

# **Velas DL**

# **DL4000**



**Non-Contact, no slippage**

**Measurement on target up to 1200 °C / 2190 °F**

**Ethernet Modbus TCP or Profibus-DP**

**Design for steel industry conditions**

E4300



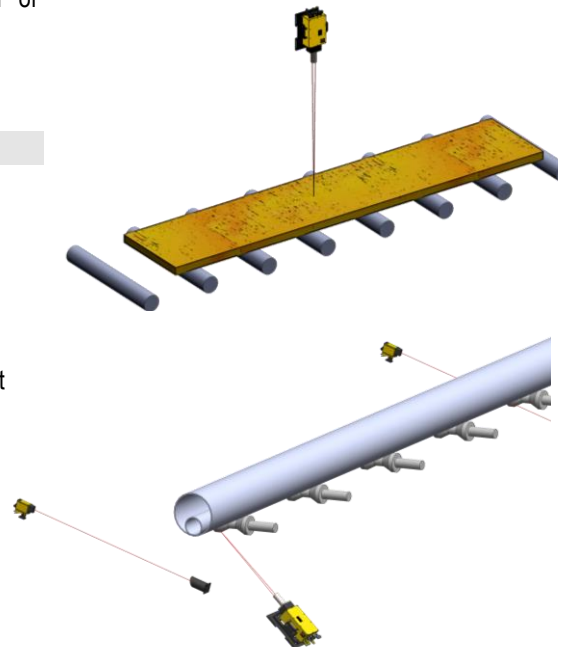
## Velas DL4000 – Features and benefits

The **Velas DL4000** directly replaces traditional, high-maintenance, problematic contact wheel and rollers type devices, with accurate “state-of-the-art” laser Doppler technology. Extremely easy to install, integrate and use. Accurate speed and length measurement reduces scrap, increases uptime and improves material yield.

- High accuracy: better than 0.05%.
- Repeatability: better than 0.02%.
- Non-Contact: no slippage, can work on very high temperature products.
- No Moving Parts: no wear.
- Autonomous sensor: ready to use, no calibration required.
- Designed for easy installation including support with 3 axis plus height adjustment.
- Water cooling and air purging for the steel industry.
- Easy Integration: built in Ethernet port.
- Sensor configuration with PC software.
- Communication protocol: Modbus TCP over Ethernet TCP/IP or Profibus-DP.

## Velas DL4000 – Typical applications

- Speed measurement for bar tracking at crop shear
- Plate length measurement
- Tube length measurement
- Bar length measurement
- Continuous caster: Billet - Bloom - Slab length measurement
- Cut to length applications
- Control of already cut length
- Speed synchronisation
- Differential speed control



## Velas DL4000 – Presentation

The **Velas DL4000** is an autonomous sensor mounted in cast aluminium housing. A hood for protecting the window glass is fitted with air purging to create an air curtain in front of this glass. The case includes a cooling stainless steel pipe and is fixed to a mounting stand, adjustable with three axes. The electrical connections are made with heavy duty connectors.

The setup of the sensor is made through DELTACConf software (delivered with sensor) and allows user to adjust parameters such as measurement ranges and offset, inputs and outputs setting, speed and communication, units, status display...

The **Velas DL4000** has a range of standoff distance from 600 mm to 2000 mm and is proposed in two models: standard and bi-directional. Bi-directional velocimeters are used in application where the target can move in forward and reverse direction, also for low speed application like continuous caster, or if the product can stop such as position control for cut to length.

For length measurement of discrete objects, detection sensors such as laser barrier V5 with reflector or Scanning Hot Metal Detector Rota-Sonde DC are recommended for an accurate detection of the head and tail. These detection sensors avoid errors due to the tracking delay / hold time of the Velas DL4000 velocimeter as objects enter and leave the measurement spot.



**Operating principle**

The principle is to measure the speed of a moving object using the Doppler effect.

