

# H1 Results and Capital Markets Day

8 November 2022, Geneva

Celebrating ingenuity and inspiration





## Welcome

#### Andrea Borla, Chief Finance Officer



#### Program



Welcome & H1 results				
10.40 - 10.45	Welcome	Andrea Borla, Chief Finance Officer		
10.45 – 11.35	H1 results + webcast	Frank Rehfeld, Chief Executive Officer, Andrea Borla, Chief Finance Officer		
Capital Markets Day				
11.45 – 12.15	Strategic overview	Frank Rehfeld, Chief Executive Officer		
12.15 – 13.00	Lunch			
13.00 – 13.45	Electric Commercial Vehicles	Frank Steinert, Fraunhofer Institute		
13.45 – 14.25	Automotive and Charging Infrastructure	Rainer Bos, SVP Europe/Americas, Bastien Musy, VP Global Product Management		
14.25 – 14.40	Break			
14.40 – 15.20	Integrated Current Sensors	Thomas Hargé, VP Integrated Current Sensors		
15.20 – 16.00	Research & Development	Ian McNutt, VP Advanced Engineering and Software, Dominik Schläfli, Head of Innovation		
16.00 – 16.30	Keeping close to our customers	Maxime Rau, VP Sales Excellence		
16.30 – 16.40	Closing remarks	Andrea Borla, Chief Finance Officer		
Factory tour				
16.40		First coach to Geneva Airport		
16.40 – 17.00	Break and kitting-up for factory tour			
17.00 – 17.45	Factory tour for four groups			
17.45		Second coach to Geneva Airport		
Cocktail				
17.45 – 18.30	Cocktail			
18.30		Last coach to Geneva Airport		





# **Capital Markets Day**

8 November 2022, Geneva

# Celebrating ingenuity and inspiration



### What we hope you take away from today

Understanding and appreciation of ...

- > Mega trends driving our growth
- > Breadth and depth of our portfolio
- > The benefits of being a pure player in current sensors
- > The growth potential of electric vehicles, renewable power generation and charging infrastructure
- > The importance of Integrated Current Sensors (ICS) for existing and new applications
- > Key technologies driving our investments
- > The foresight and focus of our R&D organization
- > The strength of our customer relationships over decades
- > But above all, this is your opportunity to meet the team leading LEM's bright future







# **Strategic overview**

#### Frank Rehfeld, Chief Executive Officer



### What is ingenuity?



Ingenuity is a good word to describe LEM. It is a response that comes from a demand. Ingenuity is a mindset, accepting a way of thinking differently, listening to one's instincts and working on practical solutions that are needed.







### **Megatrends**

cenario

Key milestones in the pathway to global net zero emissions by 2050 Scenario



Source: International Energy Agency (2021), Net Zero by 2050, IEA, Paris

### LEM is strategically well positioned to benefit from megatrends

### **Megatrends**

#### ENERGY EFFICIENCY

Hailed as the cleanest, cheapest, most reliable source of energy, i.e. the energy we can avoid using

#### DECARBONIZATION

Energy production and use account for two thirds of global GHG emissions; industry under pressure to decarbonize

#### DIGITALIZATION

IoT – ubiquitous connected power consuming devices and smart sensors on the power

Smart Grid Uninterrupted **Power Supply** 



Certain energy uses get electrified, mainly heating and road transport

Automotive > Charging Infrastructure

#### Impact on LEM

- Automation ┢╺╋ Track
- Smart Grid
- Solar >











To a **digital**, renewable-based. customer-centric system, where flexible demand meets a variable supply



╞╺╋╺╉

╋╋

#### Current and voltage total market: +12% p.a.



- > Key drivers for the total market:
  - > Electrification of automotive
  - > Charging infrastructure
  - > Energy distribution
- Total market includes different measurement technologies
  - LEM focuses mostly on DC-based current measurement
- > LEM's market share is currently 20%

LEM portfolio overview





# **3000** Active product references

# Measuring from **0.005 - 24,000** amps



### New megatrends drive volume mix



LEM's portfolio mix by revenue



- More of LEM's revenue is > linked to structural megatrends, i.e., electrification and decarbonization
- This reduces the share of > heritage businesses from 65% in 2012 to 34% by 2027
- > New portfolio mix helps limit the impacts of economic recessions

