# INVOICE

# Musterfirma GmbH

Pay with Code

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**Date:** October 23, 2026
**Invoice:** DEMO-2026-1047
**Delivery:** October 22, 2026
**Customer Number:** C-001047
**Order:** PO-2026-1047
**Customer VAT ID:** DE111888999
**Contact:** Anna Becker
Project Engineer
anna.becker@example.com

Musterfirma GmbH, Hauptstraße 12, 10115 Berlin

**To:** Beispiel Prozessanlagen GmbH
Beispielweg 8
50667 Cologne
Germany

Lab flow-control rig: **analog PID** and **digital PI** development, 5-22 Oct 2026; quantities in hours.

| # | Item Description | Qty | Unit price € | Total € |
|---|---|---|---|---|
| 1 | Analog PID: schematics, SPICE, PCB and BOM | 32 | 95.00 | 3,040.00 |
| 2 | Digital PI: algorithm, C sources and anti-windup | 34 | 110.00 | 3,740.00 |
| 3 | Bench testing/tuning; report TR-1047 (Rev. A) | 14 | 95.00 | 1,330.00 |
| 4 | Documentation and engineering handover | 6 | 90.00 | 540.00 |
| | | | Subtotal: | €8,650.00 |
| | | | VAT 19.0% (S): | €1,643.50 |
| | | | **Total:** | **€10,293.50** |

**Remarks:**

- **Project:** Laboratory flow-control test rig
- **Currency:** EUR — Euro (€)
- Illustrative example only - not payable; all details are sample data.
- **Analog PID:** Reference law for $e(t) = r(t) - y(t)$ (hardware derivative filter $T_f = 35$ ms):

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau)\, d\tau - K_d \frac{dy(t)}{dt}.$$

- **Digital PI:** Backward-Euler update before limiting, with $e[k] = r[k] - y[k]$:

$$u[k] = u[k-1] + K_p(e[k] - e[k-1]) + K_i T_s e[k].$$

  $T_s = 10$ ms, $K_p = 1.8$, $K_i = 0.45\,\mathrm{s}^{-1}$. Includes 0-10 V limiting and conditional-integration anti-windup.
- **VAT:** 19.0% as itemized above. § 12 Abs. 1 UStG
- **Payment due: November 6, 2026** (14 days from the invoice date).

October 23, 2026, Max Mustermann
(Date, Name)




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