Two laser beams, separated in angle ( $\alpha$ ) and slightly shifted in frequency, are used to create an interference pattern (fringe spacing  $\Delta s$ ) which will be scattered by the surface of the moving object (orthogonal to the optical axis speed  $V_p$ ). The optical detector (along the optical axis) records a modulated signal including the Doppler frequency ( $F_d$ ). The speed is then calculated analyzing the Doppler shift of the signal (heterodyne based detection).

$$V_p = \lambda / (2 * \sin(\alpha / 2)) * F_d$$

Finally, the length measurement is computed using a very accurate integration of the speed.

$$L_p = \int V_p dt$$

**Technical characteristics**

Model	DL40..	DL41..
Type	Standard (one direction)	Bi-directional
Minimum Speed	DL403• (600 mm): 1.5 m/min DL404• (1200 mm): 2.5 m/min DL406• (2000 mm): 4.0 m/min	DL413• (600 mm): ± 0.1 m/min DL414• (1200 mm): ± 0.2 m/min DL416• (2000 mm): ± 0.4 m/min
Maximum Speed	DL403• (600 mm) : 5 000 m/min DL404• (1200 mm) : 10 000 m/min DL406• (2000 mm) : 10 000 m/min	± 5 000 m/min
Accuracy	± 0.05 % (refer to depth of field)	
Repeatability	± 0.02 %	
Acceleration rate	Max 500 m/sec <sup>2</sup>	
Measurement update rate	40 µs	
Laser class IEC 60825-1	class 3B	
Wavelength	620 - 690 nm	

Model	DL4•3•	DL4•4•	DL4•6•
Stand Off Distance	600 mm	1200 mm	2 000 mm
Depth of field 0.1% accuracy	60 mm	120 mm	200 mm
Depth of field 0.05% accuracy	50 mm	100 mm	150 mm
Maximum target temperature	650°C / 1 200°F (1)		1 200°C / 2 190°F

(1) Option **HT filter** for higher temperature.

**Outputs**

Model	DL4••6	DL4••8
Communication protocol	Modbus TCP over Ethernet TCP/IP Serial link (RS485)	Profibus-DP Serial link (RS485)
Measurement output	3 pulse outputs, configurable as quadrature or index. Opto-isolated differential, max pulse frequency 1 MHz. Default output 5V, or user max 24 VDC	-



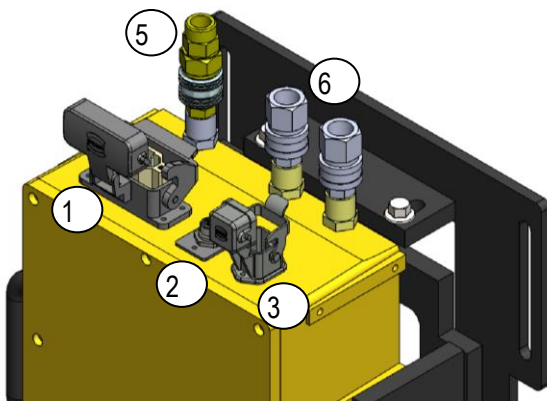
### Digital Inputs and Outputs

Digital Inputs DI1 & DI2: 2 configurable	2 digital inputs 24VDC (3V logic state 0, 10.5V logic state 1, open logic state 1), 3 mA
Digital outputs DO1 & DO2: 2 configurable	Relay: 500 mA max, 50VDC or 30VAC max
Digital output DO3: Sensor OK	Relay: 500 mA max, 50 VDC or 30 VAC max
Digital output: Indicator Shutter Open (Laser ON)	Output 24V 200 mA maxi.
Output +24 V	24 VDC - 200 mA max
Digital input: Shutter Enable	Digital input 15 VDC 3 mA (Connected to 0 V to open the shutter)

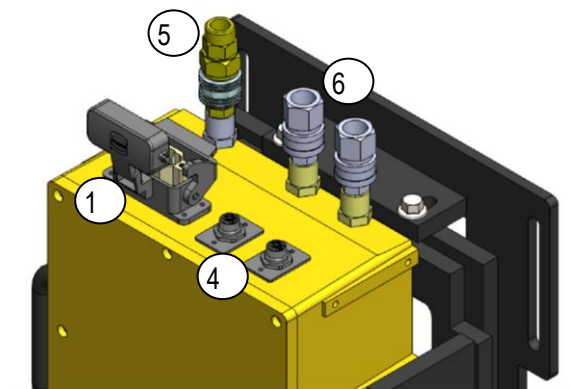
### Other Data

Operating voltage	110 V (-10%) to 240 V (+10%) - 50/60 Hz or 24 VDC (15-25 VDC)
Power consumption	40 VA for AC versions 35 W for 24VDC version
Cables	To be ordered separately. Connector fitted with silicone cable with protective steel braid. Standard length of 5 m, 8 m, 10 m and 15 m (other length on request)
Weight	22 kg (27 kg with heat shield)
Protection rating	IP 66 (cast aluminium case)
Air Purging	Protection of the optic with clean air: 200 to 400 g/cm <sup>2</sup> , 15 to 25 l/min
Operating temperature	+5 to 40 °C (41 to 104 °F) without cooling, Up to 120 °C (250 °F) or in front of hot products, with water cooling (water at about 25 °C (77 °F), pressure 1-2 bar, flow 5 to 10 litres per minute)

