汽车行业篇---德国菲尼克斯 PHYNIX 涂层测厚仪在高端制造与工业防腐领域的应用指南

——技术支持：DG Tech (Guangzhou) Co.，｜ 广州德光电子科技有限公司

一、行业背景与涂层测量痛点

汽车制造是涂层测厚仪应用最广泛、要求最严格的行业之一。从车身涂装车间到零部件供应商，涂层厚度直接关系到产品的**防腐性能、外观品质、耐久性**以及整车的**保值率**。

汽车行业面临的核心挑战：

- **多层涂装体系**：现代汽车车身通常采用"电泳底漆（ED）+ 中涂 + 色漆 + 清漆"的多层结构，总膜厚约 100-150μm，单层厚度需精确控制

- **基材多样化**：传统钢板、镀锌钢板、铝合金车身、塑料保险杠等多种基材并存，对测厚原理的兼容性提出高要求

- **高速流水线节拍**：大型主机厂的生产节拍可达 45-60 秒/车，要求测厚仪响应速度快、操作极简

- **复杂曲面测量**：车身存在门把手凹槽、A 柱曲率突变、R 角等复杂几何形状，探头可达性与定位精度是关键

- **极薄涂层精度要求**：电泳漆仅 15-25μm，清漆层 30-50μm，测量误差需控制在±1-2μm 以内

二、典型基材与涂层特征

2.1 车身用基材类型

基材类型	典型牌号	电磁特性	适用测量原理
冷轧钢板	DC01、DC04	铁磁性	磁感应法
热镀锌钢板	DX51D+Z 、HC220YD+Z	铁磁性（基体）	磁感应法
电镀锌钢板	SECC、SECD	铁磁性（基体）	磁感应法
铝合金车身	6016、5182、7075	非铁磁性导电	电涡流法
塑料保险杠	PP+EPDM、ABS	绝缘基体	需特殊方法

2.2 车身涂装典型工艺与厚度范围

涂层层级	材料类型	典型厚度	功能
电泳底漆（ED）	阴极电泳漆	15-25 μm	防腐蚀、附着力基础
中涂层	聚酯/聚氨酯	30-40 μm	填充平整、抗石击
色漆层	水性/溶剂型色漆	15-25 μm	色彩呈现
清漆层	聚氨酯/丙烯酸	30-50 μm	光泽、耐候、抗刮擦
总膜厚	—	100-150 μm	—

三、核心测量难点分析

3.1 基材多样性带来的原理切换需求

汽车制造中钢材与铝合金混用已成常态。传统单原理测厚仪在测量钢板后转测铝板时，需手动切换模式或更换探头，严重影响流水线效率。PHYNIX 的**自动基体识别（AUTO FN）** 功能可在探头接触表面的瞬间自动判断基材属性（Fe 或 NFe），并即时切换至正确的测量原理。

3.2 极薄涂层的精度控制

电泳漆（15-25μm）和清漆层（30-50μm）的测量需要高分辨率探头。普通测厚仪在薄涂层段的重复性不足（±2μm 即带来 10-15%误差）。PHYNIX Surfix® SX 系列分辨率高达 **0.1μm**，配合薄片校准可实现±1μm 级的测量精度。

3.3 复杂曲面的定位难题

车门把手凹槽、A 柱曲线、翼子板 R 角等位置的测量，要求探头能够稳定垂直贴合于被测面。PHYNIX 探头前端配备带**V 型槽的塑料接触环**，可在水平面、柱面及弯曲面上实现稳定且垂直的定位。

3.4 高温表面测量

涂装车间烘干炉出口的新涂装部件，以及发动机、制动盘等高温零部件，表面温度可达 150°C 甚至更高。PHYNIX 提供**高温接触环**（可选配件），使标准探头可测量高达 **150°C（浅褐色环）或 300°C（螺纹环）**的热表面，而无需重新校准。

四、PHYNIX 推荐产品组合

4.1 车身涂装车间（流水线快速抽检）

推荐型号	探头配置	核心优势	适用场景
Easy X I-FN HR	内置 FN 探头	一键测量＜1 秒，零校准开机即用，自动识别 Fe/NFe 基材	车身四门两盖快速抽检、电泳漆/面漆厚度管控
Easy X I-F HR	内置 F 探头	同上，专用于钢制车身	传统钢板车身线
Easy X E-FN HR	外置 FN 探头	分体设计，探头更轻巧，便于曲面测量	复杂部位或狭小空间测量



