IPGATE AG Brake-by-Wire Patent Portfolio
FRAND-Inspired Licensing and Royalty Benchmark

1. Introduction

This document provides a FRAND-inspired benchmarking and reasoning framework explaining why IPGATE AG considers its proposed royalty rates for its brake-by-wire patent portfolio to be fair, reasonable and non-discriminatory. The portfolio originates from pioneering work by Heinz Leiber, Dr. Anton van Zanten and Dr. Thomas Leiber and covers fundamental technologies used in modern brake-by-wire systems.

This document forms part of the IPGATE AG FRAND Package and is made available as a downloadable PDF to facilitate efficient, informed and constructive licensing discussions.

Disclaimer: This document is provided for transparency and information purposes only. It does not constitute a legally binding offer, a contractual commitment, or a declaration of standard-essentiality. IPGATE AG is not subject to any mandatory FRAND obligations with respect to the patents described herein. The principles, methodologies and indicative rates outlined in this document reflect IPGATE AG's voluntary, FRAND-inspired licensing policy and serve as a non-binding orientation framework for potential licensing discussions. Any binding terms can arise only from a mutually executed written license agreement.

2. Our FRAND-Inspired Licensing Commitment

Patents protecting inventions for braking systems are not standard-essential in the sense of formal industry standards such as those set by standard setting organizations like ETSI in the field of wireless telecommunication. Within ETSI, members holding patents essential to a standard are required to declare such patents and to undertake to license them on fair, reasonable and non-discriminatory terms. This mechanism ensures access to standardized technologies, prevents abuse of market power, and maintains a balance between incentives for innovation and widespread industry adoption.

While IPGATE AG's patents are not subject to such formal obligations, IPGATE AG has chosen to voluntarily align its licensing approach with the same core principles. This FRAND-inspired policy is intended to level the playing field and to ensure access to the technology under conditions of transparency and non-discrimination. Under this approach, licensing terms are designed to be fair and reasonable, enabling commercially viable agreements while safeguarding the value of the underlying innovations. It also reflects IPGATE AG's understanding of fair play in licensing: open and predictable terms for willing licensees, combined with consistent protection of its intellectual property against misuse or infringement.

IPGATE AG protects genuine innovation. Recovering the substantial investments made in research and development is essential to ensure that today's groundbreaking inventions are properly rewarded and, above all, to enable the future breakthroughs that will continue to transform advanced braking and motion control technologies.

3. FRAND Principles Applied

In line with European and international jurisprudence and licensing practice, IPGATE AG applies the following FRAND-inspired principles. Fair and reasonable means that royalties reflect the incremental technical and economic value of the patented inventions, excluding any value attributable to market power, standardization effects, or unrelated vehicle features. Non-discriminatory means that similarly situated licensees are offered comparable economic conditions based on objective criteria such as technology scope and geographic coverage, rather than licensee-specific bargaining power. Good faith and transparency mean that the scope of the portfolio, territorial coverage, royalty base, rate logic, and calculation methodology are disclosed sufficiently to allow an informed licensing decision.[1]

In addition, IPGATE AG has taken into account the patent landscape and relevant patent holders, a contribution-based royalty logic, and geographic differentiation reflecting territorial enforcement realities. The validity of the IPGATE AG patents has been confirmed by four rulings of the German Federal Court of Justice[2] following extensive challenges by multiple industry participants.

4. Scope of the IPGATE AG Technology

The IPGATE AG patent portfolio comprises more than 400 granted and pending patents covering core technologies used in modern automotive brake-by-wire systems. These include integrated braking systems of different generations, systems for autonomous driving with redundancy concepts and multiple ECUs, and vehicle motion control architectures integrating braking, stability and torque vectoring functions.

In summary, the portfolio covers two core brake-by-wire architectures: one-box electro-hydraulic brake-by-wire systems with fail-safe functionality and two-box systems combining an electro-mechanical brake booster with an ESP unit. The portfolio addresses fundamental system architecture, control logic and safety-critical functions implemented across virtually all modern brake-by-wire solutions.

The portfolio is organized into several packages with a total of 177 independent main claims across multiple jurisdictions, including Portfolio A with 82 independent main claims and Portfolio B with 95 independent main claims.

