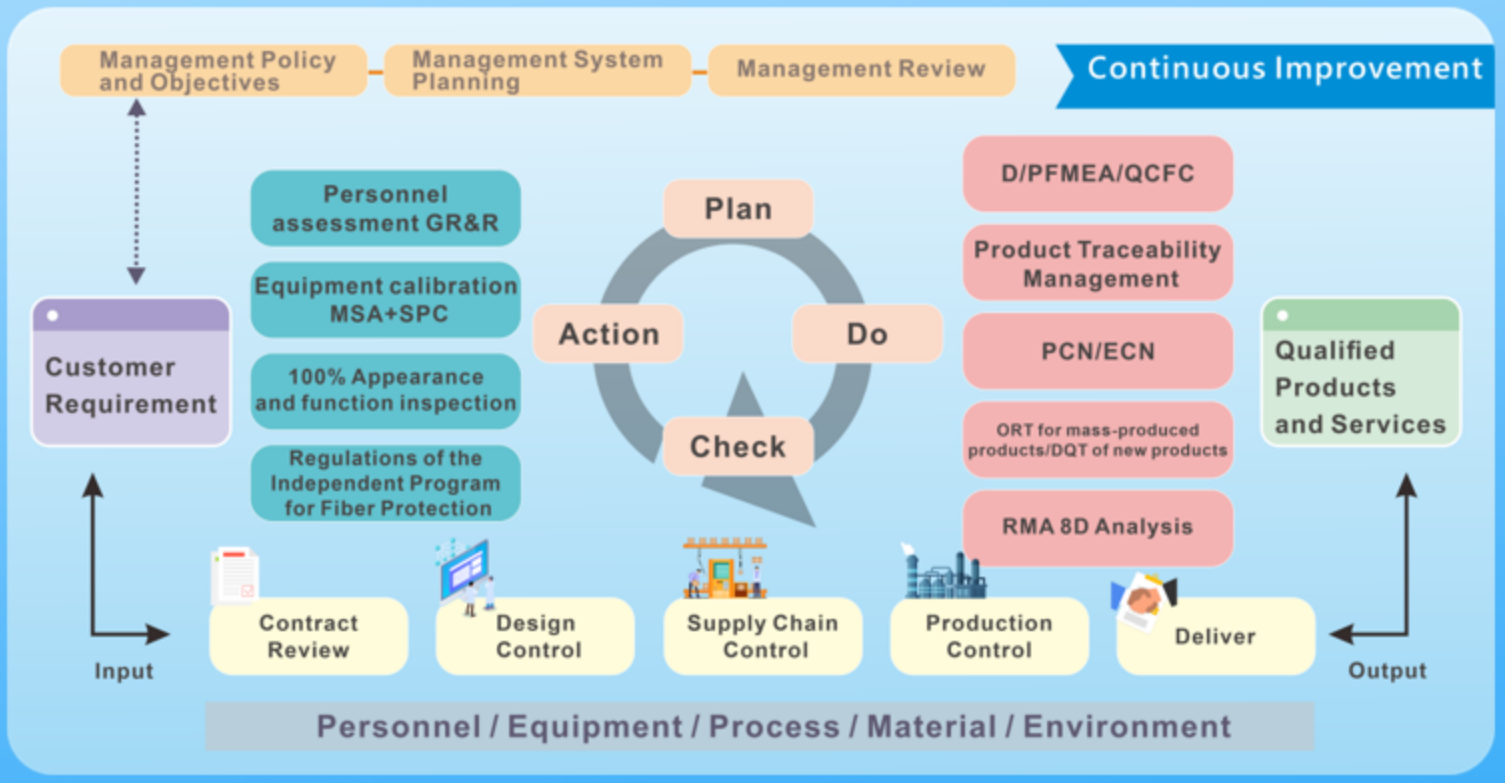


Application

- Vehicle radar
- Optical communication network
- Fiber optic sensing
- Broadcasting

Quality Assurance

Hirundo adheres to the quality policy of "pioneering and enterprising, teamwork; continuous improvement, customer satisfaction". From the beginning of its establishment, it has strictly followed the ISO9001:2015 standard, and established a set of management systems in which all departments cooperate with each other and operate standardizedly, from front-line employees to management. Fully implement the cornerstone of "6S" on-site management, start with the six elements of man-machine-material method environmental testing, use the PDCA-based cycle management model, use integrated quality tools in the product realization process, improve the personnel training mechanism, and promote all members to maintain common values and Fulfill the commitment to customer quality.



Quality Assurance

Process Failure Mode and Effects Analysis, FMEA, is used during the new product introduction phase to help identify potential risks and take steps to mitigate those risks before actual construction

Potential failure mode analysis of FMEA process

Failure Mode and Effect Analysis

项目名称：Coupler过程控制　　过程责任部门：工程技术部　　FMEA编号：HRG-TD-MI-06-025
产品类型：Common Coupler Device　　关键日期：2022年3月15日　　编　　制：吴赞良
主要参加人：吴赞良(技术部)、刘圣平(技术部)、程福祥(技术部)、徐中胜(生产部)、Gil(董事长)　　工　　序：全工序　　FMEA日期（编制）：2022年3月15日