#### LEM global footprint

1,600 people, 15 countries, 5 production and R&D sites



### The team here today

Speakers



Frank Rehfeld Chief Executive Officer



Andrea Borla Chief Finance Officer



**Rainer Bos** SVP Europe/Americas





**Frank Steinert** Head of Department Vehicle Systems, Fraunhofer Institute



**Bastien Musy** VP Global Product Management



**Thomas Hargé** VP Integrated Current Sensors



**Dominik Schläfli** Group Head of Innovation



lan McNutt VP Advanced Engineering and Software



Maxime Rau VP Sales Excellence



### The team here today

Other leaders





**Andreas Hürlimann** Chairman of the Board



Verena Vescoli Chief Technology Officer



Martin Hoffmann Strategic Accounts Manager





#### Program



Welcome & H1 results				
10.40 – 10.45	Welcome	Andrea Borla, Chief Finance Officer		
10.45 – 11.35	H1 results + webcast	Frank Rehfeld, Chief Executive Officer, Andrea Borla, Chief Finance Officer		
Capital Markets Day	/			
11.45 – 12.15	Strategic overview	Frank Rehfeld, Chief Executive Officer		
12.15 – 13.00	Lunch			
13.00 – 13.45	Electric Commercial Vehicles	Frank Steinert, Fraunhofer Institute		
13.45 – 14.25	Automotive and Charging Infrastructure	Rainer Bos, SVP Europe/Americas, Bastien Musy, VP Global Product Management		
14.25 – 14.40	Break			
14.40 – 15.20	Integrated Current Sensors	Thomas Hargé, VP Integrated Current Sensors		
15.20 – 16.00	Research & Development	Ian McNutt, VP Advanced Engineering and Software, Dominik Schläfli, Head of Innovation		
16.00 - 16.30	Keeping close to our customers	Maxime Rau, VP Sales Excellence		
16.30 - 16.40	Closing remarks	Andrea Borla, Chief Finance Officer		
Factory tour				
16.40		First coach to Geneva Airport		
16.40 - 17.00	Break and kitting-up for factory tour			
17.00 – 17.45	Factory tour for four groups			
17.45		Second coach to Geneva Airport		
Cocktail				
17.45 – 18.30	Cocktail			
18.30		Last coach to Geneva Airport		
LEM		Capital Markets Day 2022 08		



# Automotive

#### Rainer Bos, Senior Vice President Europe/Americas



#### Introduction



- > The automotive industry is going through unprecedented changes
- > Electrification is underway and there is no way back
- > Electrification of automotive powertrains and the deployment of charging infrastructure is posing significant challenges to corporations in the value chain
- > LEM plays a pivotal role in the electrification journey as a provider to solutions for electrification of the automotive industry



### **Electrification is accelerating**

EVs will represent about 30% of worldwide car production in 2027

PHEV + BEV annual car production (m units)



Source: IHS alternative propulsion forecast, LEM analysis



#### The current sensor market for Automotive

Market evolution from 2022 to 2027





#### Battery management systems

- > Range autonomy
- > Thermal management for safety aspects

#### **Motor control**

Deployment of 800V architectures (size and cost)

#### **Power conversion**

> Sensors monitor DC DC converters

#### **Electrical safety**

 Residual current detection sensors are protecting consumers from electrical hazards

### An unparalleled product portfolio in the industry

LEM is the sole pure player in current sensing





- > Diverse product portfolio
- > High level of customization
- > Key process: final calibration
- > Embedded software
- > Expertise in automotive regulations

### LEM's contribution to the Automotive sector

Cost optimization and system safety are paramount to EV adoption





### **Adjacent markets**

#### Growth opportunities beyond passenger cars



2030 projections	Share electrified (in %)	Sales forecast (in M units)
Passenger vehicles	> 40%	40M
2-3 wheelers	> 50%	50M
Buses	> 60%	0.2M
L/M/H Commercial Vehicles	~ 30%	6M





### Conclusion

LEM is at the heart of the electrification of the industry

- > Current sensing is a key enabler to the adoption of affordable, safe, fun-to-drive Electric Vehicles. Performance matters
- > Our company offers unparalleled experience in current sensing and the largest portfolio in the industry
- > The boom in the industry offers short and long-term growth opportunities for LEM
- > The company is ideally positioned to support customers in the electrification era





# **Charging infrastructure**

#### Bastien Musy, Vice President Global Product Management



#### Capital Markets Day 2022 08.11.2022 29

#### Introduction

Enabling the access to fast, easy-to-find, and affordable charging

- > A seamless charging experience: a must for mass EV adoption
- > Cost transparency and reasonable prices are important to convince consumers
- > Regulatory landscape enforcing metering for better consumer information
- > LEM has developed innovative DC metering products for charging stations





