

NORR HYDRO

Partner in Success



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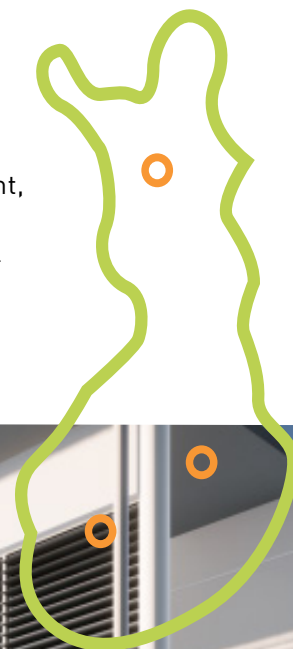


01 Norrhydro in brief

Over 35 years of experience

A Finnish forerunner in motion control and one of the leading providers of energy-efficient hydraulic cylinders in the Nordic countries. Developing and manufacturing innovative, environmentally friendly hydraulic solutions for demanding conditions for the forest machinery, material handling, construction equipment, mining and marine industries, among others.

Headquarter is located in **Rovaniemi**, including management, administration, engineering and production. Additionally, Norrhydro has two R&D units: **Tampere**, dedicated to digital solutions product development (NorrDigi®, Motiomax by Norrhydro) and **Kuopio** for cylinder design support.



1985

Founded

29,7 M €

Turnover (2022)

+180

Employees (2022)

2021

Norrhydro Group Plc listed in the Nasdaq First North Growth Market

Values

Passion & Empathy
Excellence
Integrity
Creativity
Perseverance

Mission

To provide environmentally friendly linear motion solutions for mobile industry and increase the competitive advantage of our customers

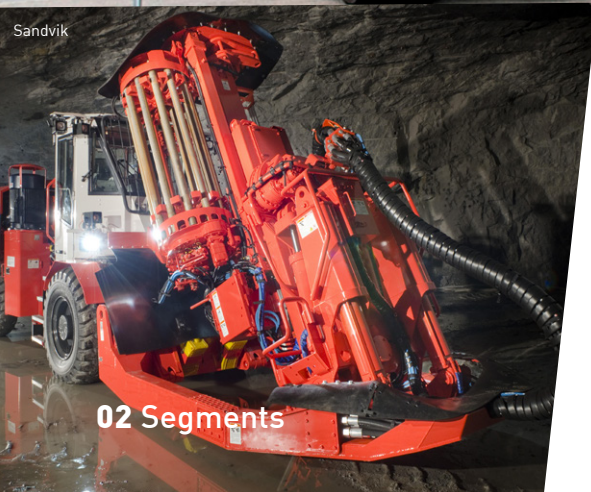
Vision

To be a global leader in intelligent and environmentally friendly linear motion.

Business plan

Based on strategic partnerships, cutting-edge technology and efficient sourcing and production.





02 Segments

Solutions are tailored to meet the toughest requirements in the segments where the machines operate 24/7/365 in harsh environments, from arctic cold to tropical heat. When snow, dust, salt, and mechanical abuse are normal elements, cylinders' operational features must be first class.

Forestry

Our solutions are used for all the machine functions, from the base machine; steering, stability and suspension functions, to the crane and harvester head or grapple.

Material handling

Reliability and safety mean everything, and energy savings play a key role in this segment. Deep R & D co-operation within this segment has resulted in remarkable energy savings.

Mining

Manufacturing cylinders for underground and surface mining machines, incl. development of a robust cylinder solution for mining loader equipment.

Construction equipment

With long experience in developing and manufacturing hydraulic cylinders for different kinds of construction equipment, solutions cope with the toughest environments and stand the test of time.

Marine & Offshore

Decades of experience from marine cylinders give us an advantage in creating the right solution for you, including close cooperation with all the major classification societies: BV, DNVGL, LR, ABS, RINA, KR, NK, CCS, RS.

03 Product portfolio

Hydraulic cylinders / **NorrDigi & NorrAccu** / **Motiomax by Norrhydro**

Depending on the customer's needs, we can offer either individual hydraulic cylinders, which are part of the hydraulic system, or entire hydraulic systems with control units.



Hydraulic cylinders

High-quality hydraulic cylinders for mobile machinery, tailored to the customer's needs. Our energy-efficient cylinders provide optimal solution for all areas of hydraulics utilization.

