

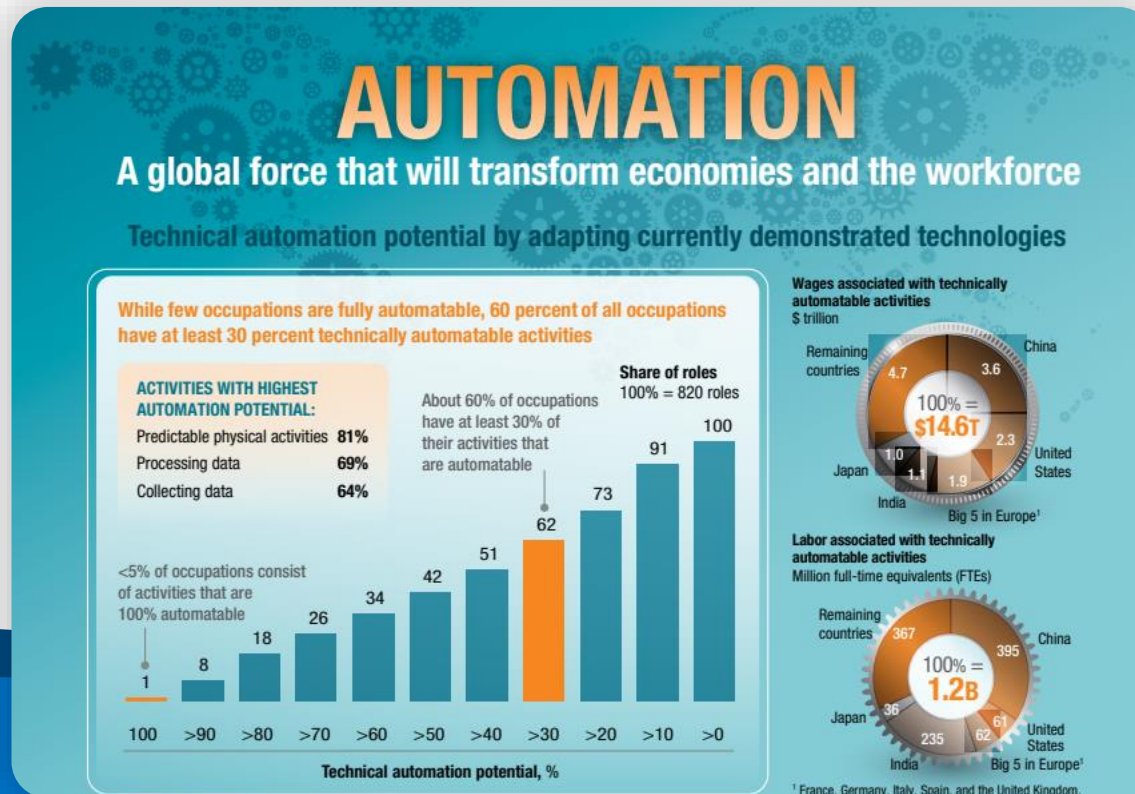
ARCHIMEDES DRIVE

imSystems

The most **versatile**, **cost competitive**, and **scalable** robotics drive technology



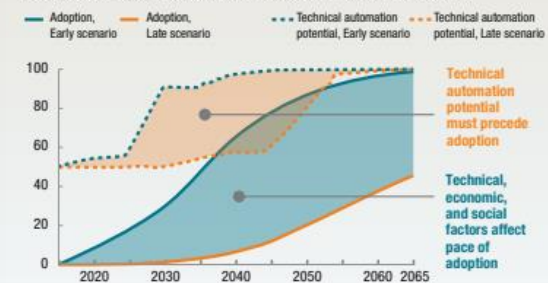
Automation is the Future



Five factors affecting pace and extent of adoption

- 1 TECHNICAL FEASIBILITY**
Technology has to be invented, integrated, and adapted into solutions for specific case use
- 2 COST OF DEVELOPING AND DEPLOYING SOLUTIONS**
Hardware and software costs
- 3 LABOR MARKET DYNAMICS**
The supply, demand, and costs of human labor affect which activities will be automated
- 4 ECONOMIC BENEFITS**
Include higher throughput and increased quality, alongside labor cost savings
- 5 REGULATORY AND SOCIAL ACCEPTANCE**
Even when automation makes business sense, adoption can take time

Scenarios around time spent on current work activities, %



MCKINSEY GLOBAL INSTITUTE

We've only automated 1/3rd of what should be possible

The world *should* automate the half billion FTE worth of dangerous, dirty, difficult manual labor jobs out there

Why has this not happened yet?