### **E-mobility infrastructure**

How to charge an EV: AC and DC chargers







### **E-mobility infrastructure**

AC or DC chargers: use cases



#### **LEM focus**





### Segmentation by geographies & regulations

Geography and regulation set DC metering requirements



#### North America –

- Biden's Bipartisan Infrastructure Law \$7.5 bn to build out a nationwide network of 500,000 EV chargers
- DC energy metering regulated at charger level
- California: first state to enforce regulation in Jan 1<sup>st</sup> 2023

#### Europe

- EU's "fit for 55" plan commits to 3.5M charging points by 2030
- Regulation at meter & charger levels
- National regulations amid European harmonization

#### China

- Peak carbon emissions by 2030 and carbon neutrality reached by 2060
- Regulation at meter level, since 2012
- Evolution of regulation towards certification at **charger level in 2023**





#### Capital Markets Day 2022 08.11.2022 34

### Creating a compelling offer for charging stations

#### LEM can leverage its unique portfolio

LEM's large portfolio addresses 3 key functions in charging stations:

- > LESR to regulate the power
- > CDSR to detect current leakage
- > DC meter to measure and issue certified billing information





#### CAGR +21%

Super charging station (250-400 kW)

Mega charging station (>400 kW)



■ Wallbox (< 50 kW)

■ Fast charging station (50 -250 kW)



LEM is the market leader on metering solutions for DC charging

DC Metering market (CHF m)



#### **DC Metering – market structure** Value markets in Europe and US





Source: Guidehouse EV Charging Equipment + LEM
# LEM's market leadership in DC Metering

Strong brand equity owing to innovation and quality





Innovative design for easy integration in the charging equipments. Plug-and.play with customer systems



Manufactured in Geneva, Switzerland



In-house expertise in metrology to comply with European and US regulatory authorities



Testing and calibration skills are key to guarantee top quality products to our customers

# Conclusion

A key growth opportunity for LEM



- > Mass EV adoption requires fit-for-purpose charging equipment, adapted to all types of usage
- > Massive government support for the rollout of charging infrastructures
- > Consumer information and transparent electricity billing is gradually enforced
- > LEM's strong product portfolio and metrology expertise support the deployment of EV charging infrastructure





## Program



Welcome & H1 results		
10.40 – 10.45	Welcome	Andrea Borla, Chief Finance Officer
10.45 – 11.35	H1 results + webcast	Frank Rehfeld, Chief Executive Officer, Andrea Borla, Chief Finance Officer
Capital Markets Day		
11.45 – 12.15	Strategic overview	Frank Rehfeld, Chief Executive Officer
12.15 – 13.00	Lunch	
13.00 – 13.45	Electric Commercial Vehicles	Frank Steinert, Fraunhofer Institute
13.45 – 14.25	Automotive and Charging Infrastructure	Rainer Bos, SVP Europe/Americas, Bastien Musy, VP Global Product Management
14.25 – 14.40	Break	
14.40 – 15.20	Integrated Current Sensors	Thomas Hargé, VP Integrated Current Sensors
15.20 – 16.00	Research & Development	Ian McNutt, VP Advanced Engineering and Software, Dominik Schläfli, Head of Innovation
16.00 – 16.30	Keeping close to our customers	Maxime Rau, VP Sales Excellence
16.30 – 16.40	Closing remarks	Andrea Borla, Chief Finance Officer
Factory tour		
16.40		First coach to Geneva Airport
16.40 – 17.00	Break and kitting-up for factory tour	
17.00 – 17.45	Factory tour for four groups	
17.45		Second coach to Geneva Airport
Cocktail		
17.45 – 18.30	Cocktail	
18.30		Last coach to Geneva Airport





# **Integrated Current Sensors**

Thomas Hargé, Vice President ICS



## Introduction

- > An Integrated current sensor is a miniature current sensor
- > It is the natural evolution for most of LEM's sensors below 100 amps
- > It enters in new applications where size and cost were preventing the usage of other LEM sensors
- > It is built on standard semiconductor equipment allowing cost reduction while making the production more scalable
- > LEM is winning on ICS through significant investments and focus as a pure player in sensors







## An ICS is a current sensor in a "chip"





- > Current carried by the lead frame
- > Generating a magnetic field
- > Measured through a Hall Chip
- > With galvanic isolation



## ICS will be used across all 5 businesses









# ICS are the natural evolution of LEM current sensors

Miniaturization trend for LEM sensors below 100 amps







**Price** 

# ICS will represent a growing share of the whole market



#### Global current sensor market (CHF m)



Current sensor except ICS

- > Small but growing share in value
- > In units the share is more significant
  - > ~25% in 2022
  - > ~38% in 2027