过程功能要求		失效模式	失效后果	严重度(S)	失效原因/机理	频度数(O)	现行过程预防	探测度(D)	风险顺序数(RPN)	建议的措施	责任及目标完成日期	措施结果				
												采取的措施	严重度(S)	频度数(O)	探测度(D)	风险顺序数(RPN)
	1.1石英基板清洗	Quartz Tube长度与生产要求不一致	产品不符合技术要求	4	1.来料不良； 2.产线或仓库混料。	3	1. IQC来料抽检半圆石英管长度； 2. 原材料做好标识，分类放置。	3	36							
		Quartz Tube两端直径不一致	影响封装的位置/导致断纤	5	来料不良	2	员工使用前进行确认；	6	60	IQC来料抽检	IQC/2012-9-30	IQC来料抽检	5	2	3	30
		Quartz Tube破裂	产品失效	7	1.来料不良；	2	1. IQC来料进行TC确认；	3	42							
					2.清洗时操作不当导致损伤例如，超声时使用夹具不对，超声机频率不当；	3	2.使用专用的清洗夹具，规定超声的频率及时间；	3	63	专人设置超声清洗机的各项参数。	产线班长/2012-9-30	生产线班长负责设置产生清洗机的参数。	7	2	3	42
					3.原材料夹持不当；	3	3.一次只能夹取一只石英半圆管。	3	63	使用塑胶镊子夹取。	清洗人员/2012-9-30	使用塑胶镊子夹取。	7	2	3	42
					1.超声清洗机故障；	2	每日进行点检	3	36							
					2.清洗方法不妥，如超声		固定的清洗时间（10min），功率									

Fiber Protection

A set of fiber handling guidelines was established to better understand fiber fragility and clearly document fiber handling requirements, these guidelines include:

- Optical fiber processing, optical fiber mechanical performance testing.
- Optical fiber winding method, optical fiber handling and storage requirements.
- Fiber stripping guide, fiber cutting requirements.
- Optical fiber splicing requirements, optical fiber cleaning methods.
- Optical fiber minimum bending radius criteria.
- Optical fiber inspection standards.
- The quality engineer conducts training and audit of fiber handling every two months to ensure that the specified fiber handling and protection requirements are effectively implemented in the factory.

Quality Assurance

Application of GR&R method to study statistical repeatability and reproducibility of production test system.

Judgment criteria:

- %R&R≤ 10%: Measuring system in good condition
- 10% ≥%R&R≤ 30%: Measuring system is accepted
- %R&R≥ 30%: Measuring system need to improve

测量系统分析MSA *GR&R--- 数据记录表 Data Worksheet*

报告编号Report NO. QAC-T08-20220217

量具名称 Equipment Name	Optical Final Test System	产品类型 Description	1*2 2/98 Coupelr	测量人员 OperatorA	XZ	测试日期 Test Tate	2022/2/17
量具编号 Equipment NO.	T08	基件编号 P/N	WBC-1X2-1550-2/98	测量人员 OperatorB	QQX	平价人数 Appraisers	3
参数规格 Dimension	IL	规格上限 USL	18.5	测量人员 OperatorC	WSP	试验次数 Trials	3
单位 Unit	dB	规格下限 LSL	16	过程变差/过程能力 Process Variation(σ/PP)	2	样品数 Samples	10

分析时机Analytical Occasion ○ Regular ○ New QCP ○ PPAP ◉ Other

零件编号Parts NO.	1	2	3	4	5	6	7	8	9	10	Total	平均值Average
1. A 1	17.65	17.93	17.91	16.52	17.66	17.92	17.59	17.73	17.98	17.93	176.82	17.682000
2. 2	17.67	17.90	17.92	16.52	17.65	17.93	17.53	17.69	17.98	17.92	176.71	17.671000
3. 3	17.64	17.92	17.91	16.52	17.65	18.03	17.55	17.74	17.99	17.90	176.85	17.685000
4. 均值Mean	17.65333	17.91667	17.91333	16.52000	17.65333	17.96000	17.55667	17.72000	17.98333	17.91667		$\bar{X}_4$ = 17.679333

The control plan is the basis for implementing the manufacturing process audit

Hirundo	文件编号	HRG-WIQA-001	文件名称	Coupler Process&QC Flowchart		版本	A1
	产品名称	Fused Coupler	产品型号	通用		页次	1/4
华瑞高光子科技（佛山）有限公司	制作	Shengjia Liu	审核	William	批准	Justin	日期 2021/12/27

▽ 原料 ○ 操作 ◇ 检查或测试 ⬇ 运输 □ 入库

ID No.	原材料	过程 材料	过程 准备	过程 过程	过程名称	管理方法 检验项目	方法	标准	职责	参考文件	设备	异常处理	不良品处理加工方式
010	光纤	▽		RoHS 符合性	光纤进料检验	光纤类型	AQL-lot	SMF28(R) Ultra Fiber	IQC	HRG-QA-IS-009	1550nm光源/针规/熔接机	记录检验报告，并向主管报告当批不合格；	反馈供应商，要求供应商提供改善分析报告；
						熔接损耗		20mm针对1圈 IL<0.50dB					
						光纤外观		与我司同类型光纤熔接，损耗<0.03dB					
						Loss/Km		没有损伤，没有分层，没有发黄					
								1310nm:0.32~0.35dB/KM 1550nm:0.18~0.21dB/KM 980nm:3dB/Km		供应商DATA			
020	石英基板 玻璃圆管	▽		RoHS 符合性	石英基板/玻璃圆管进料检验	外观	AQL-lot	没有气泡，没有裂缝，没有碎片	IQC	HRG-QA-IS-003	测量显微镜	记录检验报告，并向主管报告当批不合格；	反馈供应商，要求供应商提供改善分析报告；
						尺寸		符合图纸。 圆管（长，外径，内径）					
								石英基板（长，外径，槽宽）					
030	不锈钢管	▽		RoHS 符合性	不锈钢管进料检验	外观	AQL-lot	表面光滑，无变形，无毛刺，刻字字体大小，位置与内容与标准要求相符；	IQC	HRG-QA-IS-011	游标卡尺，塞规	记录检验报告，并向主管报告当批不合格；	反馈供应商，要求供应商提供改善分析报告；
						尺寸		符合图纸。（长，外径，内径）					
						盐雾实验	2pcs/Lot	盐水浓度5%，即100ml水放5-6克盐，在约35度条件下浸泡96h.钢管无生锈					
040	化学胶	▽		RoHS 符合性	HRG-1 HRG-2 HRG-3 HRG-4	品名，型号	100%	与PN规格描述相符； 来料日期与有效期的距离要大于保质期的2/3.	PE/IQC	HRG-QA-IS-014		记录检验报告，并向主管报告当批不合格；	反馈供应商，要求供应商提供改善分析报告；

