April 22, 2022

PIB 22-48

Introducing PowerLine FL 1000 & FL 1500

Introduction

In the upcoming quarters, we will introduce the new PowerLine FL series, a fiber laser based sub-system. The new PowerLine FL series will eventually replace the current StarFiber products. The first new products PowerLine FL 1000 and PowerLine FL 1500, which are introduced with this PIB, extend the upper power level from 600 W to 1500 W.

Furthermore, the PowerLine FL sub-system will come with the integrated Laser FrameWork Software and integrated features like PartVision and SmartSense+ (optional). This PIB discusses the launch of the new product family and specifically introduces the 1000 W and 1500 W power levels. Over the course of the next fiscal quarters more power levels and options will be released.

Figure 1: PowerLine FL 1000 & FL 1500 sub-system approach: laser, controller, chiller, various beam path arrangements and software. Configurable, but all from one supplier.

Key Message and Advantages

PowerLine FL 1000 & FL 1500 are integrated, cost effective, single mode fiber laser based sub-systems. These build on more than 15 years of experience offering such sub-systems.

Advantages:

- Fully integrated sub-system with qualified and tested components which can be configured to match application requirements. The customer gets an optimized welding solution and can improve time to market and reduce engineering costs.
- Decades of application know-how in order to select the best solution for the customer.
- Galvo based beam paths and SmartWeld+ for unique application results in mixed material and thin material welding.
- SmartSense+ process control and pulse energy monitoring for traceability.
- Integrated machine vision and camera viewing options for process setup and validation.
- New Laser FrameWork software integrating many sub-system components into one software control.
- Back reflection protected.
- Closed loop power control with external power sensor (optional).
- Faster failure analysis and faster back to operation of the complete sub-system as Coherent takes responsibility for all qualified components. Global service coverage with high availability of spare parts.

Figure 2: PowerLine FL 1000 & FL 1500 Laser Unit with SmartSense+ equipped Galvo scanner

Application Areas

The PowerLine FL 1000 and PowerLine FL 1500 are increasing the upper power levels of our welding sub-systems and are addressing especially applications in e-mobility, battery welding and electronics.

Due to the small spot size of single mode lasers, the laser beam needs to be moved quickly in order to generate wider weld seams or larger weld spots than the laser focus would define itself. Therefore they are mostly used with scanner heads or SmartWeld+ processing heads.

The advantages of single mode welding are:

- The smaller laser spot allows to couple into the material at lower laser power e.g., with 1 kW single mode high intensity fiber laser beam you can reach similar results regarding welding depth like with a multi-mode fiber laser with much higher laser power when using same optical configuration regarding scanner field size and scanner dynamics.
- Application adapted cross sections of the weld. As an example with a rectangular weld cross section the same intersection area can be reached with smaller weld depths compared to multi-mode laser welding. This can be used to improve weld strength at similar weld depth or to reduce contact resistance. On the other hand at same weld cross section the weld depth can remain smaller for welding of thinner sheets.

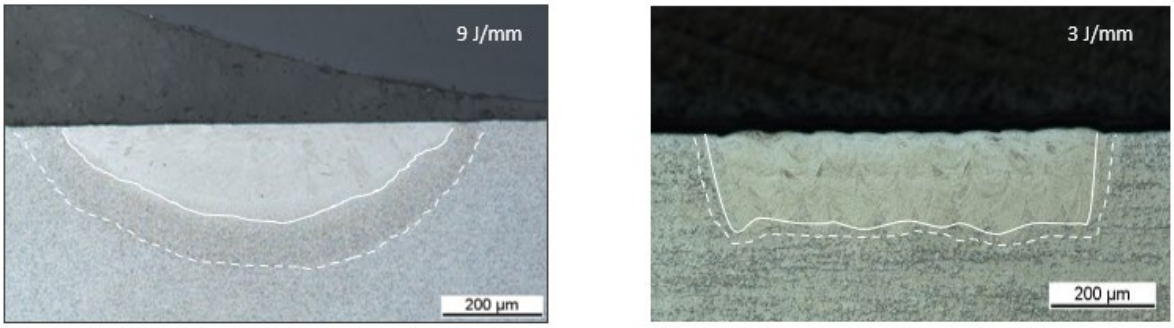


Figure 3: Left: regular penetration and cross section of a spot applied by a pulsed laser, spot size ~ 800µm. Right: Penetration and cross section of a spot applied by a single mode laser, spot size ~30µm, moved rapidly thru the material.

- Material mixing can be controlled better and thus can be adapted to the application, especially for welding of dissimilar materials resulting in improved weld quality.