[1] - Huawei v. ZTE; Case No.: C-170/13; Court of Justice of the European Union; Decision Date: 16 July 2015
- Unwired Planet v. Huawei; Case No.: [2020] UKSC 37; Supreme Court of the United Kingdom; Decision Date: 26 August 2020
- Microsoft v. Motorola; Case No.: C10-1823JLR; U.S. District Court Washington; Decision Date: 25 April 2013
- Sisvel v. Haier; Case No.: KZR 36/17; Federal Court of Justice of Germany; Decision Date: 5 May 2020

[2] - Patent: E87DE1; Case No.: X ZR 111/22; Decision Date: 13. February 2025
- Patent: E112DE; Case No.: X ZR 91/23; Decision Date: 17. July 2025
- Patent: E112DE1; Case No.: X ZR 134/23; Decision Date: 18. September 2025
- Patent: E112DE2; Case No.: X ZR 133/23; Decision Date: 21. August 2025

5. Patent Landscape

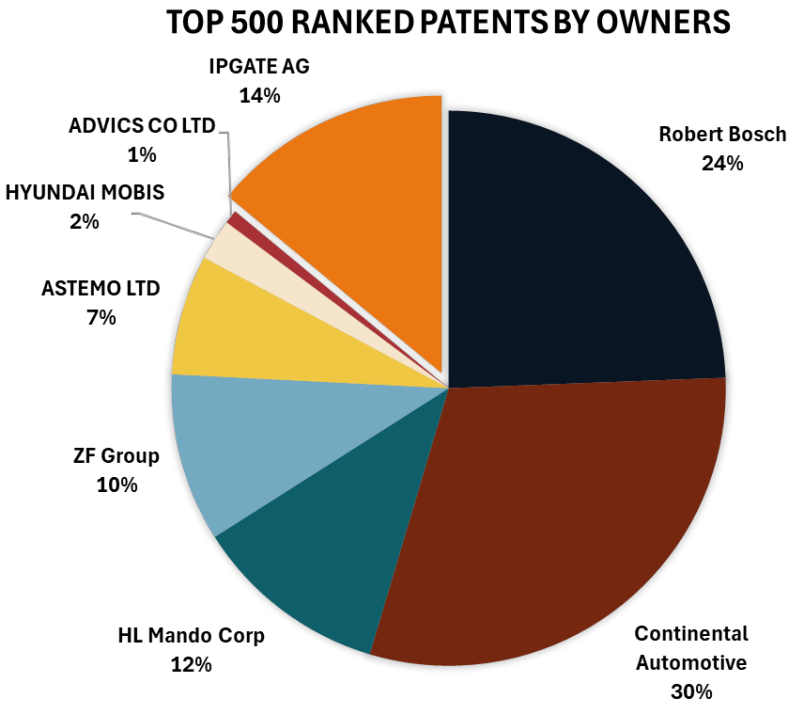
Brake-by-wire is characterized by a multi-holder patent landscape with relevant patent positions held by several major automotive technology suppliers. No single patent holder offers a complete freedom-to-operate license. The IPGATE AG portfolio covers a substantial share of the core architectural and control concepts used in modern one-box and two-box systems, including foundational system design and safety concepts that are widely implemented across the industry.

The top patent owners by number of patents and patent applications in the key technical field of electro-hydraulic brake systems are Robert Bosch, Continental Automotive, HL Mando Corp., ZF Group, Astemo Ltd., Hyundai Mobis, Advics Co. Ltd., and IPGATE AG.

However, the sheer number of filings is not a reliable indicator of portfolio strength, as it may reflect over-declaration rather than substantive value. To address this, IPGATE AG has developed an internal evaluation methodology that expands beyond raw counts and analyses citation networks using weighted criteria, including:

- Industry acceptance – Which companies cite the patent, and how significant are they as potential licensees or competitors?
- Remaining patent term – How many years of enforceable protection remain?
- Current relevance – Is the technology still actively cited, or did interest peak in the past?
- Geographic reach – Are companies across multiple jurisdictions citing the patent, indicating global commercial relevance?

Applying this valuation method to the broader patent landscape shows that 14% of the top 500 ranked patents are held by IPGATE AG, indicating a concentration of high-value assets relative to portfolio size.



6. Contribution-Based Royalty Logic and Appropriate Royalty Base

The licensed patents cover fundamental enabling technologies for brake-by-wire systems, including fail-safe architectures, redundancy and fallback logic, interaction between brake actuation and vehicle stability control, and core control algorithms required for regulatory compliance and functional safety in ASIL-D environments. These technologies are indispensable for modern brake-by-wire systems and have a substantial impact on vehicle safety, stability and drivability.