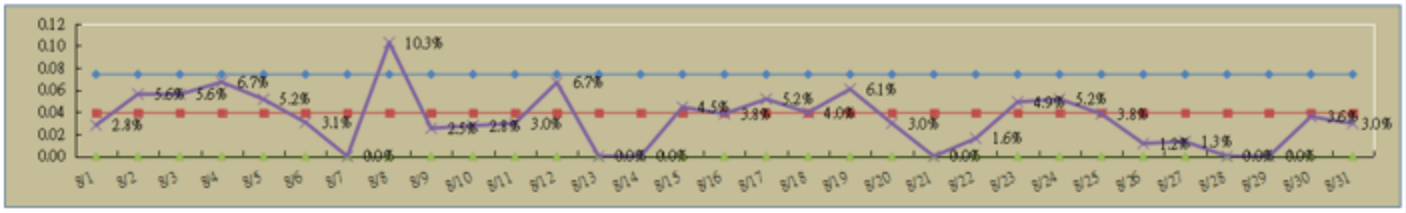
Apply SPC to continuously monitor identified critical/critical processes and characteristics.

IL Insertion loss test

T202208001

过程名称	耦合器IL测试						纪录者		H0007				日期		2022年8月				样本容量 n			样本下限								
日期	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
投入	602	1582	1088	1503	872	945	0	651	552	1259	1980	1573	0	0	382	2496	1623	2776	2863	2579	0	2842	2278	3028	1847	2412	2684	0	0	3124	3261
产出	585	1493	1027	1402	827	916	0	584	538	1224	1921	1468	0	0	365	2400	1539	2666	2689	2502	0	2796	2166	2871	1776	2384	2648	0	0	3012	3164
不良内容及数量 不合格数	17	89	61	101	45	29	0	67	14	35	59	105	0	0	17	96	84	110	174	77	0	46	112	157	71	28	36	0	0	112	97
IL	15	73	47	93	33	18		63	13	27	54	68			0	74	41	108	146	57	0	42	97	124	65	20	31	0	0	84	68
PDL	2	16	14	8	12	11		4	1	8	5	37			17	22	43	2	28	20	0	4	15	33	6	8	5	0	0	28	29
总不良数	17	89	61	101	45	29	0	67	14	35	59	105	0	0	17	96	84	110	174	77	0	46	112	157	71	28	36	0	0	112	97
不良率%	2.8%	5.6%	5.6%	6.7%	5.2%	3.1%		10.3%	2.5%	2.8%	3.0%	6.7%			4.5%	3.8%	5.2%	4.0%	6.1%	3.0%		1.6%	4.9%	5.2%	3.8%	1.2%	1.3%			3.6%	3.0%
上限 UCL	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
中心限 CL	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
下限 LCL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

P 控制图



备注及原因跟踪:	1.8-8号当天测试的产品为1*4耦合器转单产品，因为从C0027客户1*4产品转单给C0002客户，IL规格C0027要求为6.6以下没有WDL参数要求，而C0003客户要求IL在5.7-6.9之间，但有WDL0.45的要求，故测试不良计为不良数，导致不良率超标。

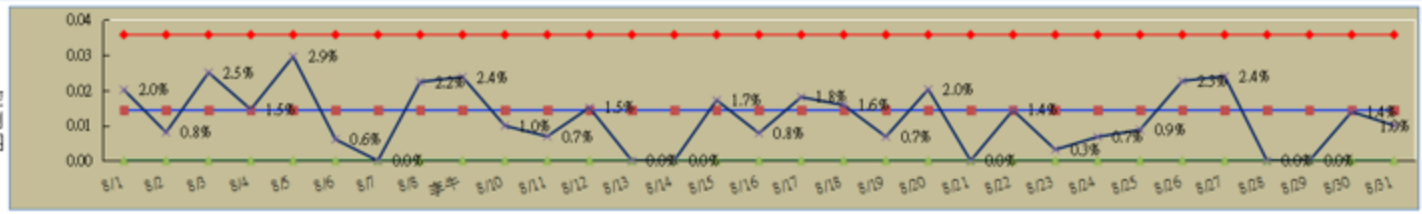
SPC判定异常规则:
a.出现超出控制线的点； b.连续七个点全在控制线之上或之下；c.任何其他非明显随机的图形；

RL Return loss test

T202208002

过程名称	耦合器RL测试						纪录者		H0007				日期		2022年8月				样本容量 n			样本下限								
日期	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	李牛	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
投入	1493	997	1402	827	916	497	0	538	1224	1921	1453	732	0	0	1400	1539	2666	2289	2502	2128	0	2166	2871	1776	2518	2746	2763	0	0	3028	3015
产出	1463	989	1367	815	889	494	0	526	1195	1902	1443	721	0	0	1376	1527	2618	2253	2485	2085	0	2135	2862	1764	2496	2684	2697	0	0	2986	2985
总不良数	30	8	35	12	27	3	0	12	29	19	10	11	0	0	24	12	48	36	17	43	0	31	9	12	22	62	66	0	0	42	30
不良率%	2.0%	0.8%	2.5%	1.5%	2.9%	0.6%		2.2%	2.4%	1.0%	0.7%	1.5%			1.7%	0.8%	1.8%	1.6%	0.7%	2.0%		1.4%	0.3%	0.7%	0.9%	2.3%	2.4%			1.4%	1.0%
上限 UCL	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
中心限 CL	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
下限 LCL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