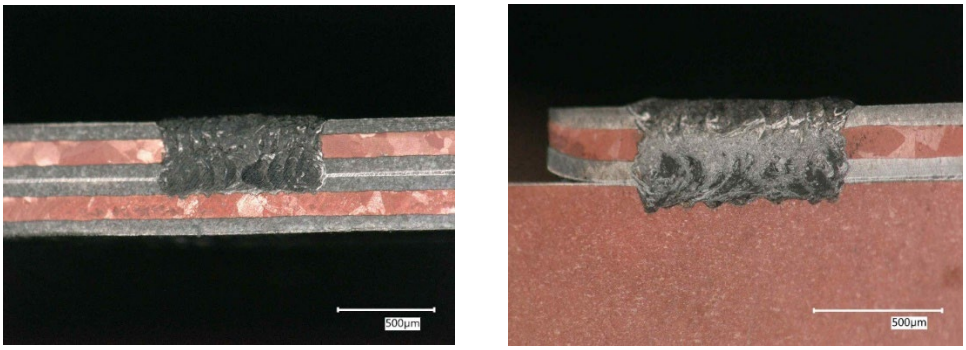


*Figure 4: Controlled welding with SmartWeld+, (left) 2 * 0,3 mm Sigmaclad (composite of Ni-SS-Cu) and (right) 0,3 mm Sigmaclad to 1 mm Cu. Rectangular, homogenous cross section. No impact visible on back side.*

- Controlled weld dynamics by specific beam movement during the weld, for example pre-conditioning or controlled thermal cool down.

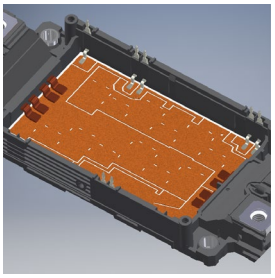
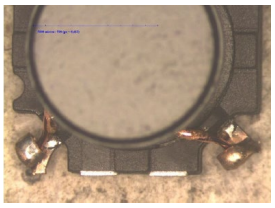
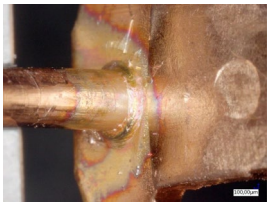
Battery & e-mobility manufacturing

- Busbar welding and interconnects for cylindrical format cell batteries (18650 and 2170 cell types)
- Welding of sub-components of prismatic or cylindrical cells (e.g., current interrupt devices and safety vents)
- Tab to cell and terminal welding
- Collector to Jelly Roll (4680 cell type)
- Laminated steel welding (e.g., stator)

For a description of general laser applications in the battery market, see our Battery Brochure (https://content.coherent.com/pdf/battery-brochure.pdf)

Electronics housing & contact welding

- Contact welding
  - Control Electronics
  - Electro motors
  - Sensors & components
  - Consumer electronics
- Housings
  - Sensors
  - Camera


Sub-System Configuration

The core of a sub-system usually consists of the components below. These items are configurable, for example some customers will choose to purchase a chiller from Coherent and some will not.

- Laser unit
- CCU (laser control with power supply, optionally with Galvo control and Galvo power supply)
- Chiller
- Software (Laser FrameWork)
- Optical beam path (fixed optics, galvo optics, various focus lenses and collimators)

These components can be enriched with several options:

- Camera for viewing purposes
- Machine vision for e.g., alignment
- Process monitoring
- Connectivity (e.g., Profinet or Profibus)
- Monitor and input devices
- Warranty plans

Usually the configuration of a customer's sub-system is determined by the result of the application test in one of our application labs. Together with the customer and the application engineers we look into the advantages and disadvantages of fixed, galvo and SmartWeld+ optical beam paths (see more details on that later in the PIB) and determine a first approach.

Application trials with customer samples are made. Upon success and approval by the customer the final configuration is determined, and an exact quote can be made through the configurator.

After receiving the PO, Coherent starts assembling all parts and starts up the system. We run a full system test of the entire sub-system. After meeting all our quality standards, we package the sub-system and ship it to the customer.

They will receive their laser process, in one shipment: ready to integrate into their machine or production line.

Specifications

Laser Unit

	PowerLine FL 1000	PowerLine FL 1500
Wavelength (nm)	1075-1085 typ. 1080	1075-1085 typ. 1080
Average Power	1000 W	1500 W
Operation	CW and modulated	CW and modulated
Operation power range	10-100%	10-100%
Polarization	Random	Random
Modulation frequency	Single Shot-10 kHz	Single Shot-10 kHz
M^2	≤ 1.5	≤ 1.5
Red pilot laser power	> 300 µJ, < 1 mW	> 300 µJ, < 1 mW
Fiber core diameter	20 µm	20 µm
Rise and fall time	25 µs	25 µs

Electrical specifications	Units	Min	Max
Mains voltage (EU+Asia) **Mains voltage (US) (3-phase Delta configuration)**	Vac Vac	360 432	484 528
Mains frequency	Hz	50	60
Primary electrical power consumption (FL 1000 / FL 1500)	kW		3,5 / 5,2

Table 1: Main specifications of PowerLine FL 1000 & FL 1500. For detailed specifications, please see PIC.

An important advantage of PowerLine FL 1000 is that it is not subject to export restrictions (whereas PowerLine FL 1500 does need an export license).