- Robots not yet good enough
- Robot development programs are very expensive
- High-value & low-mix jobs were the first to be automated, remaining labor is much harder to automate

Automation has a problem

Speed reducer (drive) issues are **the main bottleneck for mass deployment of new robots.**

“Gears are the single most cost driving component of robot arms, and if you are looking for lower cost, one of the first spec features you have to let go of is backlash”

–Jonas Haulin, Global System Architect ABB Robotics

The speed reducer sets your baseline

- All effort goes through the speed reducer; A robot’s accuracy, speed, efficiency, safety are *all* driven by the speed reducer
- Speed reducers are already the *most expensive* part of the physical robot

“It is now quicker to gestate a baby than secure a reduction gear from Harmonic Drive Systems”

–Financial Times

Harmonic Drive order backlog

	FY03/21				FY03/22				FY03/23
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Production	8,771	8,471	8,687	10,372	11,753	15,029	15,136	14,988	16,980
Order backlog	9,174	8,181	9,406	13,415	24,741	35,117	46,044	50,346	51,478



“The robot speed reducer makes up 36% of material costs and governs [the] important performance indices of an industrial robot. As far as the robot system is concerned, the precision reducer business is the core profit center of the entire robot industry chain”

–Erica Li, HSOAR Robotics

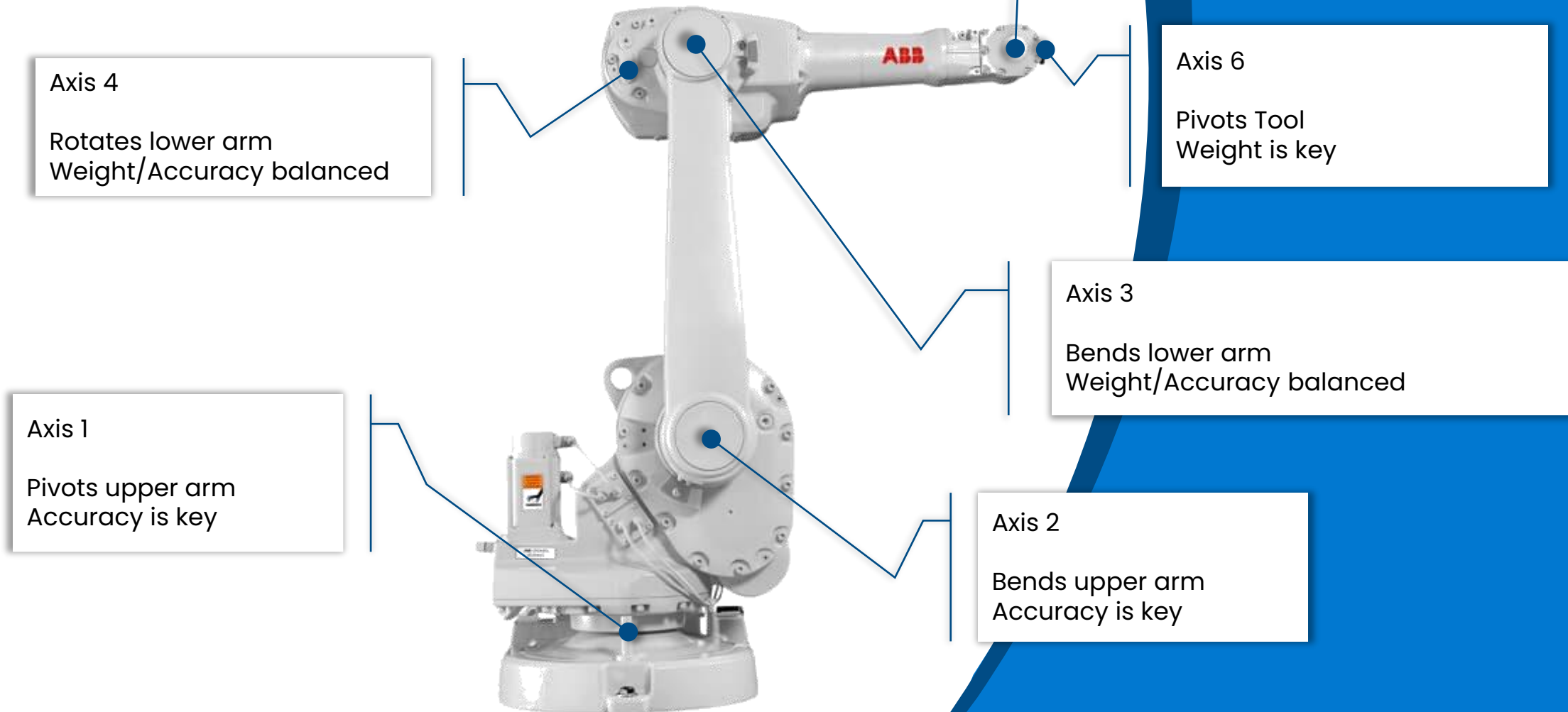
If you go on to the factory floor at any major robot builder – you will see that 80% of the work being done, is being done by humans