# ICS address a large and fast growing market

Market and applications





# Matching solutions to customer needs

ICS solutions











## GO:

- > Features:
  - > Fast & accurate
  - > Medium currents

#### > Applications:

> E-bikes

## HMSR:

- > Features:
  - > Fast & accurate
  - > Medium currents
  - > High isolation
- > Applications:
  - Solar inverters

## HMSR DA:

- > Features:
  - > Digital output
  - > Medium currents
  - > High isolation
- > Applications:
  - > Servo drives

# GXL: > Features:

- > Fast & accurate
- > High current (80A)
- > Applications:
  - > Onboard chargers



## LEM will win through strong focus and investments Product releases





Number of ICS products released

- Competitors started earlier than LEM
  - > 14 ICS released between 2010 and 2018
  - > Dominated by one player
- > LEM is already #2
  - > 4 products released since 2019
  - > 100% focused on current sensors
- > We will continue to release products
  - > Tailored to key applications
  - > With best-in class performance

Source: Companies' websites

## We leverage LEM's know-how to build ICS products







## We use the fabless semiconductor model







# We are building a team of passionate experts







- > Team organized for speed
- > Benefiting from LEM's market access
- > Supported by LEM's investment resources

### > With strong and diverse experts

- > Strong focus on talent development and acquisition
- > Bringing expertise from major semiconductor companies
- > Leveraging LEM's 50 years of experience



### > Expanding outside Geneva

- > Most of the team is in Switzerland
- > Now recruiting in Lyon/Grenoble area
- > As well as in our new factory in Penang, Malaysia

## Conclusion

> Integrated Current Sensors are changing the market offering by all players

- > They allow LEM to seize new opportunities
- > They address industrial and automotive applications as well as new markets
- > LEM is ideally positioned through application knowhow and ASIC design expertise
- > We will win through consistent investment and focus









# **Research & Development**

# Ian McNutt, Vice President Advanced Engineering & Software Dominik Schläfli, Group Head of Innovation



## Introduction

> Developing innovative products is integral to LEM's company culture

- > LEM has a network of R&D centres across Europe and Asia
- > We anticipate industry trends to position LEM optimally
- > LEM continues to invest significantly in R&D to support future growth





# Organization

160 skilled engineers and project leaders and growing





## **Innovation process**





## **Innovation process example**

Sensor for photovoltaic generation





high insulation high surge capability

assembly technology

packaging technology high surge, high insulation for 1500V applications

with digital output



# **Industry trends**

## Functional safety and security

## Functional Safety

- > Protect human life and health
- > Laws of physics and probability

# Example: Start & Sta

## Example: Start & Stop

- > Sensor part of safety concept
- > Only stop engine if sufficient charge

## Security

- > Protect systems
- > Malicious actors

## Example: EV charging station

- > Energy meter for billing
- Secure firmware update

## Requires a standards compliant development processes

## Requires new competencies and roles

- > System engineering
- > Functional safety management



# **Industry trends**

## Factors facilitating miniaturization leading to multiple benefits





# **Strategic focus**

## Megatrends as a succession of waves





## **Pipeline** Challenges and opportunities







## **Pipeline example**

Automotive battery management (BMS)









#### LEM's first in BMS sensing

- > Highest accuracy
- > Fluxgate based
- > Under cost pressure

#### Shunt resistor + isolator

- > Precision resistive alloy
- > 5 chips
- > Heating a challenge

#### Breakthrough Hall sensor

- > Magnetic core
- > 1 chip
- > More reliable



# **Pipeline example**

Electrical safety for EVs, charging infrastructure, and photovoltaics



#### Minute difference currents

- > Magnetic core based
- > Only game in town
- > Expensive materials

### **Digital signal processing**

- > Simpler, smaller magnetics
- > Same performance
- > Material savings (Cu, Ni, Co)



Source: Zentar

#### Advanced packaging

- > Smaller magnetics
- > Material substitution (ferrite)
- > Material savings (Cu)



# LEM success story – DC meter

New site, new team, new product







LEM Tech France, Lyon



Test bench



DC meter in the field

## **R&D** investment





## > R&D investment 2021/22 of CHF 29.3 million

## > Since 2017 significant increase in investment

- > Growth of teams in China and Bulgaria
- > Growth of ICS team in Geneva
- > New R&D team in Lyon
  - > DC metering
  - > Battery management
  - > Embedded software
- > Innovation team increased



## Conclusion



- > Investment in R&D continues at a high level
- > We closely follow the market and technological trends
- > We build new competencies to remain at the forefront of technology
- > Our teams have the skills to deliver high quality but cost optimized solutions which our customers love







