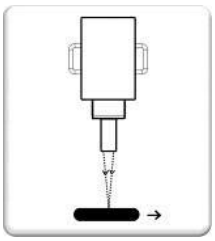
LASER Doppler Speed and Length MEASUREMENT

Velas DL

DL4000-N



Non-Contact, no slippage

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

Ethernet Modbus TCP / Profibus-DP / Profinet

Design for steel industry conditions

E4310

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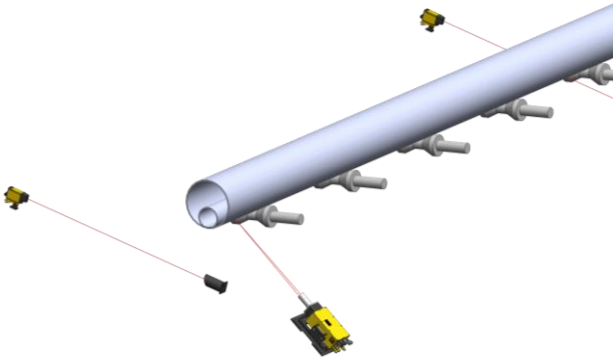
Features and benefits

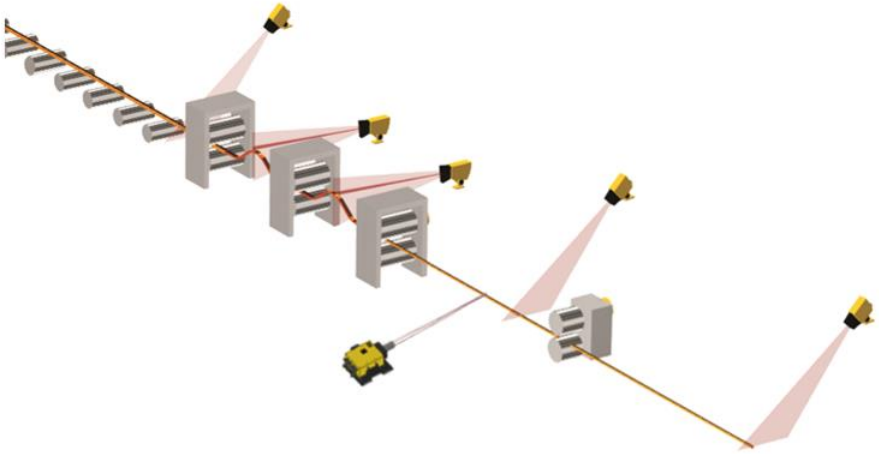
The **Velas DL4000-N** directly replaces traditional, high-maintenance, problematic contact wheel and rollers type devices, with accurate “state-of-the-art” laser Doppler technology. Extremely easy to install, integrate and use.
Accurate speed and length measurement reduces scrap, increases uptime and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

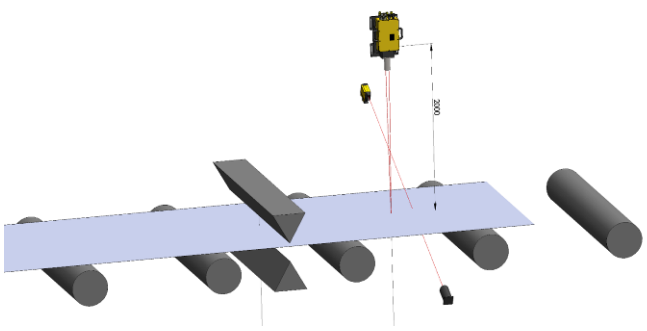
- High accuracy: better than 0.05%.
- Repeatability: better than 0.02%.
- Non-Contact: no slippage.
- Can measure on very high temperature products.
- No Moving Parts: no wear.
- Autonomous sensor: ready to use, no calibration required.
- Designed for easy installation including support with 3 axis plus height adjustment.
- Water cooling and air purging for the steel industry.
- Easy Integration: built in Ethernet port.
- Sensor configuration with PC software through RS485 or Ethernet.
- Communication protocols: Modbus TCP over Ethernet TCP/IP, Profinet, Profibus-DP, Modbus RTU.