This is a profound statement about how much further robots need to come before they are truly universal

We make that jump possible

But what is a speed reducer?

Speed reducers turn high speed, low torque electric motor power into the low speeds and high torques needed at each axis of industrial robots. Today the solution is a Strain Wave or Cycloidal type reducer. We replace those solutions.



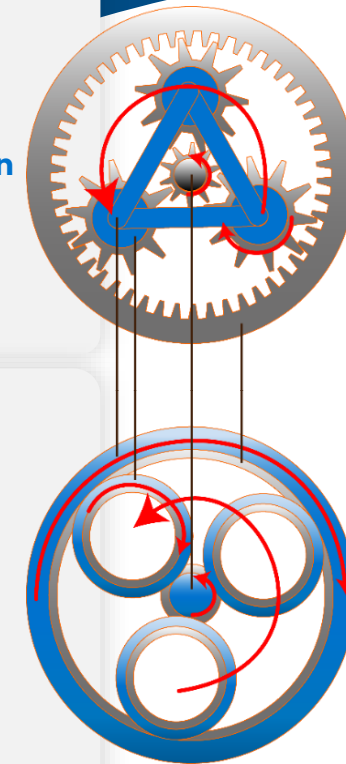
Our **patented** invention is a unique traction-based speed reducer that provides performance improvements **across the board**

TECHNICAL ADVANTAGES

- ∞ Uses **rollers, not gear teeth** to transmit power – always smooth, stiff, and with **zero backlash¹** improving the **controllability** and **accuracy (x6)**
- ∞ **High gear ratio** (i.e. the reduction in speed and increase in torque) enables **lighter robots that can manage heavier weights** (~18% more payload)
- ∞ Unparalleled **efficiency (>95%)** due to minimal friction with rolling contact

MANUFACTURING ADVANTAGES

- ∞ **Standard materials** – highly pure steel used to make bearings is available at **low cost and high quantity**
- ∞ Individual parts have **simple & consistent shape profiles**, allowing for fast **customization** and flexible production lines for more **responsive lead times**
- ∞ **Simple** production process developed from roller bearing production – **any** bearing manufacturer already **has sufficient capacity** to make enough components for IMSystems to **supply every drive** for the complete robotics industry.



¹**backlash** is the clearance between gear teeth needed to allow for free movement. Backlash allows the output of a drive to move slightly, even if the input is held rigidly.

Solution: Simple Design, Many Benefits

The **Archimedes Drive** is the **ultimate versatile solution**, addressing all key challenges in the industrial robotics market (for **every axis**, in **any robot**)

PROBLEM

SUB-OPTIMAL
PERFORMANCE

EXPENSIVE,
COMPLEX, AND
NON-
SCALABLE

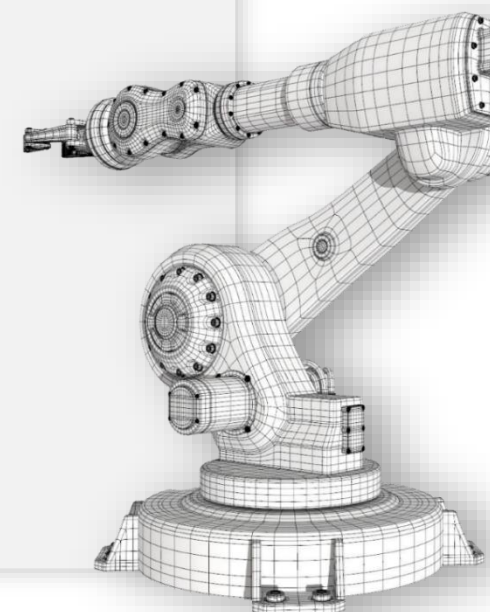
NON-
RESPONSIVE
SUPPLY

ARCHIMEDES DRIVE

Balanced design for an **optimal performance in all the axes of the robot** (robot engineers don't need to choose anymore!)