Surfix® easy X 系列量程达 **0-3000μm**（Fe/NFe），精度为±2μm 或读数的 2%，分辨率为 0.1μm（0-500μm 范围），适用于车身所有涂层类型的快速检测。

4.2 零部件与精密测量（高精度需求）

推荐型号	探头配置	核心优势	适用场景
Surfix® SX	可更换探头	分辨率 0.1μm，精度 ±(1μm+1%)，存储 2000 个数据	电泳漆厚度精确分析、电镀层测量
Surfix® SX + FN0.2	超精密探头	量程 0-200μm，精度 ±(0.7μm+1%)，极小测量区域	电镀层（如镀铬 3μm）、极薄涂层
Surfix® SX + FN1.5	标准探头	量程 0-1500μm，适用 90%以上测量任务	通用精密测量
Pocket-Surfix® X	内置探头	口袋级便携，80 个数据存储，经济实用	来料检验、现场快速确认

Surfix® SX 连接 USB 2.0 接口，测量数据可通过 **PHYNIX.connect** 软件直接传输至 Excel，满足汽车行业质量追溯要求。

4.3 特殊应用场景

应用场景	推荐方案	说明
刹车盘/发动机热表面	Surfix® SX + 高温接触环 150°C/300°C	无需重新校准，量程 0-1000μm（300°C 环）
转向架/结构件死角	Surfix® SX + 直角探头 FN1.5R	最小净空高度 25mm，适合狭窄区域
小直径圆柱体（螺钉等）	Surfix® SX + 测试工作台（探头导向器）	精准定位直径≥4mm 小型零件
多层涂层（ED+色漆+清漆）	Surfix® Pro X + 零偏移/零点抑制	仅显示最上层厚度，或通过程序 B（涡流法）分层测量

五、关键校准与操作要点

5.1 快速测量模式的选择

Surfix® easy X 系列支持**工厂校准**模式，这意味着在标准几何尺寸的测量对象上（平整表面、曲率半径>20mm、基材厚度>0.6mm），仪器可直接使用，**无需现场校准**。对于车身大平面的快速抽检，开机即可测量，极大提升流水线效率。

5.2 特殊几何形状的校准要求

当测量对象偏离标准几何形状时（例如 R 角<20mm、基材厚度<0.6mm、测量面积<15mm×15mm），建议进行**单点校准**（在未涂层的同材质工件上调零）或**两点校准**（调零+使用与待测厚度接近的标准片）。

5.3 粗糙表面的测量（镀锌板锌花）

热镀锌板表面的锌花会导致单点测量值离散性大。建议：

- 使用**同材质、同粗糙度的未涂装裸板**进行零点校准
- 每组取 5-10 个测量点，计算**平均值（Mean）**作为代表值
- 利用仪器的**在线统计功能**（n, x, s, min, max）快速评估均匀性

5.4 多层涂层测量的技巧

对于“钢基+电泳漆+色漆+清漆”的多层体系，若需单独测量各层厚度：

- **方法 A（零偏移）** ： 校准后通过菜单设置偏移值，扣除底层厚度，仅显示顶层数值

- **方法 B（涡流法）** ： 在有色金属基材上，使用 N 模式测量非导电涂层，不受底层金属涂层干扰

5.5 高温测量的注意事项

测量 150°C-300°C 热表面时（如烘干后的涂层、发动机部件）：

- 必须安装**高温接触环**（浅褐色环用于 150°C，螺纹环用于 300°C）
- 探头保持接触时间不超过 0.5 秒

- 每次测量间隔约 5 秒，以确保探头尖端冷却
- 由于传感器对磁导率和电导率变化不敏感，**无需重新校准**

六、实测数据验证

6.1 不同基材测量一致性测试

****测试条件****

- 仪器：Surfix® easy X I-FN HR
- 校准方式：工厂校准（未额外校准）
- 被测涂层：同一批次电泳漆试板（标准值 22μm）

基材类型	测量值（μm）	与标称值偏差
冷轧钢板（Fe）	22.3	+0.3
热镀锌钢板（Fe）	22.8	+0.8
铝合金板（NFe）	21.5	-0.5

结论：在标准几何尺寸条件下，工厂校准即可满足±1μm 的精度要求，自动基体识别功能确保 Fe/NFe 切换无误。

6.2 车身各部位涂层均匀性抽检

****测试条件****

- 仪器：Surfix® easy X I-FN HR
- 被测车辆：某合资品牌白车身（电泳漆）（单位：μm）

测量位置	第 1 次	第 2 次	第 3 次	第 4 次	第 5 次	均值	SD
发动机盖	20.3	21.1	20.8	20.5	21.2	20.8	±0.37
左前门	19.8	20.2	20.5	19.6	20.0	20.0	±0.35
右前门	21.2	20.7	21.5	21.0	21.3	21.1	±0.30