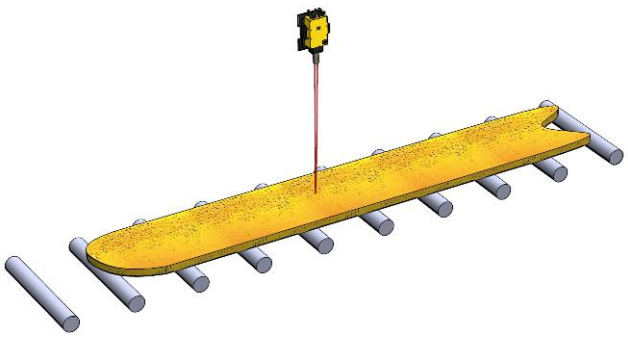
Typical applications

- Speed measurement for product tracking at crop shear
- Length measurement: Plate, Tube, Bar…
- Cut to length applications
- Control of already cut length
- Speed synchronisation
- Differential speed control









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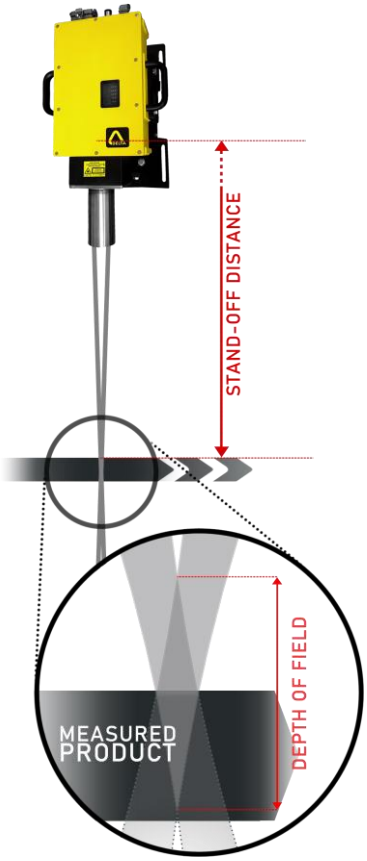
Presentation

The **Velas DL4000-N** 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 **Velas DL4000-N** has 3 possible standoff distances: 600 mm (red laser), 1200 and 2000 mm (infrared laser).

It is proposed in two models: standard and bi-directional.
The bi-directional velocimeters are used in applications where the target can move in forward and reverse direction, also for low speed application, or if the product can stop, such as position control for cut to length.

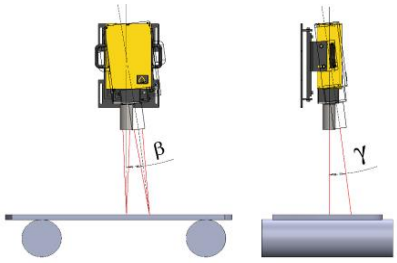


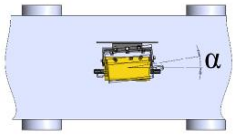
Operating principle

The principle is to measure the speed of a moving object using the Doppler effect.
Two laser beams, slightly separated in angle and shifted in frequency, are used to create an interference pattern which will be scattered by the surface of the moving object.
The optical detector (along the optical axis) records a modulated signal including the Doppler frequency. The speed is then calculated analyzing the Doppler shift of the signal.
Finally, the length measurement is computed using a very accurate integration of the speed.

Installation

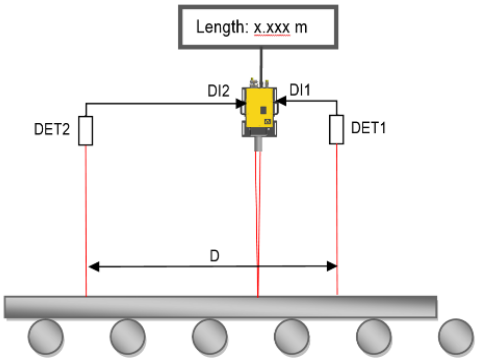
The sensor is designed to be installed at a fixed distance from the object: the **Stand-off-distance**.
It should be mounted perpendicular to the product movement.
The 3 axis mounting stand helps the user to adjust the position in order to minimize the 3 angles: α, β and γ.
The surface of product to be measured should be maintained within the **Depth of Field**, whatever its positions or dimensions.