Easy to manufacture and scale by using simple steel hollow cylinders instead of gear teeth (up to **50% cost reduction**) – simple cylinder profiles mean customization does not require new tooling

Short order delivery time and **no dependency on Japanese suppliers**. Competing tech requires high mix low volume parts – with minimal interchangeability.



What has IMSystems proven?

ACCURACY

Internal & external testing by **Mitsubishi** shows that the Archimedes drive has true zero backlash behavior, and less than a quarter the lost motion of any other commercial drive

"The lost motion is small ($6e-5$ rad), so positioning accuracy can be improved"

-Koichi Nakamura, GM Global Research and Innovation, Mitsubishi Heavy Industries

SPEED

IMS has shown live demos at **Automatica** operating at controlled accuracy with more than twice the speed of any operational robot

"That's very impressive"

-Mattias Medel, CTO, Harmonic Drive Systems

PRODUCTION COST

Production cost analysis by **Linamar Corporation** shows that the Archimedes Drive can be produced for less than any existing alternative

"I think your processing technology is amazing"

-Kazuma Otaka, Machine Plant No. 1, Mitsubishi Heavy Industries

LIFETIME

IMSystems has a dedicated lifetime test facility, developed in cooperation with **ABB Robotics**. We have shown longer life under harsher conditions than required by industry

Value Proposition in Practice

Case Study: New welding AD (Archimedes Drive) for Body in White welding cell to build new sedan

OLD WELDING ROBOT

€35,000 Base Price
 €30,800 Base Cost
 12% Margin
 €52.5m Line Revenue
 €6.3m Line Profit

5 Old Robots
 €175,000 Robot Capex
 70 Operations Per Minute
 Spot Welding Only

NEW WELDING ROBOT AD (Archimedes Drive)

€50,000 Base Price **+42%**
 €30,800 Base Cost **0%**
 37% Margin **+208%**
 €75m Line Revenue **+43%**
 €27m Line Profit **+330%**

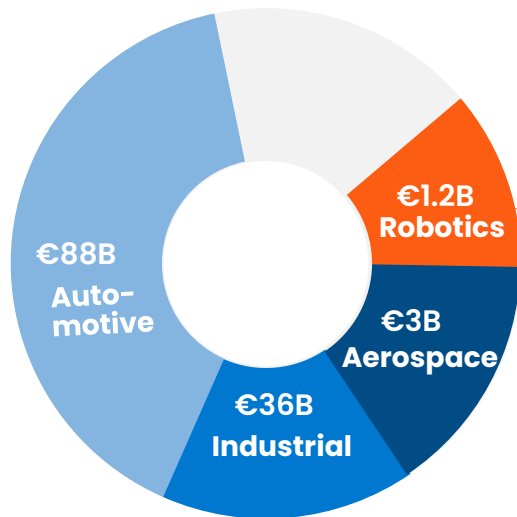
3 New AD Robots **-40%**
 €150,000 Robot Capex **-14%**
 114 Operations Per Minute **+62%**
 Spot + Continuous Welding **+Continuous Welding**
Smaller Cell Footprint



Market

Industrial robots have a unique need for high accuracy, high torque, and good cost – causing **rapidly increasing demand** for high-end speed reducers

€ 128 Billion
Worldwide Speed
Reducer Market



Robotics are a small piece of the global speed reducer market

Robots demand high accuracy – one of our strongest technical characteristics

Demand for drives in the robotics market is growing by 15% YoY

€ 1,200 Million
Industrial Robot Speed
Reducer Market
Growing at 15% CAGR



Precision Reducers
€ 1,000 M



Standard Reducers
€ 200 M

Customer Dynamics

- Industrial robots are commodities – largely interchangeable at the customer level (limited brand power)
- Drives are not commodities though – you *cannot* substitute company A for company B, without significant re-engineering & re-qualification; in practice this never happens
- Major robot OEMs are squeezed between a supplier duopoly (Harmonic Drive, Nabtesco) & their own clients (primarily automotive mfg.) with very hard requirements
- Robots have a long development cycle – 2-3 years from greenlight to product, and 7+ years in production
- Leads to robot OEMs being very risk averse – they don't want to innovate, but at the same time, they are acutely aware of the risk of someone else moving first