Single-acting cylinders

Double-acting cylinders

Multi-chamber cylinders

Technical features

Piston diameter	25–500 mm
Stroke length	max. 10 000 mm
Operating pressure	up to 400 bar
Maximum speed	1.5 m/s
Temperature range	-40 ~ +80 C



NorrDigi®

Revolutionary energy saving

Changing the hydraulics industry

Industry-changing digital hydraulics innovation NorrDigi provides up to 80 % energy savings and enables more accurate motion control.

Key features in short

The NorrDigi® system is based on our proven multi-chamber hydraulic cylinders and patented control system

Multi-chamber cylinders: enabling 16 area combinations

Intelligent motion control: for smooth and optimized shifting

Advanced accumulators: excess energy stored and recycled

Latest enabling technologies: software, sensors, micro processors, directional control valves



Energy savings
regardless of the power source

Traditional hydraulics solutions rely on throttling in achieving precise motion control. Throttling wastes energy and generates heat, requiring heavy and expensive cooling systems. NorrDigi system saves energy by achieving accurate motion control without resorting to throttling.

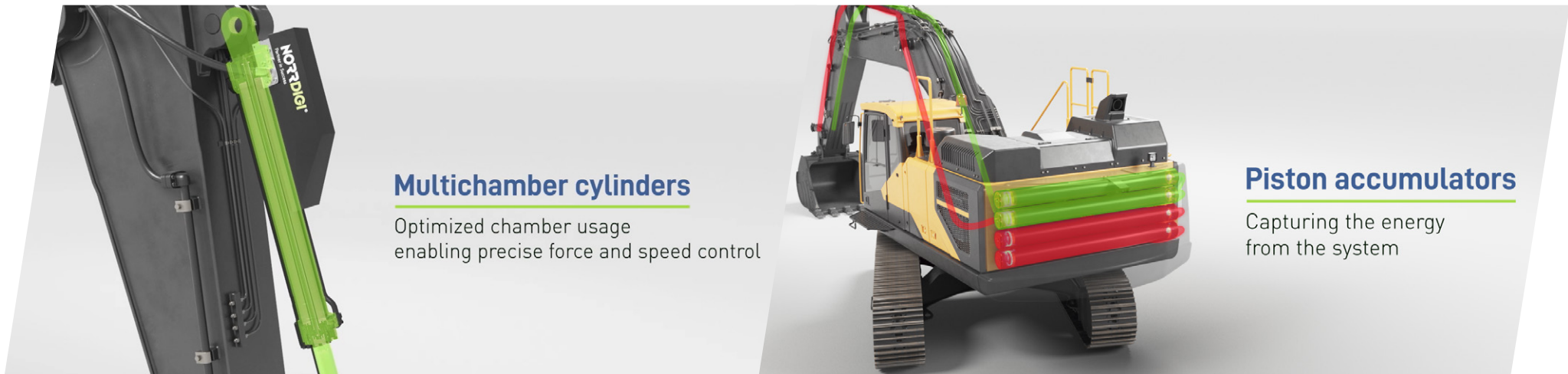
Optimized force reduces costs



Thanks to NorrDigi's multi-chamber cylinders and intelligent digital control systems, NorrDigi delivers only the necessary power needed at any given time. By optimizing force production and by recycling the released energy the energy loss can be minimized both when lifting and adjusting a load.



In the NorrDigi system, the energy is always guided directly from the accumulators to the actuators, enabling the required force and velocity to be produced immediately. When decelerating or lowering the load, the required energy is taken from the actuators and returned immediately to the accumulators.



Multichamber cylinders

Optimized chamber usage enabling precise force and speed control

Piston accumulators

Capturing the energy from the system

Key benefits



Reduced power demand



Downsizing of components



Automatic energy recovery and re-use



Reduced downtime due to preventive maintenance

Regenerating energy and saving fuel

The NorrDigi system is unique in its ability to regenerate energy and reduce fuel consumption. The effects on emissions are even greater, as the NorrDigi system allows the engine to run in with optimal efficiency. When the engine is downsized and running with optimal efficiency, its noise can be significantly reduced. The NorrDigi system enables accurate motion control and optimized energy consumption regardless of changing environmental conditions and aging components.