车顶	22.5	21.8	22.1	22.3	22.0	22.1	±0.27
后备箱盖	19.2	19.8	20.1	19.5	19.7	19.7	±0.34

结论：车身各部位电泳漆厚度分布均匀，单点 SD 均<0.4μm，说明涂装线工艺稳定。仪器的一键操作和快速响应（ < 0.5 秒）使整车多点抽检可在 2-3 分钟内完成，满足流水线节拍要求。

可视化建议：以上数据可制成**箱线图**，展示五个测量点的厚度分布与离散程度，或制成**雷达图**对比各部位厚度一致性。

七、常见问题速查（FAQs）

****Q1：车身钢板与铝合金板材混线生产时，是否需要手动切换测量模式？****

- **A**：不需要。PHYNIX FN 型探头具有**自动基体识别功能（AUTO FN）** ，仪器接触表面的瞬间即可判断基材是铁/钢（Fe）还是有色金属（NFe），并自动切换至相应测量原理。操作者只需将探头置于涂层表面即可，无需任何手动设置。

****Q2：测量保险杠等塑料基材上的涂层，能否使用 PHYNIX 测厚仪？****

- **A**：常规 PHYNIX 测厚仪基于磁感应或电涡流原理，适用于金属基材上的涂层测量。对于塑料等绝缘基体，**无法直接测量**。此时可考虑方法：

1. 使用**超声波测厚法**（需配备专用超声探头）
2. 使用**破坏性测量法**（如划格法后显微镜测量）
3. 在塑料件注塑时嵌入**同材质金属试片**作为测量参照

****Q3：如何在 R 角或车门把手凹槽处获得准确读数？****

- **A**：建议采取以下措施：

1. 利用探头前端塑料接触环的**V 型槽**，在圆柱面或弯曲面上实现稳定定位
2. 若条件允许，在**同曲率未涂装区域**进行零点校准，可完全消除曲率误差
3. 对于极小 R 角（<5mm），建议使用**直角探头 FN1.5R**或**微型探头**配合测试工作台

****Q4：刹车盘或发动机部件温度较高，能否直接测量？****

- **A**：可以。安装**高温接触环**（150°C 或 300°C 规格）后，PHYNIX 标准探头可直接测量热表面涂层厚度，且**无需重新校准**。建议每次测量间隔 5 秒以确保探头尖端

充分冷却，探头接触时间不超过 0.5 秒。

八、行业小结：PHYNIX 在汽车行业的独特价值

1. **自动基体识别**：FN 型探头自动切换 Fe/NFe 测量原理，完美适应汽车行业钢铝混线生产需求

2. **极速测量响应**：一键操作 < 0.5 秒/点，满足流水线 45-60 秒节拍要求

3. **高精度薄涂层测量**：Surfix® SX 系列分辨率 0.1μm，电泳漆、清漆层精度控制无忧

4. **复杂曲面适应性**：V 型槽接触环设计，水平面、柱面及弯曲面均可稳定定位

5. **高温测量能力**：可选 150°C/300°C 高温接触环，覆盖烘干炉、发动机等热表面场景

6. **数据追溯与质量管控**：USB 2.0 数据传输至 Excel，存储 2000 个测量值，便于 SPC 分析与质量报告

关于广州德光电子科技有限公司

广州德光电子科技有限公司（DG Tech (Guangzhou) Co., Ltd.）成立于 2010 年，是一家专注于无损检测（NDT）仪器设备领域的高新技术企业，集设计、生产、销售于一体。公司总部位于中国广州，业务覆盖汽车制造、船舶与重防腐、电力能源、新能源、轨道交通、航空航天、表面处理及石油化工等众多工业领域。

广州德光电子科技是**德国菲尼克斯（PHYNIX）公司在中国地区的官方授权代理商**（代理商信息发布于 PHYNIX 官网 www.phynix.com 的“China”区域）。公司致力于将德国精密测量技术与中国本土应用需求深度融合，为客户提供从涂层测厚仪选型、应用方案设计、现场校准指导到售后维护的全链条服务。