Commercial Adoption

Early Adopters (go-to-market)

- Two types: SMEs in a competitive & fragmented market (delta pick-and-place) & new product developers at large OEMs testing for future solutions
- Approach delta SMEs with compelling in-hand demonstration units & measured test data
- Convert first SMEs by pricing aggressively better than competitors & offering superior warranty



Majority (growth)

- Approach OEM product developers with overall productivity analysis
- Convert OEMs with successful pilot projects & de-risking lifetime performance anxiety
- Use successful pilots to bridge the chasm with secured development contracts



They are already paying us to test our prototypes...

Market Disruption

Industrial robots OEMs have a unique need for high accuracy, high torque, and cost efficiency – causing **rapidly growing demand** for high-end speed reducers. Buyers of speed reducers **primarily Japanese and European OEMs**.

2026–2028: SPEED REDUCER BUYERS WITHIN THE INDUSTRIAL ROBOT MARKET

SOM NOW (2022): €20m
Pick + Place & Special Applications



11% CAGR



SAM (2028): €1.75b
Welding + Handling



12% CAGR

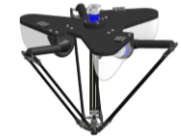


TAM (2028): €2.2b
All Robotic Applications



13% CAGR

From today



- 360° rotation by integrating the motor, yoke, & sensor
- Torque density 30% better than existing actuators by optimizing materials & motor integration
- 15% more compact than existing actuators by eliminating redundant components