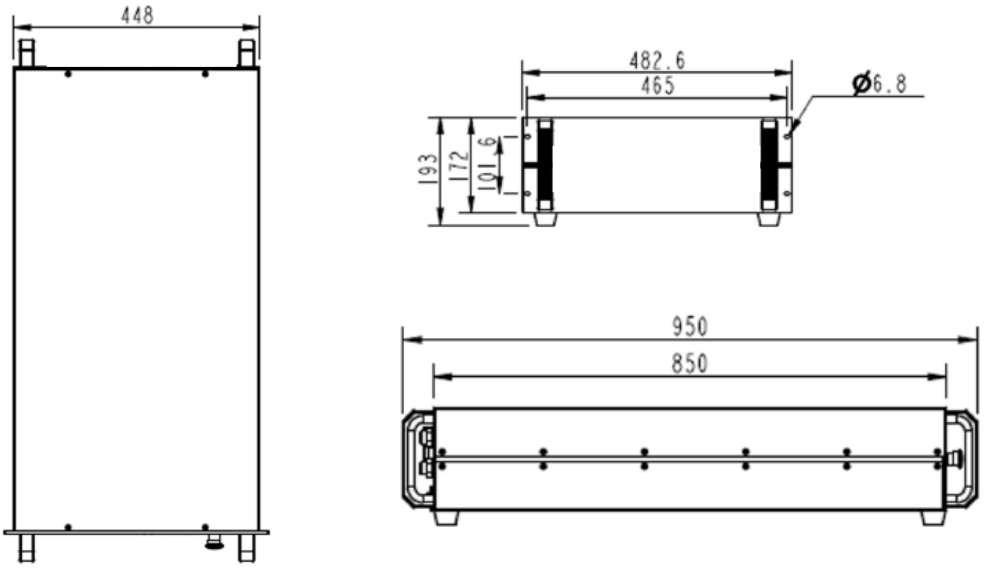


Figure 5: Dimensions (values in mm) of PowerLine FL 1000 & 1500 laser

Coherent Control Unit (CCU)

The CCU is a 19" rack (4 HU) that houses all items required for laser and scanner power. It also houses an industrial PC to run Laser FrameWork software, this eliminates the need for an external PC.

From an integration point of view it is identical (communication, control, software, dimensions) for all PowerLine FL versions (also for the upcoming power levels). The ability for an integrator to work with a large number of different power levels and beam modes while having an identical integration concept is a large advantage of PowerLine FL. Some competitors don't offer this.

- Power Module (laser-dependent)
- Basic unit with FLIF board including safety
- Galvo Module with ALI
- ITX PC with Laser FrameWork software

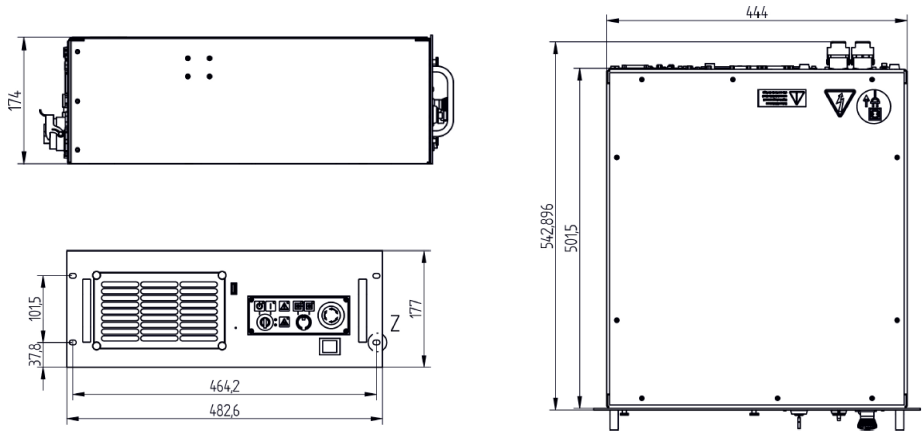


Figure 6: Dimensions (values in mm) of CCU

Optical Configurations

Scanner

There are several standard scanner configurations for PowerLine FL, similar to the ones legacy StarFiber series had. Nonstandard and 3rd party scanner options to be discussed when requested and standard options can't provide a solution.

The basic scanner package for PowerLine FL 1000 & FL 1500 consists of a 20 mm or 30 mm aperture scanner, optimized for standard applications or applications which require vision or SmartSense+ process monitoring. The advantage of a larger aperture (SI30) is that in most cases no air cooling is required, the disadvantage is the smaller field of view and slower dynamics (which could have an influence on wobbling speed).

Figure 7: Scanner assembly with vision, cross jet, and LED ring light

Description	Aperture (mm)	Configuration / coating	Material	Max avg. power (no air cooling)	Max avg. power (with air cooling)
SI20q-2	20	Regular	FS	1500	-
SI20si-2	20	Vision and/or SmartSense+	Si	600	1500
SI20q-2	20	Vision	FS	1000	1500
SI30q-2	30	Regular	FS	1500	-
SI30si-2	30	Vision and/or SmartSense+	Si	1500	-

Table 2: Overview of different Galvo Scanners

It further includes an F-Theta and collimation to achieve the different parameters below. Again, for non-standard requests, please reach out to the CPM team. The difference in sales price for the following configurations is less than 2,000$.