P 控制图



备注及原因跟踪:	

SPC判定异常规则:
a.出现超出控制线的点； b.连续七个点全在控制线之上或之下；c.任何其他非明显随机的图形；

Quality Assurance

Equipment Guarantee

In order to ensure the output of high-quality products, Hirundo's self-built laboratories that meet GR standards, such as temperature cycling 10° C/min, double 85 high temperature and high humidity, high temperature 260 degrees, low temperature -70 degrees equipment to achieve high and low temperature storage, HAST High temperature and high pressure water boiling, mechanical tension bending and twisting, etc. Mechanical vibration and shock commissioned a third-party inspection also available if necessary.

temperature circulation test & Humidity Chamber

Constant Temperature & Humidity Chamber

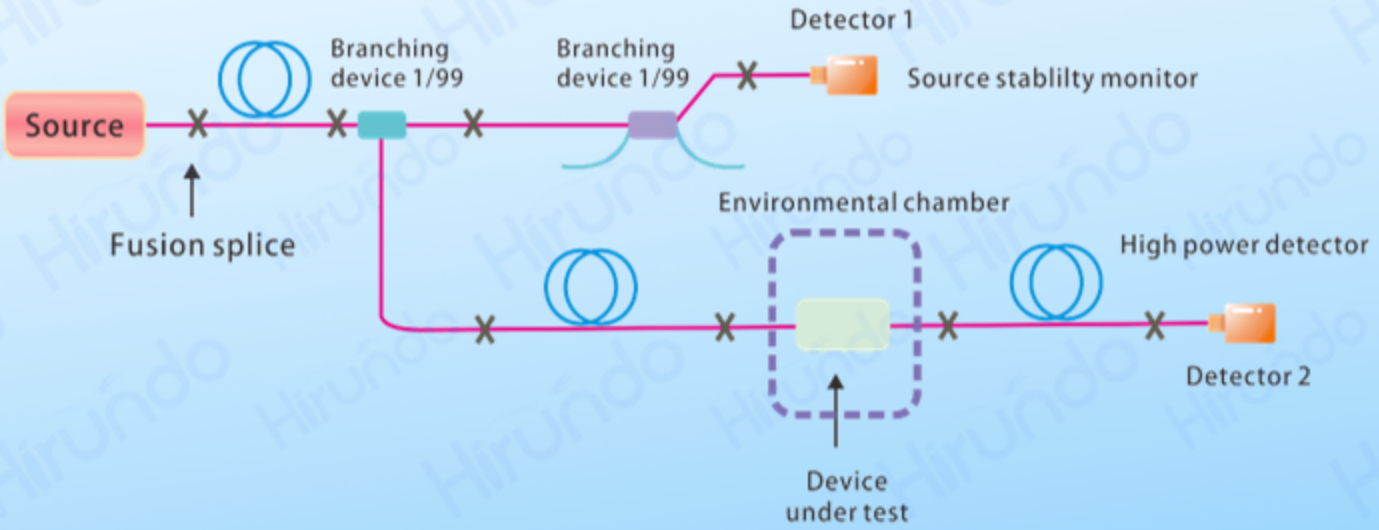
Industrial oven

PCT- Pressure Cooker Test Chamber

Tensile Testing Machine

Tensile Test Machine

High Power Test



High power characterization test set up

• The selection of initial power capability is based on the guarantee confidence in the product process, so as to reduce the test time, for Hirundo optics'2500mW products, the initial power capability will be selected from 2000mW.

• 1/99 product can meet the 5W power of 500H under the condition of 70°C for 8 samples of IL change.