### Connection

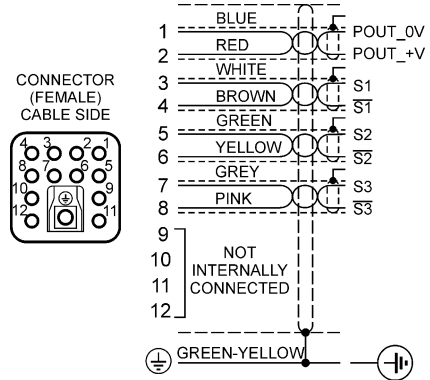
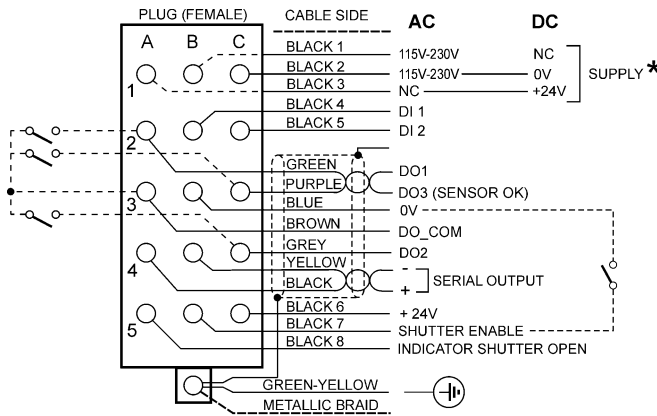


Velas DL4••6



Velas DL4••8

- ① Connector (HAN 15D) for Power supply, I/Os, laser shutter, RS485
- ② Connector (M12) for Ethernet TCP/IP
- ③ Connector (HAN 3A) for Pulse Outputs
- ④ Connector (M12) for Profibus-DP IN and OUT
- ⑤ Connector Air and ⑥ Connector Water are equipped with quick disconnect 3/8 NPT connectors

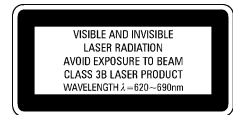


\* NOTE : CABLE IS SUPPLIED WITH CONNECTIONS FOR THE VOLTAGE REQUESTED.

**Power supply and I/O connector**

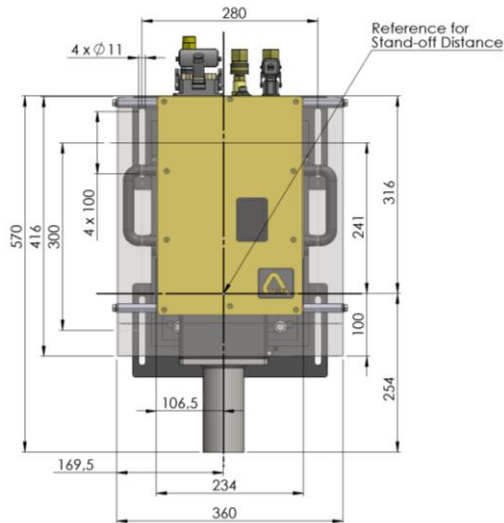
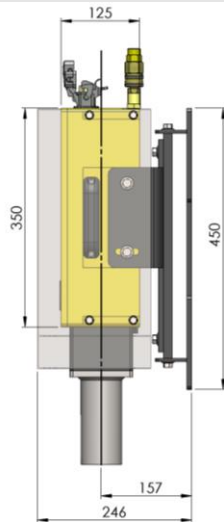
**Pulse output connector**

An installation meeting all safety requirements IEC 60825-1 requires the use of a junction box or to install the same safety functions (ON/OFF key switch, emission indicator, remote interlock connector).