秉承“专业、精准、可靠”的理念，广州德光电子科技以“成为无损检测领域值得信赖的技术伙伴”为愿景，持续为工业质量管控贡献价值。

官方网站：www.dgc020.com

服务热线：020-87597170 / 13332804048

附：英文版本

Automotive Industry Chapter--PHYNIX Coating Thickness Gauge Application Guide in High-End Manufacturing & Industrial Anti-Corrosion

——Technical Support: DG Tech (Guangzhou) Co.,

1. Industry Background & Measurement Pain Points

The automotive industry represents one of the most extensive and demanding application fields for coating thickness gauges. From body paint shops to component suppliers, coating thickness directly impacts product **corrosion resistance, appearance quality, durability**, and overall vehicle **residual value**.

Key challenges in the automotive sector:

- **Multi-layer coating systems:** Modern automotive bodies typically employ "ED primer + surfacer + basecoat + clearcoat" multi-layer structures with total thickness of 100-150µm, each layer requiring precise control

- **Diverse substrate materials:** Steel sheets, galvanized steel, aluminum alloys, plastic bumpers — each with different electromagnetic properties, demanding high

measurement principle compatibility

- **High-speed production line cycles**: Major OEM production lines operate at 45-60 seconds per vehicle, requiring fast-response, simple-operation gauges

- **Complex surface geometries**: Door handle recesses, A-pillar curvature changes, R-corners — all challenge probe accessibility and positioning accuracy

- **Ultra-thin coating accuracy**: ED primer at 15-25μm, clearcoat at 30-50μm — requiring measurement errors within ±1-2μm

2. Typical Substrates & Coating Characteristics**

2.1 Body Substrate Types

Substrate Type	Typical Grades	Electromagnetic Property	Measurement Principle
Cold-rolled steel	DC01, DC04	Ferromagnetic	Magnetic Induction
Hot-dip galvanized steel	DX51D+Z, HC220YD+Z	Ferromagnetic (substrate)	Magnetic Induction
Electro-galvanized steel	SECC, SECD	Ferromagnetic (substrate)	Magnetic Induction
Aluminum alloy body	6016, 5182, 7075	Non-ferromagnetic conductive	Eddy Current
Plastic bumpers	PP+EPDM, ABS	Insulating substrate	Special methods required

2.2 Body Coating Process & Typical Thickness

Coating Layer	Material Type	Typical Thickness	Function
ED Primer	Cathodic electrocoat	15-25 μm	Corrosion protection, adhesion base
Surfacer	Polyester/Polyurethane	30-40 μm	Smoothing,

			stone-chip resistance
Basecoat	Waterborne/Solvent-borne	15-25 μm	Color rendering
Clearcoat	Polyurethane/Acrylic	30-50 μm	Gloss, weather resistance, scratch resistance
Total	—	100-150 μm	—

3. Key Measurement Challenges

3.1 Principle Switching Due to Substrate Diversity

The mixed use of steel and aluminum is now standard in automotive manufacturing. Single-principle gauges require manual mode switching or probe changes when moving from steel to aluminum — significantly impacting production line efficiency. PHYNIX's **automatic substrate recognition (AUTO FN)** instantly identifies the substrate (Fe or NFe) upon surface contact and automatically switches to the correct measurement principle.

3.2 Ultra-Thin Coating Accuracy Control

ED primer (15-25μm) and clearcoat (30-50μm) require high-resolution probes. Standard gauges often lack sufficient repeatability in the thin-coating range (±2μm represents 10-15% error). PHYNIX Surfix® SX series offers **0.1μm resolution**, achieving ± 1μm-level accuracy with foil calibration.

3.3 Complex Curvature Positioning

Measuring door handle recesses, A-pillar curves, and fender R-corners requires stable, perpendicular probe contact. PHYNIX probes feature a plastic contact ring with **V-shaped groove**, enabling stable and vertical positioning on flat surfaces, cylinders, and curved surfaces.

3.4 High-Temperature Surface Measurement

Freshly coated parts exiting drying ovens, as well as engine and brake disc components, can reach surface temperatures of 150°C or higher. PHYNIX offers **high-temperature feet** (optional accessories) enabling standard probes to measure hot surfaces up to **150°C** (fawn-colored ring) or **300°C** (screw ring) without recalibration.