IPGATE AG offers a component-level licensing approach. This decision is driven by strategic considerations and by a commitment to fairness, transparency and proportionality. The brake-by-wire system represents the level at which the patented inventions are technically implemented and economically realized.

Accordingly, IPGATE AG applies the royalty base to the net sales price of the brake-by-wire system rather than the vehicle price. This approach ensures that the royalty remains closely aligned with the actual implementation of the patented technology while avoiding any attribution of value unrelated to the licensed inventions. It also provides a transparent and predictable framework for participants across the automotive supply chain.

7. Geographic Differentiation

Different royalty levels may apply depending on territorial exposure, in particular between brake-by-wire systems manufactured and used exclusively in China and systems manufactured in China but exported to jurisdictions where enforceable patent rights exist. Such differentiation applies consistently to the same system-level royalty base and does not depend on the identity of the licensee.

This differentiation is FRAND-consistent where it is based on objective differences in legal enforceability, litigation exposure, market structures and established international licensing practice. The differentiation is geographic rather than licensee-specific and is applied uniformly to all similarly situated implementers of brake-by-wire systems.

8. Portfolio Approach and Blended Rate

The licensed patents may be offered for negotiation as a single bundled portfolio covering the relevant brake-by-wire system technologies. This reflects the technical interdependence of the patented inventions across system generations and avoids unnecessary transaction complexity. Such a portfolio approach may be considered within the component-level licensing framework as a possible basis for licensing negotiations.

Where parts of the portfolio differ in territorial coverage or remaining patent lifetime, these differences are reflected internally in the blended rate rather than through fragmented or component-external pricing structures, provided that the overall rate remains proportionate to the portfolio's aggregate contribution to the brake-by-wire system.

9. Royalty Stacking and Aggregate Reasonableness

IPGATE AG recognizes that implementers of brake-by-wire systems may require additional licenses from third-party patent holders and that any FRAND-inspired assessment must consider the aggregate royalty burden at the system level.

By adopting a component-level royalty base and a proportionate, contribution-based rate, the proposed royalty structure is designed to leave sufficient economic headroom for other licensors, to avoid exclusionary or cumulative overpricing, and to remain compatible with sustainable economics across the automotive supply chain.

10. Indicative FRAND-Inspired Royalty Rates

The royalty is calculated as a percentage of the net sales price of the brake-by-wire system, resulting in a per-unit fee that scales with production volume and system value. The royalty rate does not apply to the vehicle price or to any other upstream or downstream value level.

The proposed royalty levels are derived from a holistic assessment of the relevant patent landscape, the technical and economic contribution of the IPGATE AG portfolio, comparable licensing practices in complex technology-driven industries, and the geographic differentiation described above. Based on this assessment, IPGATE AG considers the following indicative, FRAND-inspired rates to be appropriate for the complete portfolio: 5% per Licensed Product of the brake-by-wire system value for export markets with a minimum License Fee of CHF 5.00 and 0.5% of the brake-by-wire system value for the China domestic market with a minimum License Fee of CHF 0.75 per Licensed Product.

In addition to the patent license, licensees may obtain access to dedicated support and services provided through LSP Innovative Automotive Systems GmbH. These services include, in particular, the identification of optimal technological solutions, support for system integration into new or existing products, as well as piloting and testing activities. This offering is intended to facilitate efficient implementation, reduce technical integration risk, and accelerate time-to-market for brake-by-wire solutions based on the licensed technology.[3]

The following table summarizes IPGATE AG's indicative, FRAND-inspired royalty rates based on the brake-by-wire system royalty base and geographic scope.

FRAND-inspired royalty rates	
Export markets	5.0% of the net sales price of the brake-by-wire system with a minimum License Fee of CHF 5.00 per Licensed Product
China domestic	0.5% of the net sales price of the brake-by-wire system with a minimum License Fee of CHF 0.75 per Licensed Product

[3] Such support and services are available exclusively to licensees in good standing under a valid and effective license agreement with IPGATE AG and subject to the applicable contractual terms.

11. FRAND-Inspired Safeguards and Willingness to License

IPGATE AG confirms its willingness to engage in licensing discussions on terms reflecting fair, reasonable and non-discriminatory principles, taking into account the economic value of the licensed technology and the specific circumstances of its use at the brake-by-wire system level.

IPGATE AG's voluntary policy includes transparent disclosure of portfolio scope and representative claim charts, uniform application of its system-based royalty methodology, and good-faith negotiations with all willing licensees. Where appropriate, IPGATE AG remains open to judicial or arbitral determination of licensing terms.