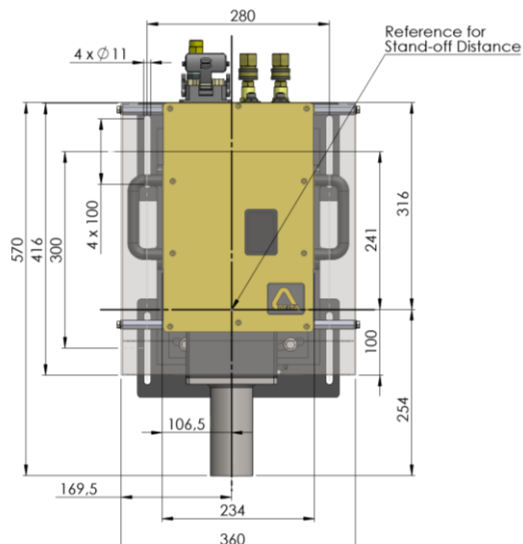
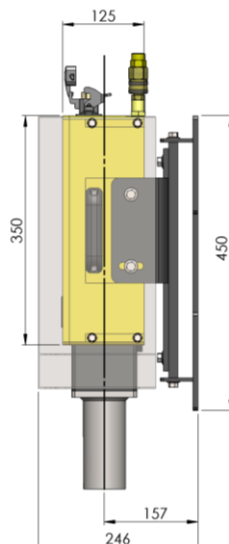


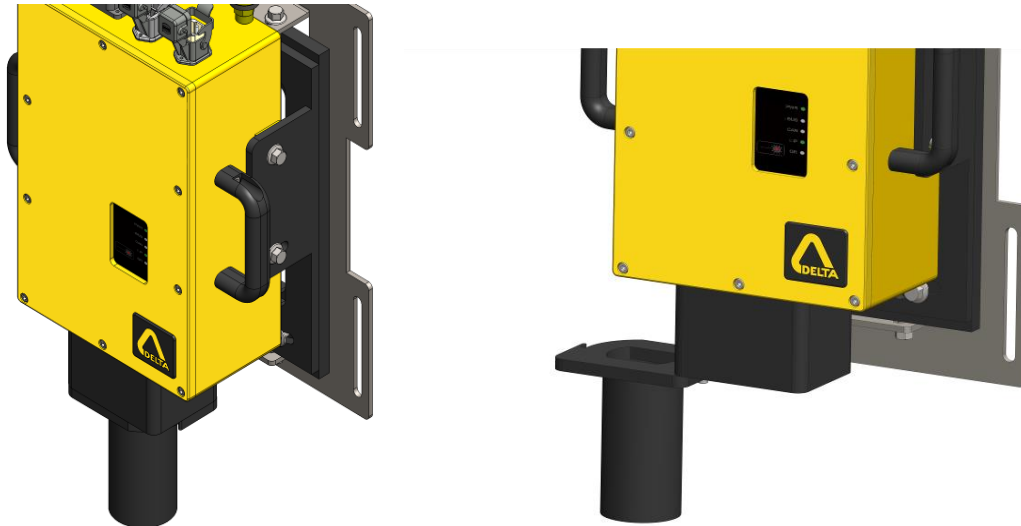
**Dimensions**

Velas DL4••6



Velas DL4••8





Velas **DL4000**, with mounting stand: including 3 axis adjustment and distance for product adjustment.  
Hood with easy access for cleaning the glass.

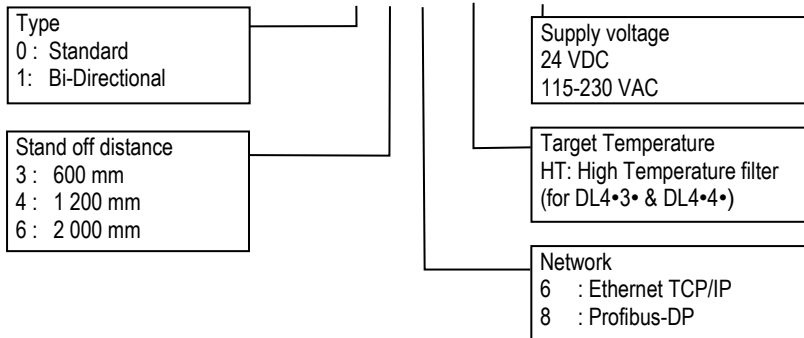
**Accessories**

- Heat shield kit, to protect from direct radiation, reference 8092735.
- Junction box, reference CRN-DL-115/230 VAC ou CRN-DL 24 VDC.
- Cables available with standard (5, 8, 10 or 15 m) or custom length:
  - Power supply & Inputs/Outputs
  - Pulse output (for DL4••6)
  - Ethernet TCP/IP (for DL4••6)
  - Profibus-DP (for DL4••8)



**Reference for order**

VELAS DL4 . . . - . . . . .



E.g. : VELAS DL4166 115-230 VAC

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Subject to change without prior notice

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