F-Theta	Galvo aperture	Collimation	Field of View	Working Distance	Theoretical spot size
F163	20 mm	100	85x85 mm	290 mm	~ 33 µm
F163	30 mm	100	55x55 mm	290 mm	~ 33 µm
F163	20 mm	120	85x85 mm	290 mm	~ 27 µm
F163	30 mm	120	55x55 mm	290 mm	~ 27 µm
F255	20 mm	100	110x110 mm	380 mm	~ 51 µm
F255	30 mm	100	82x82 mm	380 mm	~ 51 µm
F255	20 mm	120	110x110 mm	380 mm	~ 43 µm
F255	30 mm	120	82x82 mm	380 mm	~ 43 µm
F340	20 mm	100	210x210 mm	350 mm	~ 68 µm
F340	30 mm	100	155x155 mm	350 mm	~ 68 µm
F340	20 mm	120	210x210 mm	350 mm	~ 57 µm
F340	30 mm	120	155x155 mm	350 mm	~ 57 µm
F420	20 mm	100	260x260 mm	543 mm	~ 84 µm
F420	30 mm	100	145x145 mm	543 mm	~ 84 µm
F420	20 mm	120	260x260 mm	543 mm	~ 70 µm
F420	30 mm	120	145x145 mm	543 mm	~ 70 µm

Table 3: Overview of Galvo setup parameters

SmartWeld+

The SmartWeld+ application package combines fixed optics with a scanner module. It is designed to shape welding seams and cross sections with maximum precision and minimum heat input.

The maximum repetition rates of the programmed patterns and the very precise motion control of SmartWeld+ allows to better weld dissimilar materials and temperature sensitive materials even in combination with very thin material. Matching applications can be found in e-mobility (e.g., battery welding), consumer electronics, medical, or watch manufacturing and other high-tech industries.

Figure 8: Busbar welding Copper (Cu) to Aluminum (Al)

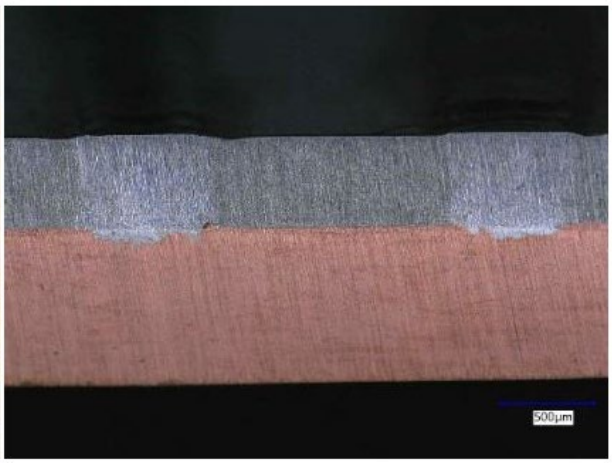


Figure 9: Cross section welding Al 0.3 mm on Cu 0.5 mm

Currently, only the PH10 SmartWeld+ (limited to 600 W average power with 100% duty cycle or 1000 W with limited duty cycle) is available. Around summer of 2022, the PH20 will be released, suitable for higher power lasers. For more information regarding SmartWeld+, please see PIB 19-54 (PH10 for StarFiber).

Due to the much smaller working area than that of our Galvo head configurations, the use of X/Y axis for positioning to the work piece is necessary.

Specification	PH10 SmartWeld+		PH20 SmartWeld+	
Compatible laser sources	PowerLine FL 150P / FL 600		PowerLine FL 1000 / FL 1500	
Max. average power (for PowerLine FL)	600 W		1,5 kW	
Mirror size	10 mm		20 mm	
Working area @f250	10 x 10 mm		30 x 30 mm (1)	
Max. rep. rate of pattern, dep. on diameter	Foc. F150		Foc. F200	
	0,5 mm	3 kHz	0,3 mm	1150 Hz
	0,9 mm	2 kHz	0,8 mm	900 Hz
	20 mm	300 Hz	1,7 mm	630 Hz
Recommended configuration with spot size	FL 150P col f80 mm / foc f150 mm spot size ~35 µm	FL 600 col f80 mm / foc f150 mm spot size <40 µm	FL 1000 / FL 1500 col f120 mm / foc f200 mm spot size <40 µm	

Table 4: SmartWeld+ specifications
(1) 45x45 using F-Tetha lens f250, lens aperture> 40mm, ±5°opticalangle.

After product release of PH20 SmartWeld+ it will be included in the SFDC configurator of PowerLine FL.

Fixed optics
At the moment, there are no fixed optics options for PowerLine FL 1000 & FL 1500 available. Soon the PH50 fixed heads will be included in the configurator.

Options

Vision

With PartVision, Coherent Munich introduced a family of new on-axis vision packages for positioning and inspection tasks. All packages provide on-axis camera alignment by a compact industrial CCD camera integrated with our Vision Cube. An area LED light supports the illumination of the workpiece. Alignment and inspection routines are programmed in an intuitive application, as an integrated and important part of the Laser FrameWork LFW. For the automatic detection and adjustment of welding position and orientation, various pre-assigned vision routines are included in the vision application, such as single- or double-point alignment. For simple manual alignment tasks, an overview image can be used, called SmartView HD. The vision application gets completed by inspection routines.