Length measurement

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-N** velocimeter as objects enter and leave the measurement spot.
The total length is equal to the length measured by the velocimeter while both sensors detect the product, plus the offset distance D between these 2 sensors.



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Technical characteristics

CE

Model	*DL4**0**••-N•*	*DL4**1**••-N•*
Type	Standard (one direction)	Bi-directional
Minimum Speed	DL403•-NR (600 mm): 1.5 m/min DL404•-NIR (1200 mm): 2.5 m/min DL406•-NIR (2000 mm): 4.0 m/min	DL413•-NR (600 mm): ± 0.1 m/min DL414•-NIR (1200 mm): ± 0.2 m/min DL416•-NIR (2000 mm): ± 0.4 m/min
Maximum Speed	DL403•-NR (600 mm): 5 000 m/min DL404•-NIR (1200 mm): 10 000 m/min DL406•-NIR (2000 mm): 10 000 m/min	± 5 000 m/min

Model	*DL4•**3**••-NR*	*DL4•**4**••-NIR*	*DL4•**6**••-NIR*
Stand Off Distance	600 mm	1200 mm	2 000 mm
Depth of field at 0.1% accuracy	60 mm	120 mm	200 mm
Depth of field at 0.05% accuracy	50 mm	100 mm	150 mm
Accuracy	± 0.05 % to ± 0.1 %, depending on the Depth of field		
Laser class (IEC 60825-1:2014)	class 3B red 620-690 nm	class 3B infrared 770-790 nm	
Laser power per beam (max.)	< 50 mW	< 40 mW	
Total Laser power (max.)	< 100 mW	< 80 mW	
Repeatability	± 0.02 %		
Acceleration rate	Max 500 m/sec²		
Measurement update rate	40 µs		
Maximum target temperature	650°C (1 200°F) 1 200°C (2 190°F) with optional **HT filter**		1 200°C (2 190°F)

Note: in case the Velas DL4000-N is submitted to vibration, the accuracy at low speed can be degraded.

Communication & Outputs

Model	*DL4••**1**-N•*	*DL4••**2**-N•*	*DL4••**3**-N•*
Built-in	Ethernet Modbus TCP RS485 Modbus RTU		
Optional protocol	-	Profibus-DP *(1)*	Profinet *(1)*
Measurement output	Incremental encoder output Galvanically isolated, 5-24V, configurable as quadrature plus index	-	Incremental encoder output Galvanically isolated, 5-24V, configurable as quadrature plus index

(1): Configuration files are available on www.deltasensor.eu.

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Digital Inputs and Outputs

Digital Inputs DI1 & DI2: configurable	Digital inputs 0/24 V, compliant IEC 61131-2 type 3 Switching threshold: 9 V – 2.2 mA Galvanically connected to 0 V
Digital input: Shutter Enable	Digital inputs 0/24 V, compliant IEC 61131-2 type 3 Switching threshold: 9 V – 2.2 mA Galvanically connected to 0 V Connect to 24V to open laser shutter (laser emission)
Digital outputs DO1 & DO2: configurable DO3: Sensor OK (alarm)	Transistor: PNP, “High side” outputs Low impedance: 50 mA max, protected against short circuit Common DO_COM: 30 V max
Digital output: Indicator Shutter Open (Laser ON)	Transistor output “High Side”, 24 V 100 mA max Output = 24 V: shutter is open, laser beam is emitted.
Output +24 V	24 VDC - 200 mA max

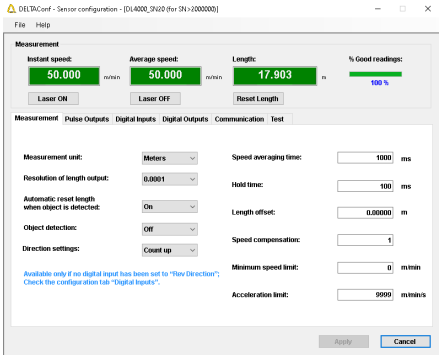
Other Data

Operating voltage / Power consumption	110 V (-10%) to 240 V (+10%) - 50/60 Hz / 40 VA 24 VDC (15-25 VDC) / 35 W
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/cm², 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)

An installation meeting all safety requirements IEC 60825-1:2014 class 3B requires the use of a junction box or to install the same safety functions (ON/OFF key switch, emission indicator, remote interlock connector).
See Accessories.