Application areas

Adaptive design enables perfect fit for the customer's platform:



Earthmoving machines



Material handlers



Reach stackers



Mining machines



Forestry machines

NorrDigi process steps

01

Simulation

Data analysis based on current machine characteristics

02

Concepting

System modelling in customer's machine

03

Prototyping

System construction and testing

04

Serial production

Continuous optimization & quality assurance

05

Technical support

Remote system monitoring





NorrAccu

Piston accumulators for the most demanding applications

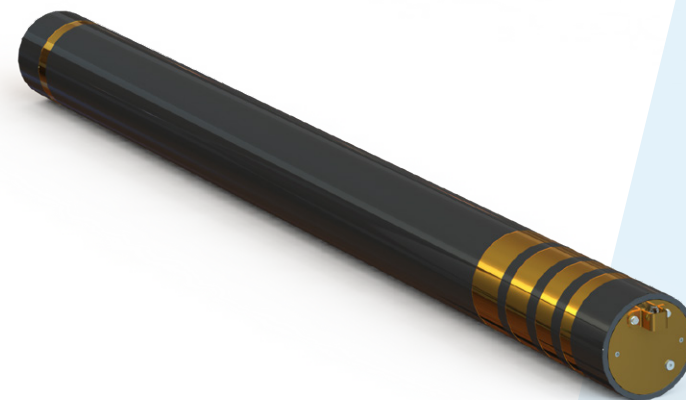
The NorrAccu accumulators were developed to meet the need for increased durability and fatigue life. These accumulators are also used in the NorrDigi system, where the operation requires many cycles.

Optimizing power utilization and performance

The combination of NorrAccu piston accumulators and Norrhydro's multi-chamber cylinders can effectively reduce energy requirement by 35 %.

Designed for heavy-duty requirements, harsh conditions, and for long life in uninterrupted use, the NorrAccu piston accumulators offer optimal energy-savings even when applied to the most challenging use cases. The accumulators store excess energy from cylinders for later use. The energy feedback from

the NorrAccu accumulators improves the hydraulic system's power utilization and optimizes performance. When coupled with Norrhydro's digital hydraulics innovation NorrDigi™, the fuel efficiency improvements are extraordinary.





Motiomax by Norrhydro

Electromechanical and energy efficient motion systems

Motiomax® is a pioneer in electromechanical motion systems enabling comprehensive electrification solutions for linear and rotary motion. Motiomax systems are always optimized for customer applications. They consist of electromechanical cylinders, hub motors for mobile machines, industrial gear motors and required automation.



Customer benefits

By replacing common hydraulic system with electromechanical solution significant advantages can be achieved.

High energy efficiency and energy recovery

Easy connectivity with automation systems

Long run time in battery operated systems

Safe operation and low audible noise

Easy to maintain and low life cycle costs

Easy and accurate motion control

Environment friendliness

Simple system structure with few components

Main features

Electromechanical cylinders together with high-quality Motiomax gearboxes and heavy load ball screws enable the reliable operation and long service life for demanding applications.

Force	10–3000 kN
Power	0,1–300 kW
Stroke	max. 6 m
Speed	max. 1 m/s
Efficiency	80–90 %
Energy recovery	70–80 %

- + Almost oil free operation
- + Easy position measurement



Typical applications

Motiomax solutions are ideal especially for demanding applications where energy efficiency, precise moves and high forces are required. Almost oil-free structure supports the usage in conditions requiring cleanliness.

Industrial automation systems / process industry

Moving machinery

Lifting systems

Material forming

Wood and food industry

Marine / offshore applications

Battery operated systems with high energy efficiency requirement

04 New world-class production facility

Opening in
autumn 2022

8 370 m²
floor space

Possibility for an
expansion

Increased production
capacity (+20% in first
step, mid-term 200%)

KPI's
Work safety TR0 and
Quality PPM 500

Environmentally friendly facility

CO²

Reduction of -20% of CO²
emissions compared to
current facility



Waste heat
recovery and re-
usage for heating



Use of
solar energy

Waste heat is recovered from the plant's cooling water circuit. In addition, equipment to recover heat from the outside air will be installed on the roof of the building, which will be able to increase heat production. The same equipment also produces the hot heating water needed by the factory's paint shop during the summer.

On the roof of the new production building, 1,000 solar panels with a total capacity of 395 kilowatts will be installed in an area of approximately 3,000 square meters.

Investments in production

Automatic final test system
New CNC lathes

Component washing machines
Robotic paint shop
Automated welding stations

Cleanliness of production has been taken to the next level

ISO 4406 12/10/8
No wooden packages

All components to assembly via washing
Clean room assembly cell

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