

PRODUCT DATA

CCLD Laser Tacho Probe Type 2981

CCLD Laser Tacho Probe with Adaptor and High-temperature Fiber Type 2981-A

Uses

- Non-contact measurement of rotational speed
- Synchronization between rotating or reciprocating machine elements and measurement instruments

Features

- Compatibility with Constant Current Line Drive (CCLD), DeltaTron or ICP[®] input, from 3 to 20 mA constant current
- CCLD power means:
 - No separate power supply required
 - Simple two-wire cabling
- Continuous wave laser for jitter-free order tracking and balancing applications
- Operating range of Type 2981 to at least 70 cm (27") and with high-temperature fiber AE-4003 to at least 5 cm (2")
- Low-speed measurements to 0 RPM for wind turbine and ship propulsion applications
- High-speed supercharger measurements up to 300000 RPM
- Measurements in automotive engine compartments (130°C) with optional fiber-optic cable
- Manual test button to verify tachometer trigger level when the machine is not rotating or available
- Robust and IP 64 rated
- Flexible mounting options make it easy to attach:
 - ¼"–20 UNC (camera tripod), 10–32 UNF and M4 on the flat side of the probe
 - M22–1 threading with flange on the front
- Small size for measurements in tight locations



Introduction

CCLD Laser Tacho Probe Type 2981 is designed especially for contact-free speed measurements on rotating or reciprocating machine parts. Type 2981 produces a voltage pulse for each shaft rotation or machine part cycle.

When used with retroreflective tape like the QS-0056, Type 2981 has the advantage that it can be located between 1.5 and 70 cm (0.6 to 27") from the test object, thus safely separating the probe from possible contact with moving parts or otherwise hazardous environments.

Powering

Type 2981 can be used with any CCLD supply that provides 3 mA to power the tacho probe. Type 2981 is ideal for use with Brüel & Kjær data acquisition hardware:

- LAN-XI multichannel data acquisition hardware ([bp2215.pdf](#))
- Hand-held Vibration Analyzer Type 2250-H* ([bp2183.pdf](#))

This hardware includes a combined trigger input and a CCLD supply to power the tacho probe.

* Type 2250 requires units with serial number 2630266 or above

Mounting

Fig. 1
Type 2981 with Hand-held FFT Analyzer Type 2250-H for product vibration testing



Use of the probe is very straightforward. Mount it in a convenient static location on or off the machine up to 70 cm from the target by using a magnetic mounting base, such as the optional UA-0642, or a suitable bracket to connect to the M22-1 thread on the front of the probe. Alternatively, use a camera tripod with standard 1/4"-20 UNC (DIN 4503) thread.

The probe should be angled so that its visible laser dot faces the test object to which a small strip of self-adhesive reflective tape has been attached. The retroreflective tape backscatters the laser energy to the receiver. Backscattering the light allows the probe to be more than 30° from perpendicular to the measurement surface.

Output Signal

For each pass of the target, a $-0.8 V_p$ pulse is output, DC biased between +18.0 V and +19.5 V. Type 2981 can measure down to 0 RPM[†] when used with a system capable of DC coupling of the CCLD power supply such as in the Brüel & Kjær LAN-XI family of data acquisition front-ends ([bp2215.pdf](#)) or Hand-held Vibration Analyzer Type 2250-H ([bp2183.pdf](#))*.

Fig. 2
Type 2981 includes 4 m of retroreflective tape and a storage box

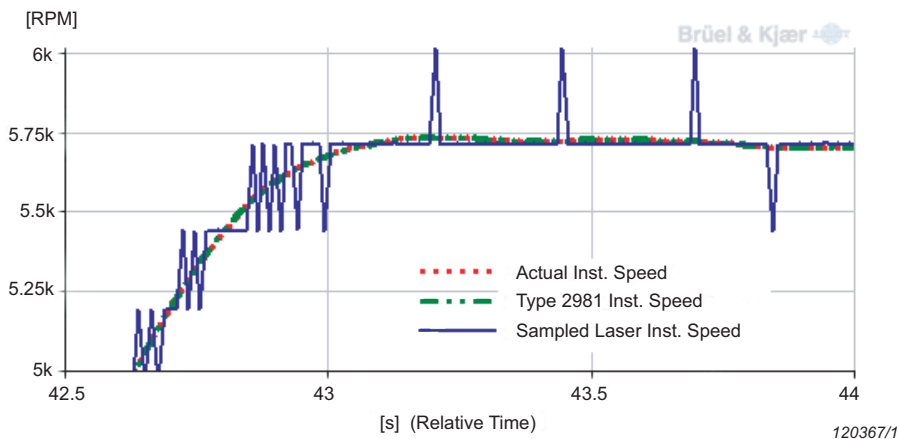


It is possible to use Type 2981 with a standard CCLD supply. The low RPM limit of the system will be the high-pass frequency of the CCLD power supply rather than zero. Bias voltage and signal amplitude are almost completely unaffected by RPM and distance to the object and are also independent of CCLD current between 4 and 20 mA. A small LED on the probe body flashes when reflected light pulses are received, giving a positive indication of correct orientation relative to the moving object. Alternatively, the test button can be pressed momentarily to produce a pulse to confirm connection to a measurement channel and allow trigger setup when the test object is either unavailable or not rotating.