In the coming months, the SFDC configurator will be updated with standard vision packages for PowerLine FL, similar to the marking packages described in PIB 22-14: “Introducing PartVision”.

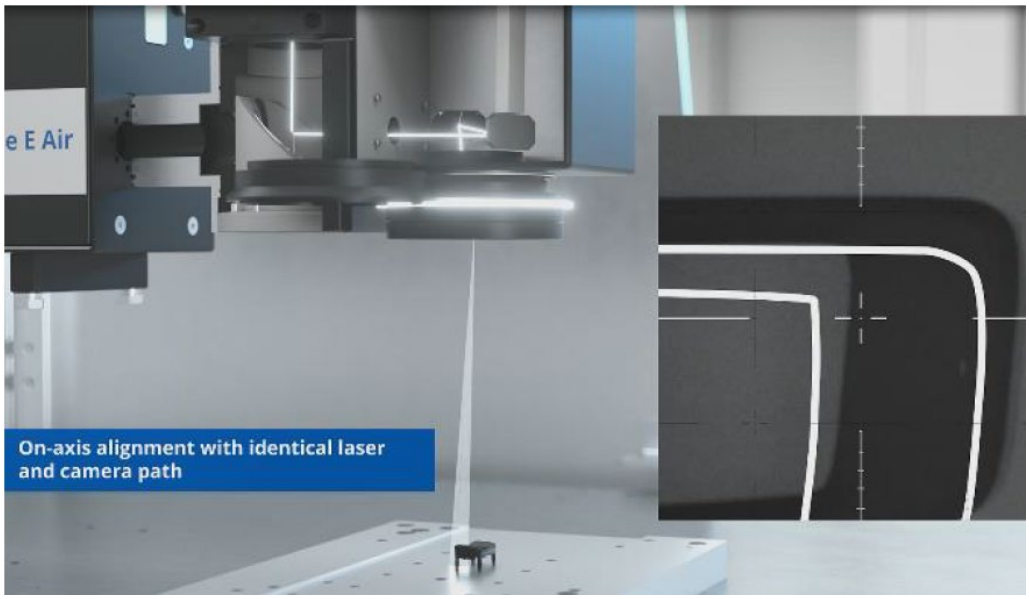


Figure 10: On-axis alignment by pattern match

Pricing of a vision package will be between 12 k$ and 50 k$, depending on required accuracy and features. Please consult with the CPM team for the specific vision configuration for your application.

Process monitoring

There are two options for offering process monitoring to customers:
Coherent’s own process monitoring and control solution, SmartSense+.
Alternatively, we can offer an interface to a third party process monitoring system. A mechanical and optical interface for Precitec LWM already exists. Acquiring and setting up the process monitoring system is then preferably handled with and by Precitec directly.

For the full sub-system delivery (all parts from one partner) it is advised to offer SmartSense+ to the customer. This is the preferred process control system for PowerLine FL.

SmartSense+ captures back-reflected optical signals from the laser process through the processing optics (fixed, galvo or SmartWeld+). Those signals are then split up and guided to three different photo detectors covering the visible, laser and near IR wavelength range for information about the plasma intensity or spectral composition, back-reflected laser light and surface temperature (see Figure 11).

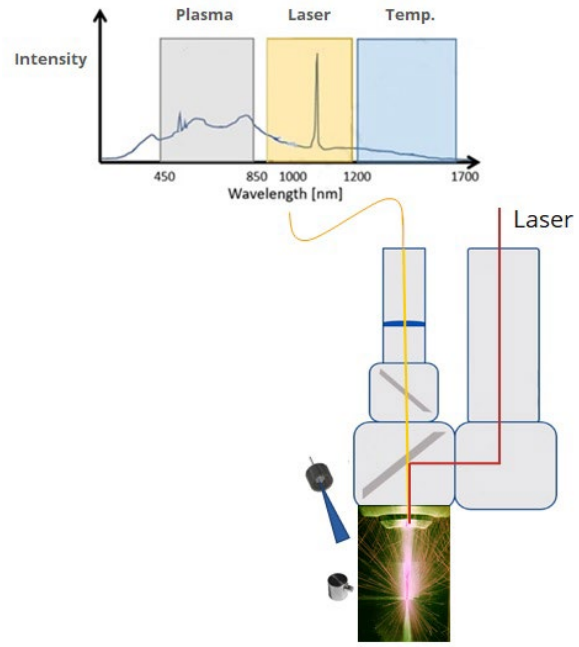


Figure 11: Schematic illustration of the optical setup for process monitoring.

As a unique preposition in the market, with SmartSense+ also acoustic signals from the laser process can be collected. Combining optical and acoustic information provides an even better foundation for a determination, if a process was “ok” or “not ok”, or ultimately even why it was “not ok”.

Figure 12: Two examples of welding setups (left: SmartWeld+, right: Galvo) with integrated SmartSense+ process control.

Pricing is around 30 - 45 k$, depending on configuration. For more details on SmartSense+, please see PIB 22-37.

Note that all process monitoring systems are not fully available in the configurator yet. Please contact the CPM for inquiries.