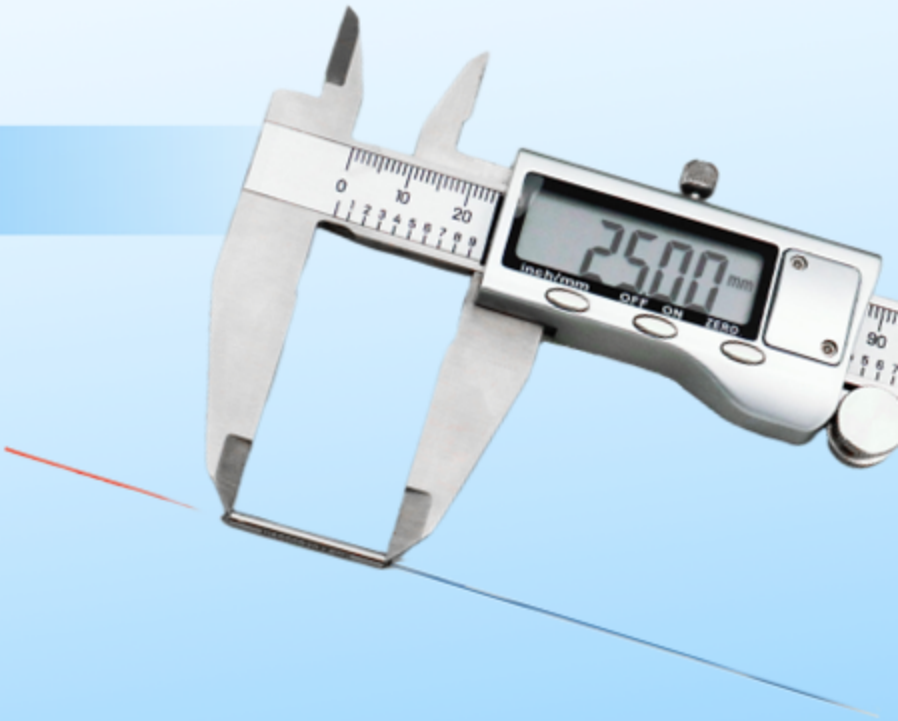
ITEM	NO.	IL11->O1 (dB)	IL11->O2 (dB)	IL12->O1 (dB)	IL12->O2 (dB)	PDL11->O1 (dB)	PDL11->O2 (dB)	PDL12->O1 (dB)	PDL12->O2 (dB)
Before 5W High power test	1	0.17	17.82	17.76	0.21	0.01	0.02	0.03	0.03
	2	0.12	17.78	17.85	0.15	0.01	0.07	0.06	0.02
	3	0.18	17.82	17.94	0.19	0.01	0.04	0.03	0.01
	4	0.10	17.75	17.76	0.13	0.01	0.03	0.04	0.01
	5	0.18	17.63	17.59	0.16	0.01	0.01	0.01	0.01
	6	0.16	17.66	17.69	0.14	0.02	0.04	0.01	0.04
	7	0.14	17.78	17.80	0.16	0.01	0.03	0.02	0.01
	8	0.18	17.45	17.48	0.18	0.01	0.07	0.05	0.02
	9	0.17	17.99	18.06	0.14	0.01	0.04	0.04	0.01
	10	0.14	17.66	17.64	0.09	0.02	0.05	0.06	0.02
	11	0.22	17.95	17.89	0.25	0.01	0.04	0.05	0.01
	12	0.23	18.01	17.93	0.15	0.01	0.03	0.02	0.01
	13	0.22	17.99	17.87	0.14	0.01	0.04	0.02	0.01
After 5W High power test	1	0.21	17.81	17.81	0.20	0.01	0.02	0.02	0.02
	2	0.15	17.83	17.84	0.17	0.02	0.10	0.10	0.03
	3	0.24	17.95	17.93	0.21	0.01	0.06	0.04	0.01
	4	0.23	17.88	17.89	0.24	0.01	0.01	0.02	0.01
	5	0.24	17.67	17.68	0.27	0.01	0.03	0.02	0.01
	6	0.23	17.77	17.80	0.24	0.01	0.02	0.02	0.01
	7	0.17	17.82	17.83	0.20	0.01	0.01	0.01	0.01
	8	0.17	17.46	17.49	0.18	0.01	0.02	0.02	0.01
	9	0.23	18.09	18.09	0.20	0.01	0.05	0.05	0.01
	10	0.19	17.76	17.82	0.23	0.00	0.07	0.07	0.01
	11	0.18	17.91	17.92	0.26	0.01	0.02	0.02	0.02
	12	0.24	18.00	18.01	0.26	0.01	0.03	0.04	0.01
	13	0.18	17.90	17.98	0.23	0.02	0.03	0.04	0.02
Variation	1	0.04	0.01	0.05	0.01	0.00	0.00	0.01	0.01
	2	0.03	0.05	0.02	0.02	0.00	0.03	0.04	0.01
	3	0.06	0.13	0.01	0.02	0.00	0.01	0.01	0.01
	4	0.13	0.13	0.13	0.11	0.01	0.02	0.02	0.00
	5	0.06	0.04	0.08	0.11	0.00	0.02	0.01	0.01
	6	0.07	0.11	0.11	0.10	0.02	0.03	0.00	0.03
	7	0.02	0.04	0.03	0.05	0.00	0.02	0.01	0.00
	8	0.01	0.01	0.01	0.00	0.00	0.05	0.03	0.01
	9	0.07	0.11	0.03	0.06	0.01	0.02	0.01	0.00
	10	0.05	0.10	0.18	0.13	0.01	0.02	0.02	0.01
	11	0.03	0.05	0.03	0.01	0.00	0.02	0.02	0.01
	12	0.01	0.01	0.07	0.11	0.00	0.00	0.02	0.00
	13	0.04	0.08	0.10	0.09	0.01	0.01	0.02	0.01

Coupler Solution

Miniature

Support Mini-Size package to suit high density and flexibility demands

- 3x30mm
- 3x25mm（*0.9mm loose tube）
- 2.4x25mm
- 2.0*15mm

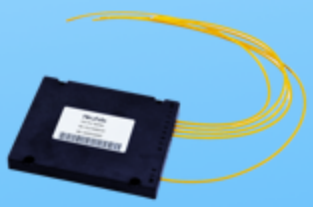


Various Package Types

- 1x2; 2x2; 2x4;
- 1x3; 3x3;
- 1x4;