4. Recommended PHYNIX Product Combinations

4.1 Body Paint Shop (Production Line Fast Inspection)

Model	Probe	Key Advantages	Application
Easy X I-FN HR	Built-in FN	One-button <1 sec, no calibration needed, auto Fe/NFe recognition	Body panel fast inspection, ED/primer/clearcoat QC
Easy X I-F HR	Built-in F	Same features, steel-only	Traditional steel body lines
Easy X E-FN HR	External FN	Detachable probe, lighter, better for curved surfaces	Complex shapes, tight spaces



Surfix® easy X series offers **0-3000µm** range (Fe/NFe), ±2µm or 2% accuracy, with 0.1µm resolution (0-500µm range) — covering all automotive coating types.

4.2 Component & Precision Measurement

Model	Probe	Key Advantages	Application
Surfix® SX	Exchangeable probes	0.1µm resolution, ± (0.7µm+1%), 2000 data storage	ED primer analysis, electroplating
Surfix® SX + FN0.2	Ultra-precision probe	0-200µm range, ± (0.7µm+1%), minimal measurement area	Electroplated layers (e.g. 3µm chromium), ultra-thin coatings
Surfix® SX + FN1.5	Standard probe	0-1500µm range, covers 90% of applications	General precision measurement
Pocket-Surfix® X	Built-in probe	Pocket-sized, 80 data storage, cost-effective	Incoming inspection, field confirmation

Surfix® SX features USB 2.0 interface for data transfer via **PHYNIX.connect** software directly to Excel, meeting automotive quality traceability requirements.

4.3 Special Applications

Application	Recommended Solution	Notes
Brake disc/engine hot surfaces	Surfix® SX + High-temp foot 150°C/300°C	No recalibration needed, 0-1000µm range (300°C ring)
Tight spots/structural parts	Surfix® SX + Right-angle	Minimum clearance 25mm

	probe FN1.5R	
Small-diameter cylinders (screws, etc.)	Surfix® SX + Test stand (probe guide)	Precise positioning for ⩾ 4mm diameter parts
Multi-layer coatings	Surfix® Pro X + Zero-offset	Display only top layer thickness

5. Key Calibration & Operation Points

5.1 Quick Measurement Mode

Surfix® easy X series supports **factory calibration** mode. For standard geometry measurement objects (flat surfaces, radius >20mm, substrate thickness >0.6mm), the instrument can be used directly **without field calibration**. For fast inspection on body panels, simply turn on and measure — dramatically improving production line efficiency.

5.2 Special Geometry Calibration

When measuring objects that deviate from standard geometries (R-corners <20mm, substrate <0.6mm, area <15mm×15mm), **single-point calibration** or **two-point calibration** is recommended.

5.3 Rough Surface Measurement (Galvanized Steel Zinc Spangles)

For hot-dip galvanized steel with visible zinc spangles:

- Perform **zero calibration on uncoated bare plate with same material and roughness**

- Take 5-10 measurements per set, use **Mean** as representative value

- Use built-in **online statistics** (n, x, s, min, max) for uniformity assessment

5.4 Multi-Layer Measurement Techniques

For “steel + ED primer + basecoat + clearcoat” multi-layer systems:

- **Method A (Zero-offset)**: Set offset value via menu to subtract lower layers, displaying only top layer

- **Method B (Eddy Current)**: On non-ferrous substrates, use N-mode to measure non-conductive coatings without interference from underlying metal layers

5.5 High-Temperature Measurement

When measuring hot surfaces at 150°C-300°C:

- Install **high-temperature foot** (fawn-colored for 150°C, screw ring for 300°C)

- Keep probe contact time under 0.5 seconds

- Allow 5 seconds between measurements for probe tip cooling

- **No recalibration required** as sensor is insensitive to permeability/conductivity changes

6. Verified Measurement Data

6.1 Substrate Consistency Test

Test Conditions

- Instrument: Surfix® easy X I-FN HR

- Calibration: Factory calibration (no additional calibration)

- Coating: Same batch ED primer test panels (nominal 22µm)

Substrate Type	Measured Value (µm)	Deviation from Nominal
Cold-rolled steel (Fe)	22.3	+0.3
Hot-dip galvanized steel (Fe)	22.8	+0.8
Aluminum alloy (NFe)	21.5	-0.5

Conclusion: Under standard geometry conditions, factory calibration meets ±1μm accuracy requirements. Automatic substrate recognition ensures error-free Fe/NFe switching.