Chiller and cooling requirements

PowerLine FL 1500 & FL 1000 need a relatively high flow rate to cool the laser, fiber and still have capacity for a power meter for service events. A qualified chiller can be bought as an option with the laser or sub-system. Single unit list price for a chiller package (includes hoses, fittings, etc) is 9,845 $.

Chiller specifications	
Cooling method	Water/Air cooling
Cooling medium	Distilled water + DOWCAL™ 30% solution
Water temperature	25 ± 1 °C
Total cooling power	6 kW
Cooling power used	3.5 kW (+ 1.5 kW for power meter for servicing)
Total flow rate	20 l/min
Flo rate used	15 l/min (laser module) + 2 l/min (fiber) (+ 2,5 l/min for power meter for servicing)
Environmental Temperature	Max. 40˚C to guarantee cooling capacity.
Dimensions (WxDxH)	550x550x1387 mm
Weight (empty / in operation)	110 kg / 125 kg
Electrical connection (V, Hz, Ph)	400, 50, 3 460, 60, 3
Primary electrical power consumption	2,4 kW

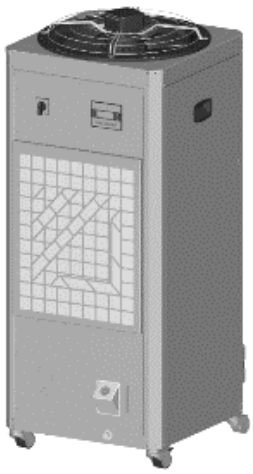


Table 5: Specifications of optional chiller.

For customers who use their own cooling infrastructure or chiller:

Chiller requirements	
Cooling power used by PowerLine FL	3.5 kW (+ 1.5 kW for power meter for servicing)
Total flow rate	20 l/min
Flow rate used by PowerLine FL	15 l/min (laser module) + 2 l/min (fiber) (+ 2,5 l/min for power meter for servicing)

Table 6: Requirements for chiller for PowerLine FL 1000 & FL 1500.

Connectivity

Within the StarFiber product family there is an option for a 19" rack mounted box that translates various signals (e.g., Profinet, Profibus, Ethernet/IP) to 24 V signal in order to drive the laser and select programs automatically. A similar setup will be developed for PowerLine FL and introduced in the configurator soon.

Laser FrameWork Software

Laser FrameWork (LFW) is a completely new software architecture on systems and sub-systems from Coherent. It's represented by the new graphical user interface (GUI). LFW presents itself in the modern Coherent dark theme. Design, layout and segmentation are based on the current standard for all new Coherent GUIs, to allow for simple and intuitive use by the customer. Laser FrameWork incorporates decades of experience in industrial applications of lasers and is going to provide all the great features within a modern architecture and design.

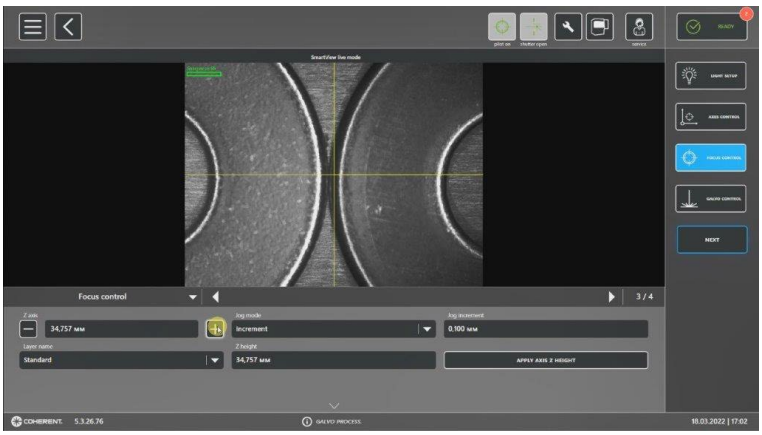


Figure 13: Laser FrameWork GUI showing a vision task for laser marking

The PowerLine FL product family comes with a pure Laser FrameWork architecture right from the beginning. Depending on whether the sub-system has a galvanometer scanner or a fixed optic setup, either the full LFW platform (including workflow, VLM and laser parameter pages) or just a separate GUI for laser parameter settings will be incorporated. For more information on Laser FrameWork, please see PIB 22-13.

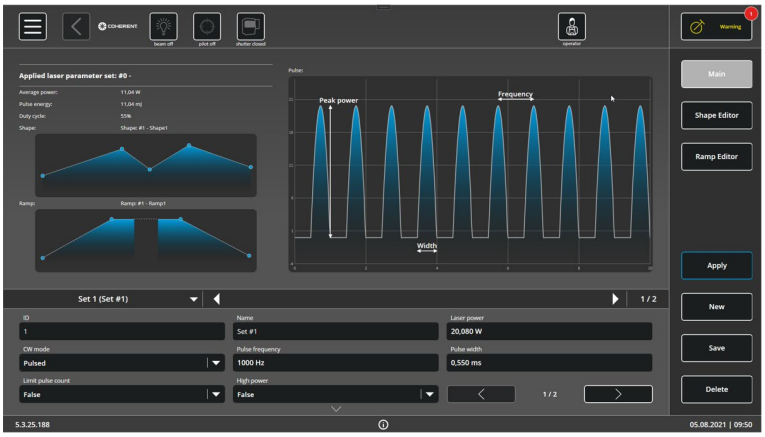


Figure 14: Laser parameter page (here: pulse shaping) in LFW GUI

Pricing and "How to Quote"

PowerLine FL is a configurable product and pricing depends on the configuration and optical setup. There will be a PowerPoint based training in PIC on how to quote a sub-system with the help of Quote Quickly and the SFDC configurator (MOD00739). Below is an overview of standard configurations and their list prices. Please use these prices as a budgetary option to inform customers. For accurate quoting, use the configurator or consult the CPM team.