LGX Cassette

Rack Module



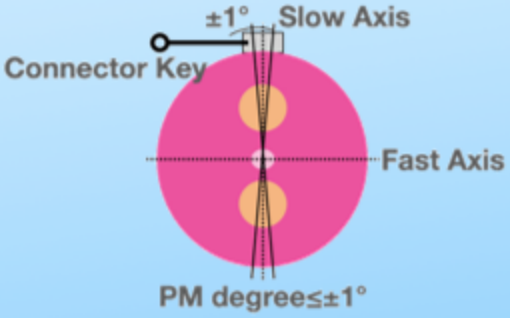
ABS Box

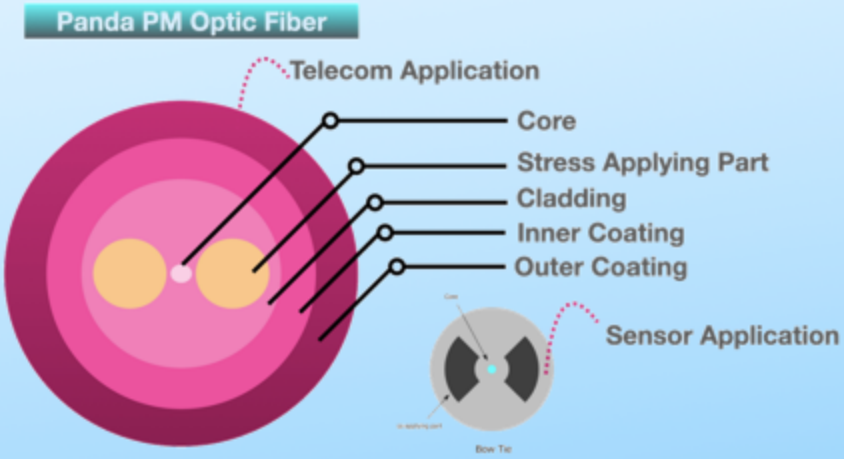
Metal Tube

Coupler Solution

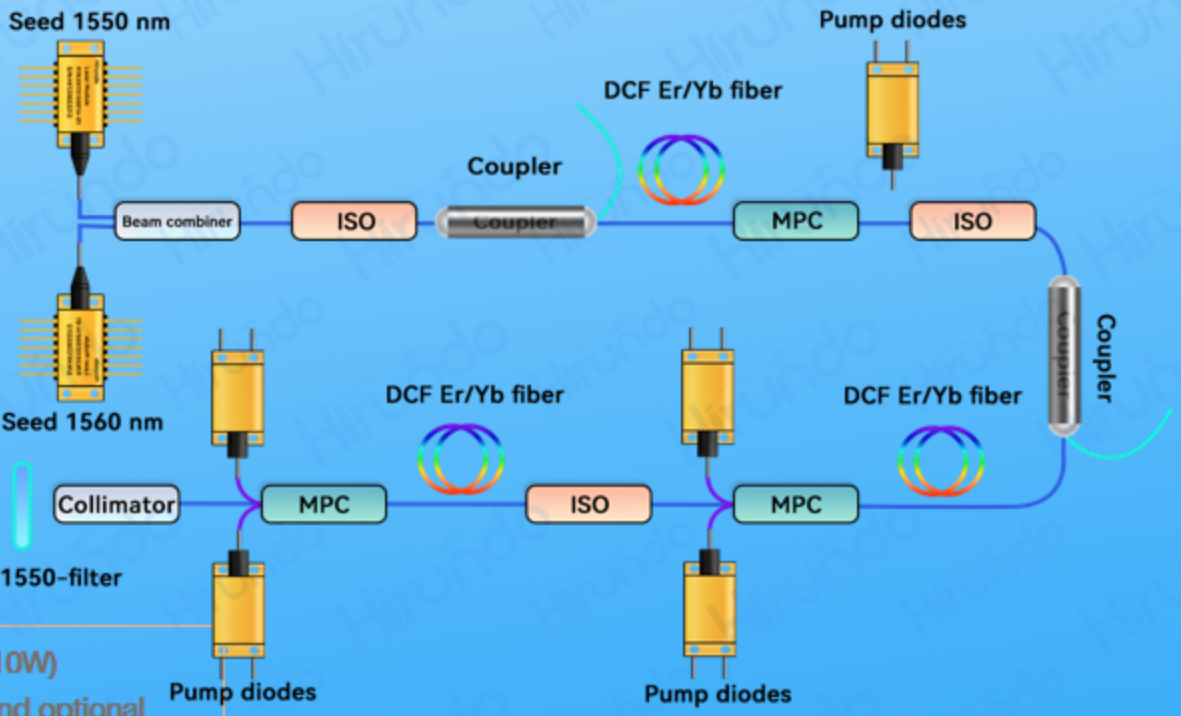
PM Solution

- Covering 460-2200nm wavelength
- Panda Fujikura PM Fiber
- High Polarization Extinction Ratio (PER)
- 2.0 mm narrow key FC/PC or FC/APC connectors