# Keeping close relationships with customers

Maxime Rau, Vice President Sales Excellence



## Introduction



- > We understand who our customers are and what they need
- > We are present at each step of the buying cycle and customer journey
- > LEM's value proposition
  - > Qualified sales force
  - > Ability to co-develop
  - > Strong geographic coverage
- > 50 years of success



# Who are our customers?

Three types of customers

### **Time to Market**

## Endorsers

Companies working as design centers on development contract basis with no intention to produce in volumes:

- Eager to shine as innovative and pushing technical boundaries

- Able to influence their customers to use their preferred solutions

 $\rightarrow$  Require application knowhow

## Trendsetters

Companies that influence market either through:

- Commercial scale / Global reach
- Technical leadership

→ Require strong relationship, codevelopment and loyalty





**Followers** 

approved solutions

Companies who are focused on

Carry over of existing designs
Use of standard and already

 $\rightarrow$  Require fast local support

short time to market through:




# Who are our customers?

Example: Advanced Design Engineer





"I always need to find compromise to come up with the best technical design at the best cost."



#### Personality



#### **Professional goals**

- > Loves technical challenges
- > Does not like to do same things again
- Is motivated by transforming ideas into real products and patents
- > Enjoys exchanging with peers

#### Expectations from suppliers

- > Solution providers
- > Collaborative spirit
- > responsive

## Buying cycle and customer journey

Endorsers' + trendsetters' support is a long-term investment





4-5 years investment

LEM

7 to 15 years return

#### LEM's value proposition

How does LEM differentiate from competition?





#### **Qualified sales forces**

Experienced, loyal and with strong technical background

- > 15.6 years average experience in Technical Sales
- > 10.9 years average length of service for LEM
- > 80% holding a Technical Engineering degree



#### **Business Sector Sales background**



# Engineering qualification Electronics Electrical Engineering Automation Other N/A





#### **Co-development expertise**

Example of collaboration





Figure 3: Enhanced DCM™1000 application kit incorporating the customized LEM HAH1 current sensor

"Customized Current Sensor Enables High Power Density Electric Vehicle Inverters"

Bodo's Power Systems, April 2021



#### LEM global footprint

Close to customers for fast response



Sales R&D Production Customization

. .

Frankfurt, Germany	•	
Vienna, Austria	•	
Brussels, Belgium	•	
Randers, Denmark	•	
Paris, France	•	
Padova, Italy	•	
Skelmersdale, UK	•	
Lyon, France	•	
Sofia, Bulgaria		
China		
Beijing		
Shanghai	•	
Shenzhen	•	
Xian	•	
Hefei	•	
Taipei, Taiwan	•	

#### North America

Europe

Geneva, Switzerland

Milwaukee, Wisconsin Columbus, Ohio Amherst, Massachusetts Los Angeles, California

#### Rest of world

Pune, India	•		
Seoul, South Korea	•		
Tokyo, Japan	•		
Tver, Russia	٠	•	•

Agents/distributors O





## Supporting fast growing local businesses

Acceleration of revenue from pilot to multiple customers





Shorter time to market with followers from pilot engineering blocks



New technologies drive miniaturization Precision DC and AC current sensors are getting smaller and smarter.







# **Closing remarks**

#### Andrea Borla, Chief Finance Officer



### What we hope you take away from today

Understanding and appreciation of ...

- > Mega trends driving our growth
- > Significant R&D investment to capture opportunities
- > Breadth and depth of our portfolio
- > The growth potential of electric vehicles and charging infrastructure
- > The importance of Integrated Current Sensors (ICS) for existing and new applications
- > Continued development of our traditional businesses Automation, Track, Renewable energy
- > Ambition to grow at least as quickly as the market low double digits
- > CHF 600 million sales within the next five years (2027/28)
- > Maintaining EBIT margin of around 20%





#### Program



Factory tour				
16.40		First coach to Geneva Airport		
16.40 - 17.00	Break and kitting-up for factory tour			
17.00 - 17.45	Factory tour for four groups			
17.45		Second coach to Geneva Airport		
Cocktail				
17.45 – 18.30	Cocktail			
18.30		Last coach to Geneva Airport		



## New global HQ "The Hive" in Meyrin, Geneva



- > Home to about 250 employees working in R&D, engineering, production, sales, and corporate functions
- > Symbol of our ambition and our way of working:
  - > Agility
  - > Transparency
  - > Collaboration
- > State-of-the art work environment, including spaces for innovation
- > Reflects sustainability principles of our businesses
- > Will inspire current and future LEM people to fulfil their potential and continue devising ingenious solutions





#### **Factory tour groups**



Leading the world in electrical measurement, LEM engineers the best solutions for energy and mobility, ensuring that our customers' systems are optimized, reliable and safe.