Jitter-free Measurement

Type 2981 uses a continuous-wave laser. A tachometer probe based on a continuous-wave laser avoids the phase jitter from tachometer probes based on pulsed or sampled lasers and provides the precise rotational speed and phase information needed for order tracking, phase or balancing applications. It also minimizes the size needed for the reflective target.

Fig. 3
Comparison of Type 2981 to actual RPM and output of sampled laser (1.8 kHz) with jitter



[†] Measurement down to 0 RPM requires DC coupling of the CCLD power supply and that the retroreflective target is small relative to the shaft circumference, $\leq 15^\circ$

Measurements in Hot Engine Compartments

Although the body of Type 2981 is limited to an ambient temperature of 50°C (122°F), it is possible to measure inside hot engine compartments by using heat-resistant fiber optics to transmit the outgoing and returning laser beams.

Optional Fiber AE-4003-D-020 can function in temperatures of up to 130°C (266°F). Other fibers are also available in order to reach even higher temperatures.

AE-4003-D-020 is 2 metres long (6' 6") and allows Type 2981 to be placed in a relatively cool location (for example behind a car's bumper) while the tip of the fiber measures inside the engine compartment. AE-4003-D-020 includes a cutting tool for installations needing a shorter fiber.

The two 2.2 mm diameter fibers of AE-4003-D-020 couple with Type 2981 via Adaptor UA-2144.

Transmitting the laser light through AE-4003-D-020 does affect the operating range. The distance between the tip of the fiber and the target is not as large as the Type 2981 without a fibre due to light losses in the fiber. The fiber's 5 cm (2") operating range is sufficient for almost all measurements.

Fig. 4
AE-4003-D-020 is 2 m in length but comes with a precision cutting tool to reduce light losses from non-perpendicular cuts



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Fig. 5
Type 2981, UA-2144 and AE-4003-D-020 are also available as a bundle: Type 2981-A



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Speed Measurements in Tight Spaces

Some locations do not have direct line of sight to a mounting location for Type 2981.

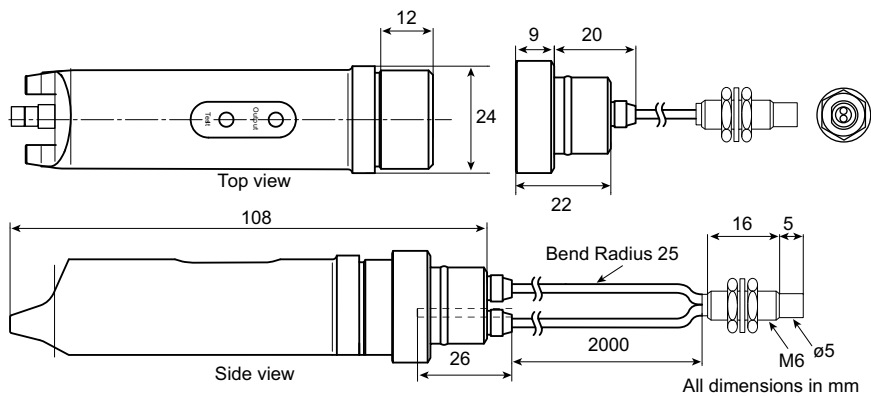
In such instances, the very compact AE-4003-D-020 fiber has an M6 body less than 25 mm long and a minimum bend radius of 25 mm so that it can be routed to tight locations.

There is a wide range of other 2.2 mm diameter fibers that are compatible with the UA-2144 2.2 mm x 2 fiber adaptor, including fibers with smaller tips and tighter bend radii but that usually have lower operating temperatures. Note: a 26 mm minimum length of 2.2 mm diameter fiber is required to fit in Adaptor UA-2144. Some fibers have a protective covering and only a short length of 2.2 mm diameter fiber.