Note that the list prices for more than one unit cannot be maintained in the configurator and will need to be updated manually.

MOD00739	1 unit list price	2-4 units	5-9 units	10-24 units
PL FL 1000 sub-system with scanner SI30	92,500 $	87,875 $	76,775 $	69,375 $
PL FL 1500 sub-system with scanner SI30	97,500 $	92,625 $	80,925 $	73,125 $

*Table 7: Single unit list price for PowerLine FL, based on laser + controller (safety/power supply/PC) and simple *Galvo setup (SI30q-2 / F255 / F120 coll.). Excludes chiller.*

Below is an overview of alternative configurations.

MOD00739	1 unit list price	2-4 units	5-9 units	10-24 units
Chiller package (water / air)	9,845 $	8,825 $	On request	On request
PL FL 1000 sub-system with PH20 SmartWeld+	111,000 $	105,450 $	92,130 $	83,250 $
PL FL 1500 sub-system with PH20 Smartweld+	116,000 $	110,200 $	96,280 $	87,000 $
PL FL 1000 sub-system with scanner SI30 and PartVision (depending on config.)	103-118 k$	97-111 k$	85-97 k$	77-88 k$
PL FL 1500 sub-system with scanner SI30 and PartVision (depending on config.)	108-123 k$	102-116 k$	89-102 k$	80-92 k$
PL FL 1000 sub-system with scanner SI30 and SmartSense+ (depending on config.)	123-138 k$	116-131 k$	105-117 k$	98-111 k$
PL FL 1500 sub-system with scanner SI30 and SmartSense+ (depending on config.)	128-143 k$	121-136 k$	109-121 k$	104-115 k$

*Table 8: **Budgetary** pricing of alternative configurations.*

Availability Timelines

In Q3 FY22 the first pilot series production will be finished and there will be several lasers available for customer demos and application labs.

Once ramped up, we target to be able to ship standard configurations within 10-12 weeks. Please consult with the CPM team or the lead time report in PIC for up to date information. For volume orders and non-standard configurations please consult the CPM/PLM team.

Service Strategy & Service Pricing

The primary support strategy is remote online diagnostics and when necessary a field service visit. There are some parts that can be exchanged in the field (see FRU list below) as advanced replacement. In exception major items (e.g., laser engine) can be sent back to BU for depot repair but this is very time consuming. To maximize uptime, A+ contracts for laser and CCU combined are available according to the table below.

Product Info	Standard Warranty		Installation	
Powerline FL 1000 / FL 1500	Months	Hours	Powerline FL 1500 / 1000	Months
All versions	26	-	No	No

Product Info	Warranty or PPlus			Non Warranty			Other
Powerline FL 1000 / FL 1500	Primary Strategy	Secondary Strategy	A+ Avail	Primary Strategy	Sec. Strategy	A+ Avail	Remote Service
All versions	FS	DR	yes	FS	DR	yes	Yes

FS	Field Service
DR	Depot Repair

Product	Service Module		Price	Part number
PowerLine FL 1000	A+	Advanced replacement	5,130 $	2257152
PowerLine FL 1000	P+	Warranty Extension 12 months	3,990 $	2271717
PowerLine FL 1500	A+	Advanced replacement	5,220 $	2257153
PowerLine FL 1500	P+	Warranty Extension 12 months	4,060 $	2271715
PowerLine FL 1000 / FL 1500	PM visit	Maintenance annual	900 $	2252875
PowerLine FL 1000 / FL 1500	PM visit	Maintenance bi-annual	1,800 $	2252876

Table 9: Overview of warranty packages for PowerLine FL 1000 & FL 1500. A+ contracts cover the laser source and CCU.

Service

- A depot repair is normally not needed – Exchange procedure advanced replacement.
- The system is ready for a Remote Control.
- The System and Laser source will be supported by the Coherent service worldwide network.
- A yearly preventive maintenance on the part of local service is recommended. (Recommendation: one shift: one time a year – two/three shift: twice a year).

After Sales Service

- Maintenance Contract.
- Service Contract with reaction time for a service on site.
- Warranty extension – max. 36 month.

Training

The Training Center in Gilching offers:

- Operator training (1 day).
- Software training VLM (2 days).
- Service training for Coherent and Distributor staff (2 days).
- Application training and process assistance (1 day).