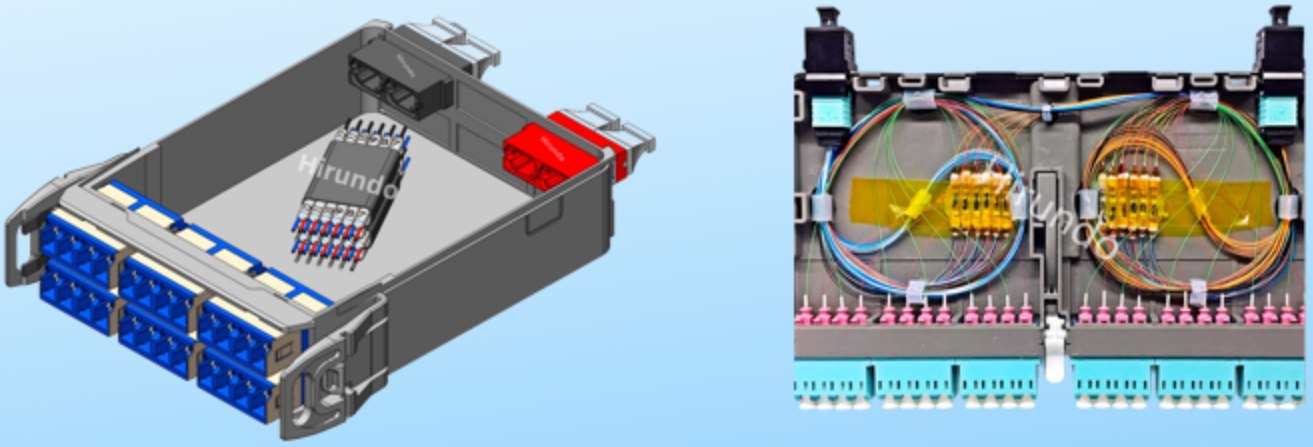


High Power Solution

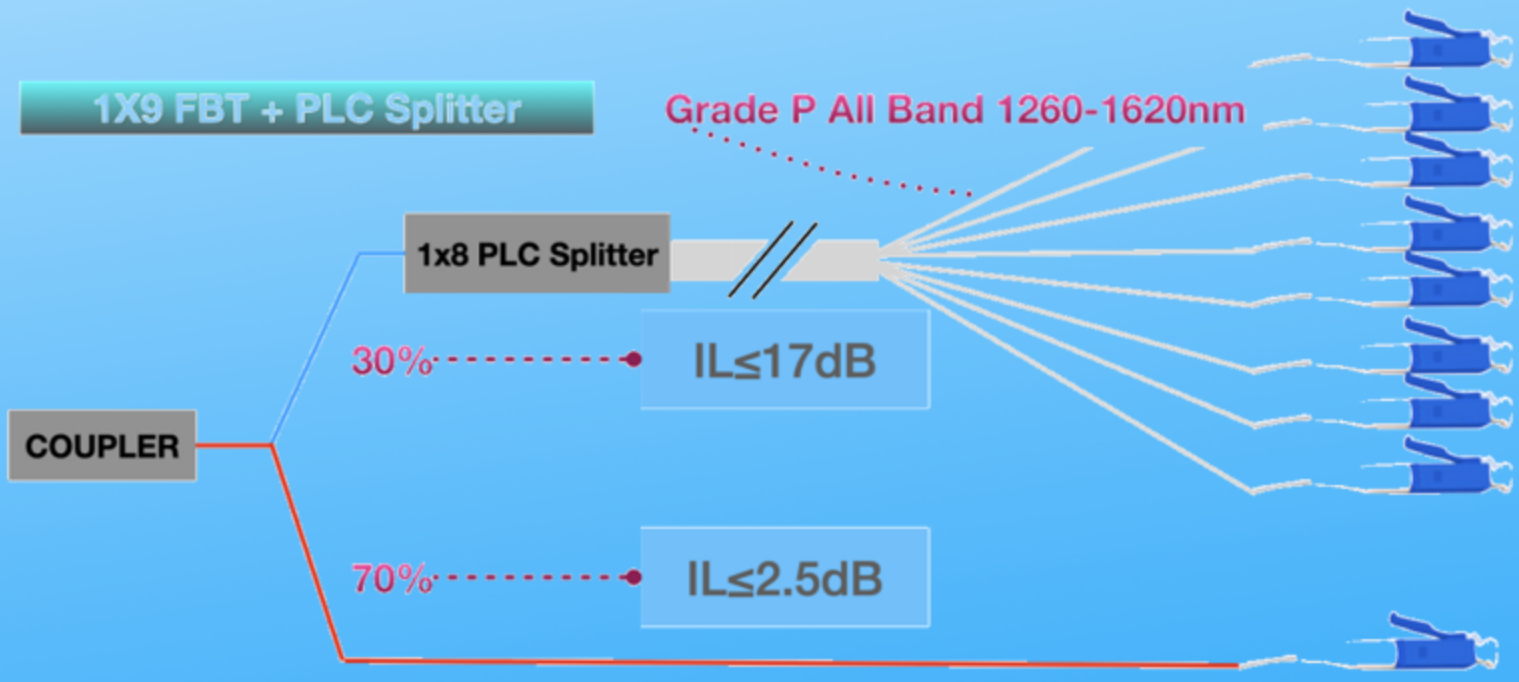


- High operating power (1-10W)
- 1060/1550nm working band optional
- Various types of split ratios are optional

Custom OEM&ODM



Coupler Hybrid MPO module



Coupler Hybrid PLC Splitter

Coupler Optical Performance

Dual Window Coupler

Parameters		Normal		Ultra Broadband	
		Grade P	Grade A	Grade P	Grade A
Operating Wavelength(nm)		1310 & 1550			
Operating bandwidth(nm)		±40		±80	
Typical excess loss(dB)		≤0.07	≤0.1	≤0.07	≤0.1
Insertion Loss (dB)	50/50	≤3.6	≤3.8	≤3.8	≤4.0
	45/55	≤4.2/3.2	≤4.4/3.4	≤4.5/3.3	≤4.7/3.5
	40/60	≤4.7/2.7	≤4.9/2.9	≤5.0/2.8	≤5.2/3.0
	35/65	≤5.4/2.4	≤5.7/2.6	≤5.8/2.5	≤6.1/2.7
	33/67	≤5.7/2.2	≤6.0/2.4	≤6.1/2.3	≤6.4/2.5
	30/70	≤6.0/1.9	≤6.3/2.1	≤6.4/2.0	≤6.7/2.2
	25/75	≤7.0/1.7	≤7.3/1.9	≤7.3/1.7	≤7.7/1.9
	20/80	≤7.9/1.3	≤8.4/1.4	≤8.3/1.3	≤8.7/1.5
	15/85	≤9.5/1.0	≤10.0/1.2	≤9.6/1.0	≤10.1/1.2
	10/90	9.2~11.2/≤0.75	8.80~11.40/≤0.8	9.15~11.05/≤0.75	8.75~11.45/≤0.8
	5/95	12.05~14.15/≤0.4	11.60~14.60/≤0.5	12.00~14.25/≤0.45	11.50~14.70/≤0.5
	3/97	14.1~16.5/≤0.35	13.60~17.05/≤0.45	14.00~16.60/≤0.35	13.45~17.15/≤0.45
	2/98	15.75~18.45/≤0.3	15.15~19.00/≤0.4	15.60~18.60/≤0.3	14.95~19.20/≤0.4
	1/99	18.6~21.6/≤0.25	17.95~22.25/≤0.35	18.35~21.85/≤0.25	17.60~22.55/≤0.35
PDL(dB)		≤0.15	≤0.2	≤0.15	≤0.2
Return Loss(dB)		≥50			
Directivity (dB)		≥55			
Operating Temperature		-40~+85° C			
Storage Temperature		-40~+85° C			