For best performance with the optical fiber ensure that:

- The retroreflective target is at least as large as the laser spot
- The bracket holding the fiber tip has minimal motion in the operating range of measurement

Fig. 6
Physical dimensions of CCLD Tacho Probe Type 2981, Fiber Adaptor UA-2144 and Fiber AE-4003-D-020



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Specifications – CCLD Laser Tacho Probe Type 2981

PERFORMANCE

RPM range: 0* – 300000

Operating Range: 1.5 cm (0.6") to > 70 cm (27") and > 30° from centre line

Laser Spot: < Ø5 mm at 70 cm distance

ELECTRICAL

Current Requirements: CCLD, 3 to 20 mA

Voltage Requirements: CCLD, ≥ 20 V

DC Bias Output: +18.0 V to +19.5 V for CCLD current ≥ 4 mA (individually measured and stored in TEDS)

Signal Output: $-0.8 \pm 0.2 V_p$ re DC bias output. Rise and fall time < 500 ns

Output Connector: SMB

Protection: Max. Continuous Input Voltage: -5 V to +30 V current limited†

Laser: Class 3R. Visible 660 – 690 nm, CW, P [optical] < 2 mW

Complies with EN/IEC 60825-1:2007

Activity LED: Flashes when pulses are received or lights up if the test button is activated



* Measurement down to 0 RPM requires DC coupling of the CCLD power supply and that the retroreflective target is small relative to the shaft circumference, ≤ 15°

† Current limit at transducer: 20 mA up to +20 V; 13 mA up to +30 V to guarantee input power < 400 mW

Test Button: When activated, the output level drops 0.8 V and the activity LED is lit. This corresponds to the active signal level

TEDS: TEDS template with probe identification and specifications for power requirements, trigger level, signal level and polarity

Isolation: Housing is separated from signal ground by a 1 kΩ resistor to avoid the effect of ground loops in multichannel systems

MECHANICAL

Mounting: ¼"–20 UNC (camera tripod), 10–32 UNF and M4 on the flat side of the probe; M22–1 thread with flange on the front

Front Protection Glass: Acrylic with hard-coated and antireflective surface

Weight: 50 g (2 oz.)

Dimensions: Ø22.5 × 91 mm (Ø0.87 × 3.6")

ENVIRONMENTAL

Enclosure: IP 64, dust tight and protected against splashing water

Temperature Range:


Operating: -10 to +50°C (14 to 122°F)


Storage: -20 to +80°C (-4 to +176°F)

EMC

EN 61000-6-2: Immunity for industrial environments

EN 61000-6-3: Emission for residential environments

 Compliance with EMC Directive and Low Voltage Directive of the EU

 Compliance with the EMC requirements of Australia and New Zealand

Specifications – Adaptor UA-2144 and Fiber AE-4003-D-020

PERFORMANCE

Operating Range: 4 to > 50 mm (2")

Laser Spot: < 6 mm at 25 mm distance (1")

MECHANICAL

Fiber Length: 2 m (78.7" - can be cut with included tool)

Mounting: M6 – 0.75 thread with two included nuts

Bend Radius: 25 mm (1")

Minimum Ø2.2 mm fiber length with UA-2144: 26 mm (1.02")

ENVIRONMENTAL

Temperature Range (AE-4003): -60 to +130°C (-76 to +266°F)

Compatible with existing MM-0360 serial number 100xxx (not compatible with MM-0360 serial number 110xxx)

Ordering Information

Type 2981 CCLD Laser Tacho Probe includes the following accessories

- QS-0056-001: Retroreflective Tape, 4 m
- KE-0345: Box for Type 2981 and tape

Type 2981-A CCLD Laser Tacho Probe with Adaptor and High-temperature Fiber

also includes the following accessories

- UA-2144 Adaptor for Fiber Ø2.2 mm for Laser Tacho Probe Type 2981
- AE-4003-D-020 High-temperature Dual Fiber for Type 2981, 2.0 m (6.7ft)

OPTIONAL ACCESSORIES

Type 1704-A Battery-powered CCLD Signal Conditioner

UA-2144 Adaptor for Ø2.2 Fibres

AE-4003-D-020 High-temperature Fiber, 2 m (6.7ft)

KE-1019: Soft Case

Mounting

UA-0801 Lightweight Tripod

UA-1251 Lightweight Tripod, compact type

UA-0642 Mounting Magnet with integrated 10–32 stud

Cables

AO-0564-D-XXX SMB Right-angle Connector to BNC Cable

AO-0587-D-XXX SMB Straight Connector to BNC Cable

AO-0726-D-XXX SMB Straight Connector to 2250 cable

WA-1705 SMB to 10–32 female adaptor

XXX = represents length in decimetres (e.g., -D-010 is 1 m long)

TRADEMARKS

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