6.2 Body Panel Coating Uniformity Inspection

Test Conditions

- Instrument: Surfix® easy X I-FN HR

- Vehicle: One joint venture brand BIW (ED primer) (Unit: μm)

Position	#1	#2	#3	#4	#5	Mean	SD
Hood	20.3	21.1	20.8	20.5	21.2	20.8	±0.37
Left front door	19.8	20.2	20.5	19.6	20.0	20.0	±0.35
Right front door	21.2	20.7	21.5	21.0	21.3	21.1	±0.30
Roof	22.5	21.8	22.1	22.3	22.0	22.1	±0.27
Trunk lid	19.2	19.8	20.1	19.5	19.7	19.7	±0.34

Conclusion: ED primer distribution across body panels is uniform, with SD <0.4μm — indicating stable paint line process. One-button operation and fast response (<0.5 sec) enable complete vehicle multi-point inspection within 2-3 minutes.

7. Frequently Asked Questions (FAQs)

****Q1: When steel and aluminum are mixed on the same production line, is manual mode switching required?****

- **A**: No. PHYNIX FN probes feature **automatic substrate recognition (AUTO FN)** . The instrument instantly identifies the substrate (Fe or NFe) upon surface contact and automatically switches to the correct measurement principle. No manual setting is required.

****Q2: Can PHYNIX gauges measure coatings on plastic bumpers?****

- **A**: Standard PHYNIX gauges based on magnetic induction/eddy current principles

apply to coatings on metal substrates. For plastic insulating substrates, direct measurement is not possible. Alternative approaches include:

1. **Ultrasonic thickness measurement** (with specialized probe)

2. **Destructive methods** (cross-section microscopy)

3. Embedding **metal reference tabs** during plastic molding for measurement reference

Q3: How to obtain accurate readings on R-corners or door handle recesses?

- **A**: Recommended approaches:

1. Use the plastic contact ring's **V-shaped groove** for stable positioning on cylinders and curved surfaces

2. Perform **zero calibration on uncoated area with same curvature** to eliminate curvature error

3. For very small R-corners (<5mm), use **right-angle probe FN1.5R** or **micro-probe** with test stand

Q4: Can hot brake disc or engine components be measured directly?

- **A**: Yes. With **high-temperature foot** (150°C or 300°C option) installed, PHYNIX standard probes can directly measure hot surface coatings, **without recalibration**. Allow 5 seconds between measurements for probe tip cooling; keep contact time under 0.5 seconds.

8. Industry Summary: PHYNIX's Unique Value in Automotive

1. **Automatic substrate recognition**: FN probes auto-switch Fe/NFe modes, perfect for mixed steel/aluminum production lines

2. **Fast measurement response**: One-button operation <0.5 sec per point, meeting 45-60 sec production cycle requirements

3. **High-precision thin coating measurement**: Surfix® SX 0.1µm resolution, ED primer and clearcoat accuracy guaranteed

4. **Complex curvature adaptability**: V-shaped groove contact ring design ensures stable positioning on flat, cylindrical, and curved surfaces

5. **High-temperature capability**: Optional 150°C/300°C high-temperature feet cover

drying ovens, engine components, and other hot surfaces

6. **Data traceability**: USB 2.0 data transfer to Excel, 2000 measured value storage, supporting SPC analysis and quality reporting

About DG Tech (Guangzhou) Co.,

DG Tech (Guangzhou) Co., , established in 2010, is a high-tech enterprise specializing in non-destructive testing (NDT) instrumentation, integrating design, manufacturing, and sales. Headquartered in Guangzhou, China, our business covers a wide range of industrial sectors including automotive, marine & heavy-duty anti-corrosion, power generation, new energy, railway, aerospace, surface treatment, and petrochemicals.

DG Tech is an **officially authorized distributor of PHYNIX (Germany) in the Chinese marke**t — as publicly listed on the PHYNIX official website (www.phynix.com) under the "China" region. We are dedicated to integrating German precision measurement technology with local Chinese application needs, providing customers with full-chain services including coating thickness gauge selection, application solution design, on-site calibration guidance, and after-sales support.

Website: www.dgc020.com

Service Hotline: +86 20-87597170 / +86 13332804048

—— 本系列文章由广州德光电子科技有限公司撰写，经德国 PHYNIX 官方审核发布，中英双语对照，旨在为全球工业界提供涂层测厚领域的专业应用指南。