To tomorrow



MID-TERM GOALS

2030: €477M REVENUE

2035: LEADER OF DRIVE TECHNOLOGIES FOR THE GLOBAL ROBOTICS MARKET

Competition

IMSystems is the **only viable player** with potential for **world leadership**

Legacy incumbents controlling 85% of the speed reducer market

Nabtesco
Cycloidal

HD
HARMONIC DRIVE
Strain Wave

Sumitomo
Drive Technologies
Cycloidal

Me-too imitators using similar technology with 5% of the market

Nidec
Strain Wave

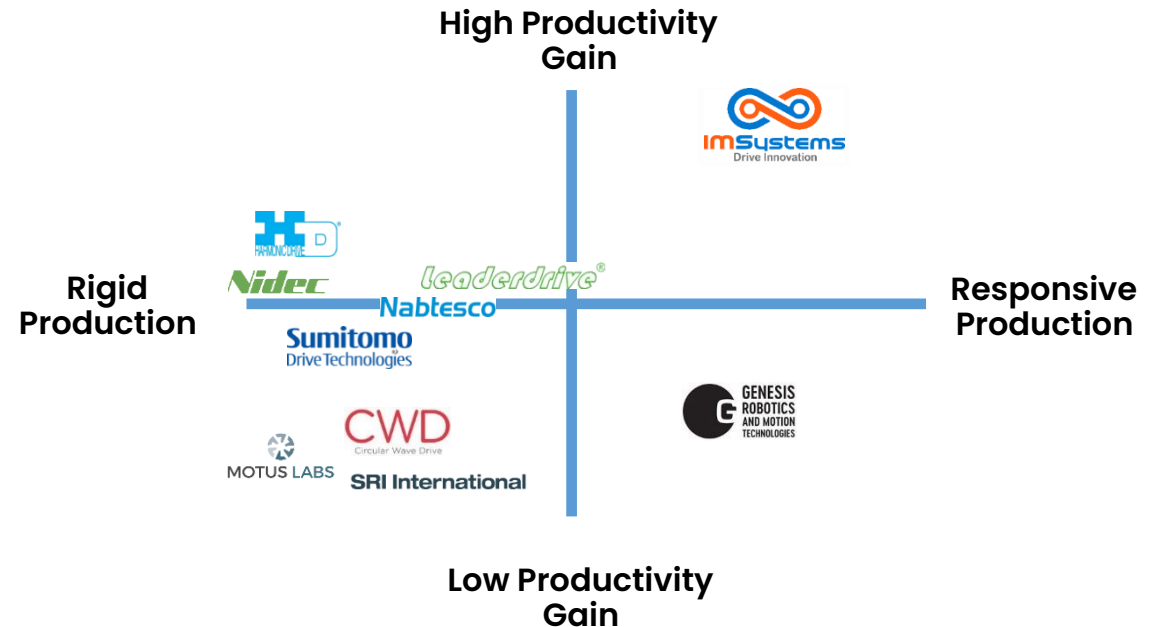
绿的谐波
leaderdrive[®]
Strain Wave

New challengers using proprietary technologies & little or no market presence

MOTUS LABS

Genesis Robotics & Motion Technologies

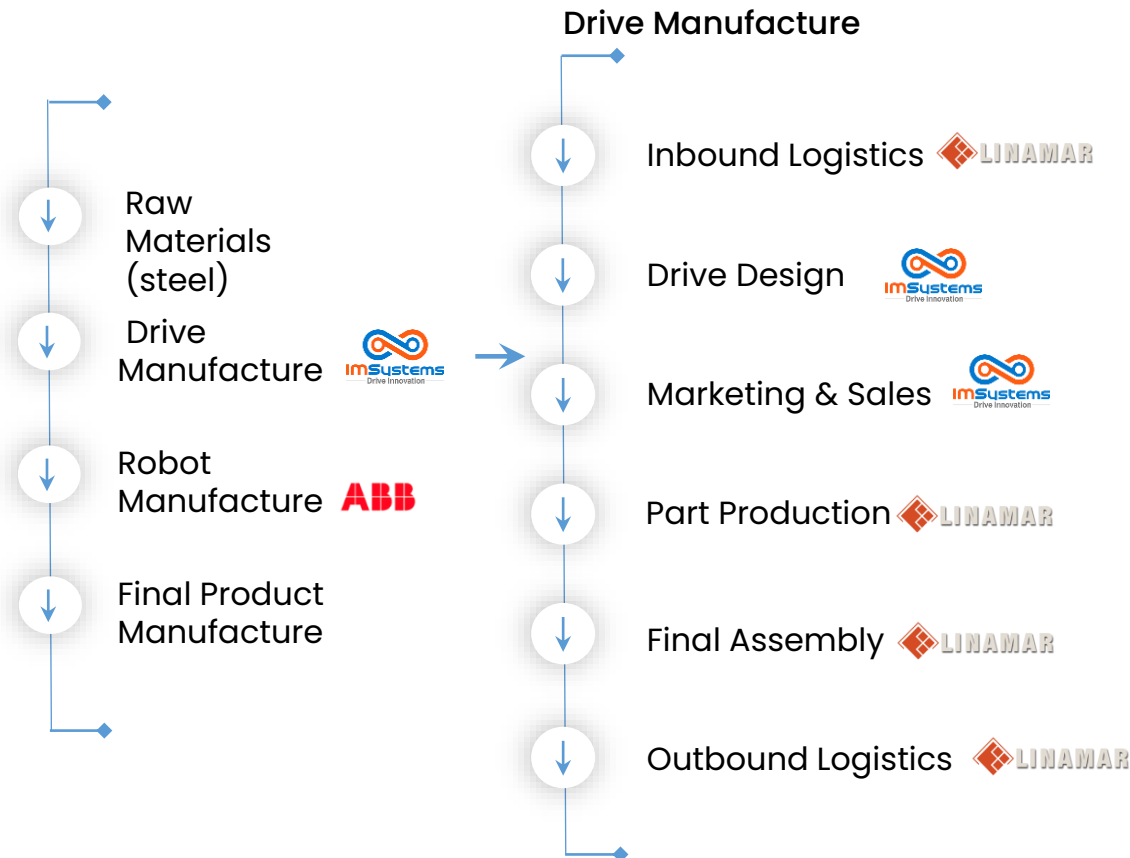
SRI International



Business Model

Selling tailored versions of standard drives to robotics companies (universal applicability: all axes, all robots), offering them a performance advantage at a **premium, but competitive price**

Value Chain



Pricing

- The high-performance Archimedes Drive will be offered at a **slight premium**, but still **affordable price**: ~ €550
- Manufacturing agreement with Linamar guarantees 1st unit cost at full volume pricing, delivering **margins up to 60%** from day one & a production cost which is lower than the competition's
- This **margin gap** – between the premium price point and a locked in lower production price is an **inherent structural advantage** because we can remain substantially profitable when our competition cannot