Configuration

The setup of the sensor is made through ***DELTAConf*** software (delivered with sensor) and allows the user to adjust parameters such as measurement ranges and offset, inputs and outputs setting, speed and communication, units, status display…
The ***DELTAConf*** can access to the **Velas DL4000-N** via Ethernet or RS485.
The ***DELTAConf*** software can also be downloaded from our Website www.deltasensor.eu.



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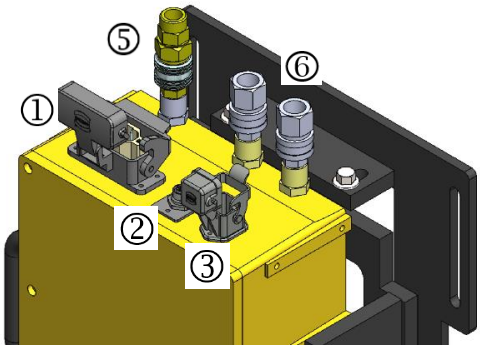
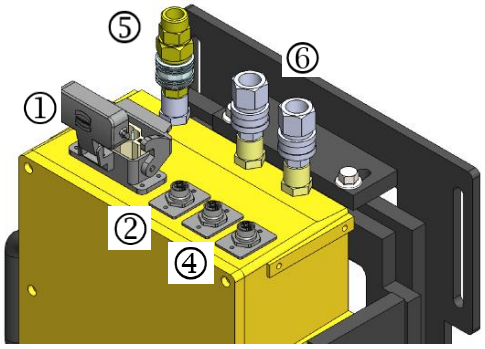
Connection

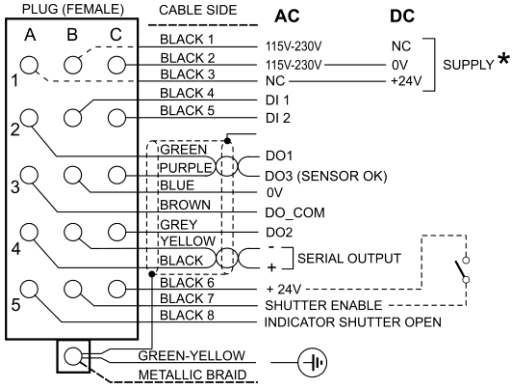


Velas DL4••**1**-N• or DL4••**3**-N•



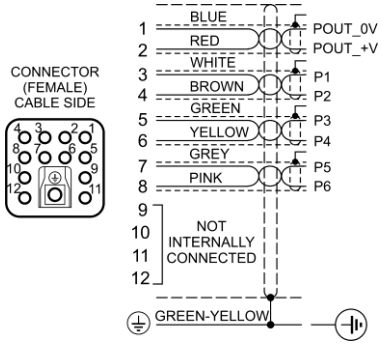
Velas DL4••**2**-N•

① Connector (HAN 15D) for Power supply, I/Os, laser shutter, RS485
② Connector (M12) for Ethernet TCP/IP and for Profinet (DL4••**3**-N• only), 4 pins, D-coded, Female
③ Connector (HAN 3A) for Pulse Outputs
④ Connector (2x M12) for Profibus-DP IN and OUT: 5 pins, B-coded, male (IN) and female (OUT)
⑤ Connector Air and ⑥ Connector Water are equipped with quick disconnect 3/8 NPT connectors

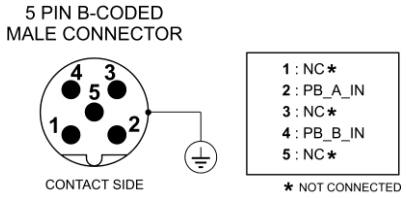


* NOTE : CABLE IS SUPPLIED WITH CONNECTIONS FOR THE VOLTAGE REQUESTED.

