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Digital Material Passport

| | | | |
|------------|---------------|------------------|--------------|
| ID | DMP-METAL-005 | Version | 1.0.0 |
| Issue Date | 2025-05-17 | Certificate Type | EN 10204 3.1 |

Business Transaction

| Order | | Delivery | |
|----------|------------|-------------|------------|
| Order ID | PO-23456 | Delivery ID | DN-65432 |
| Position | 1 | Position | 1 |
| Date | 2025-05-01 | Date | 2025-05-16 |
| Quantity | 1000 kg | Quantity | 1000 kg |

Product Information

| | |
|-------------------|------------------------------|
| Product Name | Titanium Alloy Ti-6Al-4V ELI |
| Batch ID | T-65432-01 |
| Surface Condition | Machined |
| Production Date | 2025-05-15 |
| Country of Origin | DE |

Product Norms

| | |
|----------|------------------|
| Standard | ASTM F136 (2022) |
|----------|------------------|

Material Designations

| | |
|--------------|--------|
| Number (UNS) | R56401 |
|--------------|--------|

Product Shape

| | |
|----------|----------|
| Form | RoundBar |
| Length | 3000 mm |
| Diameter | 30 mm |

Chemical Analysis

| | |
|-----------------|---------------|
| Heat Number | T-65432 |
| Melting Process | VAR |
| Casting Date | 2025-05-14 |
| Casting Method | VacuumCasting |
| Sample Location | Product |

Elements

| Symbol | Ti | Al | V | Fe | O | C | N | H |
|--------|-------|-------------|-------------|------|------|-------|-------|-----|
| Unit | % | % | % | % | % | % | % | ppm |
| Min | - | 5.5 | 3.5 | - | - | - | - | - |
| Max | - | 6.5 | 4.5 | 0.25 | 0.13 | 0.08 | 0.05 | 120 |
| Actual | 89.32 | 6.02 ± 0.05 | 3.95 ± 0.03 | 0.18 | 0.11 | 0.026 | 0.012 | 35 |

Mechanical Properties

| Property | Symbol | Actual | Minimum | Maximum | Method | Status |
|--|--------|-------------|---------|---------|-------------------------|----------|
| Fatigue Test Room temperature, R = 0.1 | | | | | ASTM E466 | ✓ |
| Cycles (N) | 10000 | 50000 | 100000 | 500000 | 1000000 | 10000000 |
| Value | 650 | 635 | 610 | 590 | 570 | 550 |
| Notch Sensitivity | | 0.85 - 0.92 | | | Internal Method TS-5432 | ✓ |

Physical Properties

| Property | Symbol | Actual | Target/Min | Maximum | Method | Status |
|----------------|--------|------------------|------------|---------|-----------|--------|
| Density | | 4.43 ± 0.01g/cm³ | 4.43g/cm³ | - | ASTM B311 | ✓ |

Supplementary Tests

| Property | Actual | | | Target/Min | Maximum | Method | | | Status |
|------------------------------|--|-----|-----|----------------|---------|---------------------------------|-----|-----|--------|
| Microstructure Examination | Equiaxed alpha with intergranular beta | | | - | - | ASTM E407 | | | ✓ |
| Ultrasonic Inspection | Yes <small>No indications greater than reference standard</small> | | | - | - | ASTM E2375 | | | ✓ |
| Surface Quality Assessment | Class 1 - Medical Grade | | | - | - | Visual Inspection per ASTM F136 | | | ✓ |
| Alpha Case Depth | 5µm | | | - | 25µm | Microhardness Traverse | | | ✓ |
| Grain Size Distribution | 8 - 10ASTM No. | | | 7 - 12ASTM No. | - | ASTM E112 | | | ✓ |
| Hardness Profile | Array data (see below) | | | - | - | ASTM E384 | | | ✓ |
| Distance from - surface (mm) | 0.1 | 0.5 | 1 | 2 | 3 | 5 | 10 | 15 | |
| Value [HV] | 345 | 350 | 352 | 350 | 349 | 348 | 351 | 347 | |

Validation

We hereby certify that the material described above has been manufactured and tested in accordance with ASTM F136 and meets all requirements for surgical implant applications.

Validated By

| Name | Title | Department | Date |
|------------------|--------------------|--------------------|------------|
| Dr. Markus Weber | Head of Metallurgy | Research & Quality | 2025-05-17 |