Key Partners + Investors

- ABB** Investor & key sparring partner for our technology
- LINAMAR** Investor & key manufacturing partner (contractually committed to all production build-out CAPEX for 7 years)
- finindus** Investor & key technical partner (OCAS & ArcelorMittal cutting edge steel knowledge)

TEAM



Jack F. Schorsch, MSc

Founder, Inventor & CEO

- 15 years experience in robotics and prosthetics
- Led first in man test for DARPA bionic limb



Drs. Ir. Rory Deen

Co-Founder & CFO

- +5 Million in capital raised
- Forbes 30 under 30



Ir. Alfons Schure

CTO

- Developed highest accuracy, highest torque traction drive on record



Ir. Thibaud Verschoor

Head of Product

- Managed pilot projects with ABB, Comau, & Bosch
- Forbes 30 under 30



Ir. Matthew Corvers

Head of Production

- Developed all the internal IMS operational processes
- Forbes 30 under 30

6 Engineers w/ PhD & Ms in Netherlands

7 Business Developers in Europe, US, & China

2 PhDs attached to the Technical University of Delft & University of Twente

Board Members



Hans Maenhout

Finindus

Hans Maenhout is Investment Director at Finindus, a joint investment company of ArcelorMittal and the Flemish Region



Sam Cocca

Linamar

Sam Cocca is the Group President, Europe of Linamar Corporation



Bart van Mierlo

Independent Board Member

Bart van Mierlo is the co-founder of Science [&] Technology Corporation, S[&] T, delivers Solutions and Services for Space, Science and Defense domains








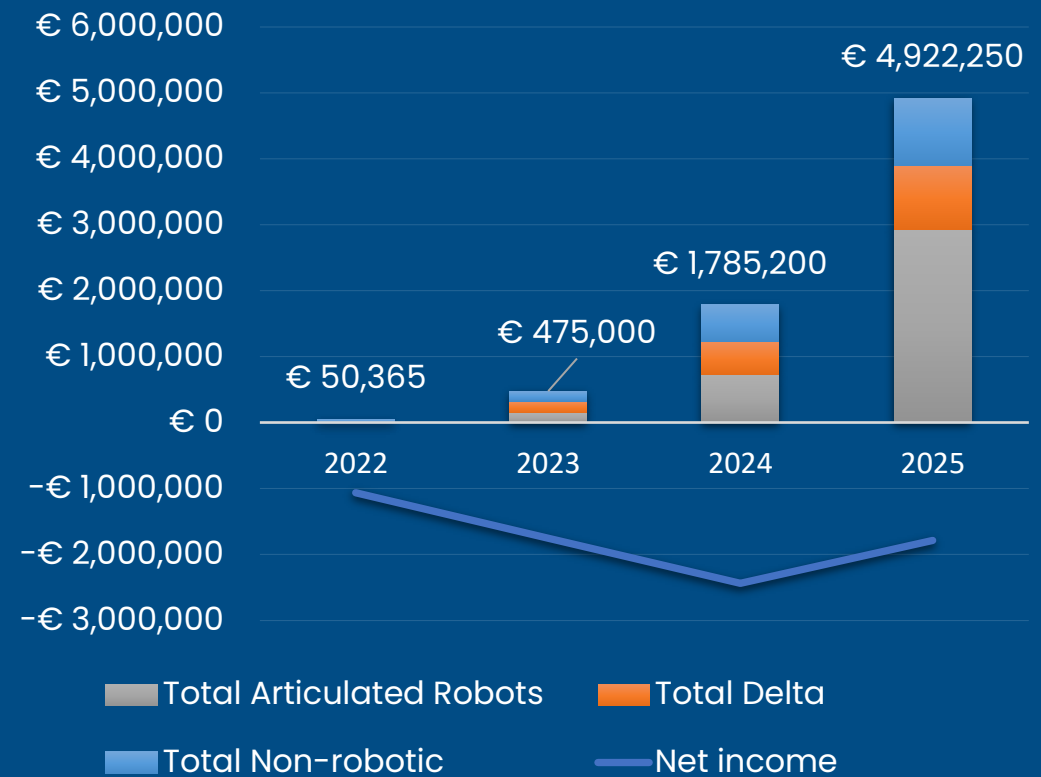
Maarten Schippers

Independent Board Member








Maarten Schippers is the CEO of Rolan Robotics, a regional robotics system integrator & the former CEO of Airbus Space & Defense, Netherlands