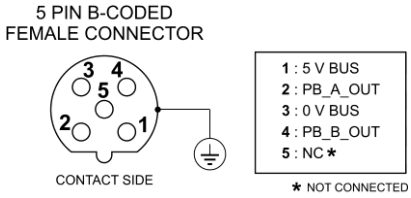
Power supply and I/O connector



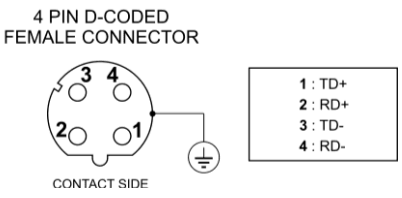
Pulse output connector (DL4••**1**-N• & DL4••**3**-N•)



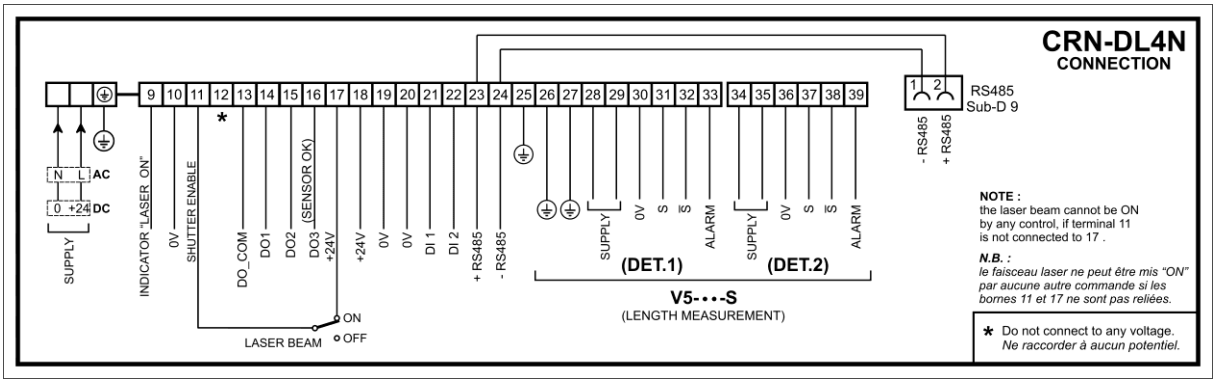
Profibus IN



Profibus OUT



Profinet / Modbus TCP



Junction box

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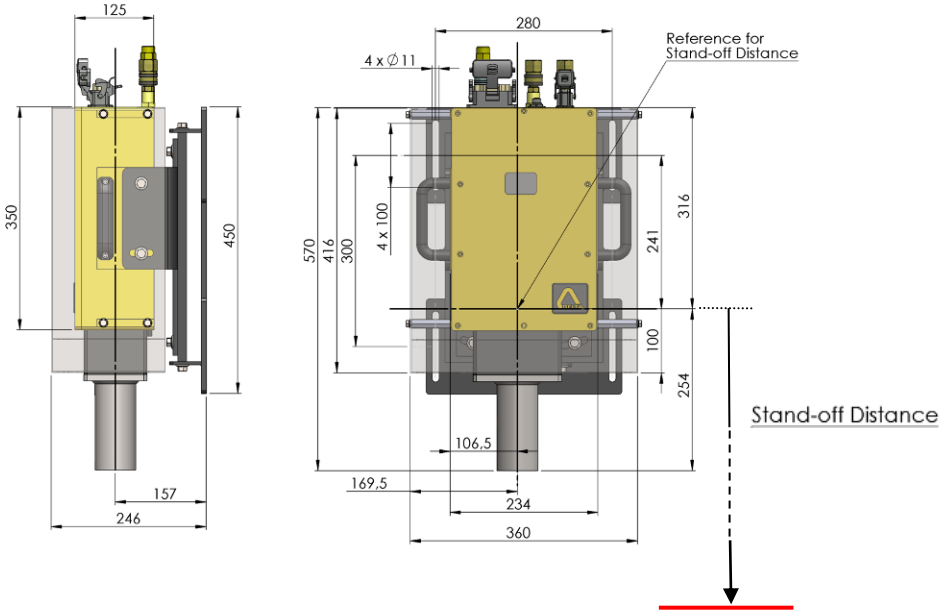
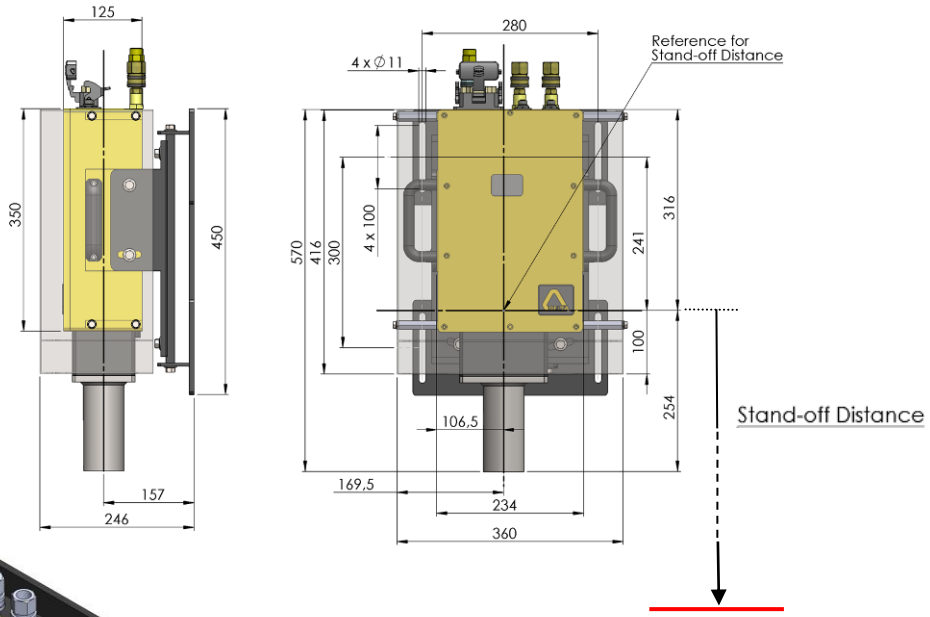
Dimensions

Velas DL4••**1-N**•
Velas DL4••**3-N**•



Velas DL4••**2-N**•



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

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Accessories

- Junction box, including terminal block for connection of power supply and I/Os, and all mandatory laser safety functions for laser class 3B: ON/OFF key switch, emission indicator, remote interlock connector.
  Configuration port RS485 (a USB to RS485 adapter is provided).
  References: *CRN-DL4N 115-230V* or *CRN-DL4N 24VDC*.
  For special junction box, please contact us.

- Heat shield kit, to protect from direct radiation, *reference 8092735*.

- Cables available with standard (5, 8, 10 or 15 m) or custom length:
  - Power supply & Inputs/Outputs
  - Ethernet
  - Profibus-DP (for DL4••**2**-N•)

- Profibus Termination resistor (male connector M12, B-coded), *reference 2536756.*

Reference for order

VELAS DL4 • • • - N - •• •••

Type
0 : Standard
1: Bi-Directional

Stand-off distance
3 : 600 mm (DL4•3•-NR)
4 : 1200 mm (DL4•4•-NIR)
6 : 2000 mm (DL4•6•-NIR)

Supply voltage
24VDC
115-230V

Target Temperature
-HT: High Temperature filter
(for DL4•3•-NR & DL4•4•-NIR)

Communication protocol
1 : Modbus TCP + Pulse
2 : Modbus TCP + Profibus-DP
3 : Modbus TCP + Profinet + Pulse

Example: VELAS DL4042-NIR-HT 115-230V → Velocimeter DL4000-N, type standard, stand-off distance 1200 mm, Profibus-DP, equipped with High Temperature filter, power supply 115-230 VAC.

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