Coupler Optical Performance

All Band Coupler

Parameters		All Band Coupler	
		Grade P	Grade A
Operating Wavelength(nm)		1260-1620	
Operating bandwidth(nm)		±40	
Typical excess loss(dB)		≤0.07	≤0.1
Insertion Loss (dB)	50/50	≤3.8	≤4.0
	45/55	≤4.45/3.45	≤4.65/3.65
	40/60	≤5.1/3.1	≤5.3/3.3
	35/65	≤5.7/2.7	≤5.95/2.90
	33/67	≤6.0/2.55	≤6.25/2.75
	30/70	≤6.4/2.3	≤6.7/2.5
	25/75	≤7.4/2.0	≤7.65/2.2
	20/80	≤8.3/1.7	≤8.8/1.8
	15/85	≤9.9/1.4	≤10.1/1.50
	10/90	9.10~11.10/≤1.15	8.65~11.50/≤1.25
	5/95	11.90~14.30/≤0.80	11.40~14.80/≤0.90
	3/97	13.85~16.75/≤0.75	13.30~17.35/≤0.85
	2/98	15.45~18.75/≤0.70	14.75~19.40/≤0.80
	1/99	18.25~21.95/≤0.65	17.50~22.70/≤0.75
PDL(dB)		≤0.15	≤0.2
Return Loss(dB)		≥50	
Directivity (dB)		≥55	
Operating Temperature		-40~+85° C	
Storage Temperature		-40~+85° C	

Coupler Optical Performance

Monolithic Multi-Mode Coupler

Parameters		1×2 (2×2)	
		Grade P	Grade A
Operating Wavelength(nm)		850 or 1310, or Customized	
Operating bandwidth(nm)		±40	
Typical excess loss(dB)		≤0.4	≤0.7
Insertion Loss(dB)	50/50	≤3.7/3.7	≤4.0/4.0
	40/60	≤4.7/2.7	≤5.0/3.0
	30/70	≤6.0/2.1	≤6.3/2.4
	20/80	≤7.8/1.4	≤8.1/1.7
	10/90	≤11.2/0.9	≤11.6/1.2
	5/95	≤14.5/0.7	≤15.0/1.0
	2/98	≤18.6/0.6	≤19.4/0.9
	1/99	≤22.0/0.5	≤22.8/0.8
Uniformity (50/50)(dB)		≤0.5	≤0.8
Return Loss(dB)		≥40	
Directivity (dB)		≥40	
Operating Temperature		-40~+85° C	
Storage Temperature		-40~+85° C	

Parameters	1×3		3×3		1×4	
Operating Wavelength(nm)	850 or 1310, or Customized					
Operating bandwidth(nm)	±40					
Grade	Grade P	Grade A	Grade P	Grade A	Grade P	Grade A
Typical excess loss(dB)	≤0.7	≤1.0	≤1.0	≤1.3	≤0.9	≤1.2
Insertion Loss(dB)	≤6.0	≤6.3	≤6.3	≤6.6	≤7.8	≤8.3
Uniformity(dB)	≤0.6	≤0.9	≤1.2	≤1.6	≤1.2	≤1.5
Return Loss(dB)	≥40					
Directivity (dB)	≥40					
Operating Temperature	-40~+85° C					
Storage Temperature	-40~+85° C					

Coupler Optical Performance

PM Coupler

Parameters	Value							
Center Wavelength (λc) (nm)	1310 or 1550 or Specify							
Operating Wavelength (nm)	λc ± 20							
Split Ratio	1/99	2/98	5/95	10/90	20/80	30/70	40/60	50/50
Maximum split ratio tolerance, λc (dB)	± 0.3	± 0.5	± 0.7	± 1.0	± 2.0	± 2.0	± 2.5	± 3.0
Additional Loss (Typical) (dB)	0.2							
Maximum loss value (dB)	0.4							
Minimum extinction ratio*(dB)	20							
Thermal stability (dB)	≤ 0.005							
Minimum Return Loss (dB)	50							
Minimum Directivity (dB)	50							
Maximum power (W)	2							
Fiber Type	PM fiber or Singlemode fiber							
Operating temperature	-5 to +70°C							
Storage temperature	-40 to +85°C							

High Power Coupler

Parameters		Value	Unit
Operating Wavelength(nm)		1520-1550	nm
Insertion Loss (dB)	25/25/25/25	≤6.6	dB
consistency (dB)		≤1.0	dB
polarization dependent loss (dB)		≤0.25	dB
Directivity (dB)		≥55	dB
Return Loss (dB)		≥50	dB
Average power (W)		1.5 Pre second	W
Fiber Type		SM Fiber	/

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