Training	Days	Part number	Cost in €*	Cost in $*
Setup & Installation	1	1336171	1,200 €	1,500 $
Powerline FL service (operator / service / PM)	1	2213276	2,300 €	2,700 $
Training VLM	2	1391959	4,600 €	5,400 $
Application support	1	1404030	2,300 €	2,700 $

Table 10: Overview of trainings for PowerLine FL.
** All costs stated are excluding travelling costs, accommodation and expenses.*

See PIC for the FRU list. For more information, please contact local field service manager or Service PLM.

Positioning in the Coherent Product Portfolio

PowerLine FL 1000 & FL 1500 single mode CW laser sub-systems are Coherent's perfect solution for all welding applications of thin sheet welding of up to 1 mm penetration depth in highly reflective material and / or dissimilar materials, or welding applications with higher penetration depth in materials like Stainless Steel.

The HighLight FS-ARM is available from > 2 kW to the high power range and is best suited for high speed, low spatter, challenging materials and applications.

Competitive Landscape

Fiber lasers are a commodity. However, there are several ways for us to differentiate ourselves from the competition.

Our main focus is selling sub-systems, as we have successfully done over the years with StarFiber. Multiple hundreds of 100 W - 600 W sub-systems are delivered to internal and external customers yearly. With these numbers we are definitely beating sub-system competitors and we expect to continue this trend upward by extending the power range and value of our sub-systems.

Coherent fiber laser sub-systems include a variety of options and differentiators:

- Machine vision and camera viewing options for process setup and validation.
- SmartWeld+ for unique application results in mixed material and thin material welding.
- SmartSense+ process control and pulse energy monitoring for traceability.
- Application support, purchase process, delivery, installation, laser process ownership and after sales service all from one supplier.
- Ready to use out of the box to minimize integration time

Within the fiber laser market there are various types of offerings. Often, pricing of these types of offerings are (mistakenly) compared directly against each other. One can distinguish between the following offerings:

- **Fully integrated sub-systems** (laser engine, safety, power supply, optional chiller, optical beam paths, integrated control software, vision etc.),
- **Integrable laser systems** (laser engine, safety, power, optional chiller),
- **Laser engine** (no or optional safety & power supply).

In Table 11 you will find these offerings in one overview, pricing is qualitative but gives an idea about competitiveness. Table 12 displays a more quantitative view on pricing and positioning. Please note the remarks regarding these numbers.

	Coherent	Trumpf TruFiber	Trumpf TruFiber P ("SPI +")	Local integrators	IPG / Nlight / TruFiber P Compact (SPI)
					
Main product strategy	**Fully integrated sub-systems** (laser engine, safety, control, software, power supply, chiller, optical beam paths, vision etc.) or **integrable laser systems** (laser engine, safety, power, optional chiller).				**Laser engine** (no or optional safety & power supply)
Remark	Note that most vendors offer all options (fully integrated sub-systems, integrable laser system or laser engine), but in the market the vendors above have a different focus (e.g., IPG offers sub-systems, but focuses on laser engines).				
List pricing (single unit)	-	-	+	+/-	++
Volume pricing	+/-	-	+	-	++
Application support	++	+	+	++	+/-
Service & support	+ (global)	+ (global)	+ (global)	- (local)	+/- (global)
Positive	Full sub-system offering (incl. process monitoring). Unique application results (e.g. with SmartWeld+).	High quality, very stable source leading to consistent application results.	New product based on upgraded version of SPI source. Success to be determined.	Highly customizable offering.	Aggressive on pricing, mostly global presence.
Negative	High list price for single units.	Expensive. Low sales volume.		Depending on 3rd parties for most/all components.	Most components still need to be arranged/developed by the customer themselves.

*Table 11: Overview of product positioning of PowerLine FL 1000 & FL 1500 relative to competitive **single mode** fiber lasers (-- negative … ++ good)*

Table 12 is an approximate comparison between pricing levels of different vendors. Note that these numbers differ heavily between regions worldwide.

The **left** part of the table shows a full sub-system with laser engine, safety, control, software and a simple galvo. The **right** side of the table shows offerings of vendors of laser engines (only).

	Coherent PowerLine FL	Trumpf TruFiber	Trumpf TruFiber P (asm. "SPI+")	IPG / Trufiber P compact (SPI)
1000W	93 k$	105 k$	57 k$	25 k$
1500W	97 k$	110 k$	67 k$	34 k$
	Fully integrated sub-system: laser source w/ safety, control, software, power supply, simple galvo, etc.			**Laser engine** w/o safety, power supply, etc (no CCU).

Table 12: Overview of list pricing between vendors. Left "fully integrated sub-system", right "laser engine only"

Single unit opportunities we target to win through high quality application work and sub-system differentiators. For higher volume opportunities our pricing scheme (see table 8) allows a more aggressive pricing. Please discuss your projects with PLM/CPM team.

Marketing Activities

The PowerLine FL can be found on our website from Monday, 4/25 on: https://www.coherent.com/machines-systems/laser-welding/powerline-fl. The datasheet is available there and in the PIC. At Laser World of Photonics PowerLine FL will be launched in the Automotive area.

Product Launch PowerLine FL	April	May	
	Week 17	Week 18	Week 19
Blog post			
Social Media posts			
Corporate Newsletter			
Laser World of Photonics, Munich			

Contact Person

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