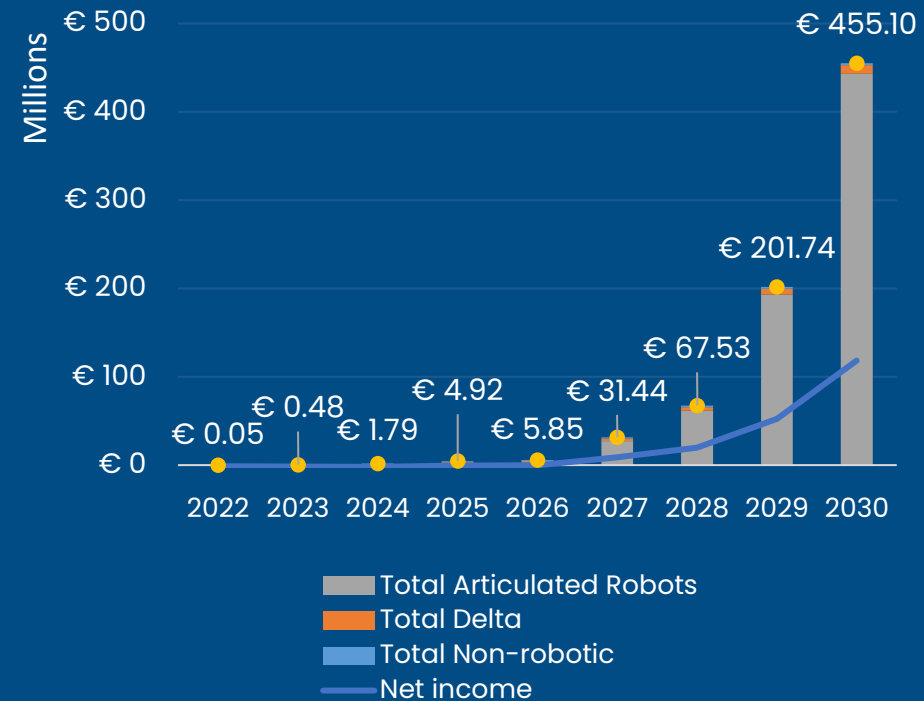
Short Term Projections

- 
2023 driven by **signed pilots** with wearable & delta robot manufacturers as well as development unit sales
- 
Small-scale production line set up in 2023 with manufacturing partner / investor Linamar Corporation. Supporting 2,000 units/year capacity
- 
2024 growth assumes conversion of 2023 pilots with known volumes & pricing, 2 new pilots in the delta field, plus 1 new pilot with articulated robot OEMs
- 
Large-scale production line set up in 2024 and online in 2025 with manufacturing partner / investor Linamar Corporation. Supporting 50,000 units/year capacity
- 
2025 growth driven by 15% YoY growth of existing supply contracts (per client forecast), 50% conversion rate of 2024 pilots, and pre-launch product & services to single articulated OEM



Long Term Projections

-  **2026 breakeven** and validated as supplier to 2 large OEMs. Adopted for use in two separate robot manufacturing lines
-  **2027 2 new OEMs adopt.**
+11% of existing clients portfolio conversion to IMS, corresponding to a 9 year robot product lifecycle
-  **2027** production starts with a **33%** gross margin
-  **2028 3 new OEMs adopt.**
+11% of existing clients portfolio conversion to IMS, corresponding to a 9 year robot product lifecycle
-  **2029** accepted by all major OEMs for use in new robots
-  **2030 455MEUR revenue** reached
-  **2030** reach a **38%** gross margin



IMSystems is raising an **investment of € 6 million** to make our technology the core of **new robot designs** and get the **Archimedes Drive** ready for **large-scale production**



The most efficient & accurate
compact speed reducer in the world

∞ Higher profitability (+300% per robot line)
for our clients and increased productivity
(+62%) for their clients

∞ Leveraging our supply relationship for
one month lead times

World-class cross-functional
management team with a diverse range
of complementary skills and a clear plan
to revolutionize the robotics market
through a breakthrough innovation



Strong and experienced team

Key partners (& shareholders)



ABB

Key sparring partner for our technology
One of the top 4 robot makers worldwide
Potential first customer profile

LINAMAR

Key manufacturing partner
Obligated to finance 100% of
production CAPEX through 2029

Summary

∞ Directly increasing customer's portfolio

∞ Results in a Win-Win-Win scenario

The drive sells at a premium
with lower COGS



