TADANO

HYBRID

AC 4.070HL-1
AC 5.120H-1

PRELIMINARY

Our environmental targets.

The Tadano Group is pursuing the ambitious goal of reducing the CO_2 emissions from its global business activities by 25% by 2030, compared to 2019 levels. Over the same period, Tadano aims to cut CO_2 emissions from the use of its products by 35% and reduce its industrial waste by as much as 50%. The goal is to be completely climate neutral by 2050 – zero carbon emissions.

To achieve these ambitious environmental protection goals, Tadano has grouped the solutions in its global "Tadano Green Solutions" (TGS) strategy into four pillars:

- Construction and energy supply of its facilities (e.g. equipping buildings with solar modules)
- Production materials and supplies (green steel, alternative fuels)
- Product portfolio (e-Pack, hybrid cranes)
- Product applications (e.g. setting up wind turbines and installing solar modules)

Our motivation.

Over the next few years, stricter legal requirements for internal combustion engines will drive increased demand for electrically powered construction machinery. We are innovation leaders here, offering our customers the advanced, environmentally friendly and low-noise solutions they need. The electric crane operating system has an efficiency of around 85%, which is more than double the energy conversion efficiency of an efficient diesel engine.

Consequently, our hybrid crane concept generates about 60% less CO_2 than a diesel-powered superstructure. If that's not motivation enough, what is?

85 %
efficiency of the electric crane operating system

60 %
CO_2-saving

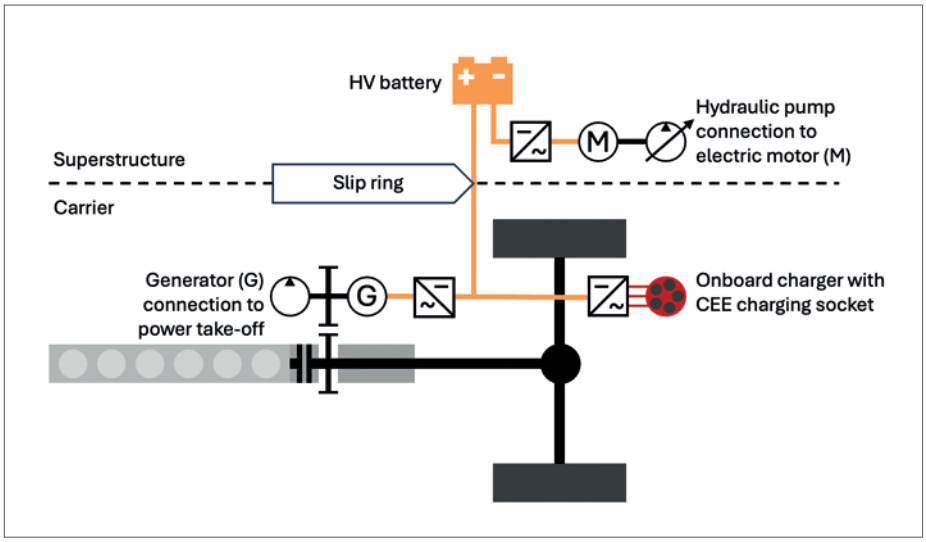
AC 4.070HL-1 AC 5.120H-1

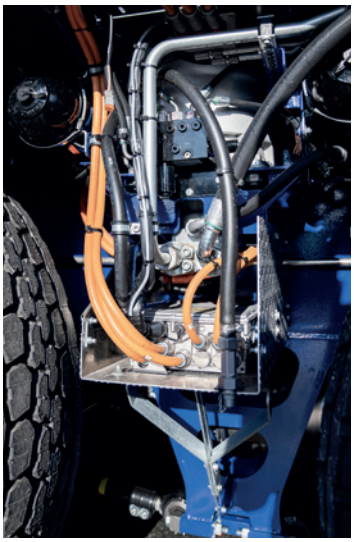
Electrical solutions are part of our business too: We have now electrified our tried-and-true AC 4.070L-1 all-rounder.
Why? Because your positive feedback at bauma 2022 confirmed that our innovative commitment to a green future was the right choice. That is what drives us to continue our efforts to electrify our cranes.

Electric, efficient, easy: our flexible energy supply concept.

- **High-voltage battery**
- **External power connection**
- **Generator on the carrier's diesel engine**

Conventional driving and full electric on-site operation: These are two benefits of the new Tadano AC 4.070HL-1 hybrid crane and the upcoming AC 5.120H-1. The diesel carrier engine brings the crane to the work site and can then be switched off for the duration of the job once the outriggers have been deployed. The high-voltage battery (HV battery) in the superstructure powers an electric motor as well as the thermal management system and the superstructure cab air-conditioning. The electric motor powers the hydraulic system used during crane operation. All crane functions thus match diesel operation in terms of performance and the operator experience. The Tadano AC hybrid crane can be operated both self-sufficiently under its own battery power and with the support of an external power supply, such as the work site mains power. Using an external power supply extends the multiple-hour electric runtime and can take the load off the HV battery. Even when the HV battery is fully discharged and there is no external power supply, the hybrid crane remains fully operational thanks to a generator driven by the carrier's diesel engine. The generator charges the HV battery and allows continued crane operation. These hybrid cranes also feature the separate and proven 24V on-board electrical system, which can be used for de-rigging if the high-voltage system fails.





HYBRID DRIVE: FUNCTIONAL DESCRIPTION.

THE HV BATTERY IS CHARGED IN TWO WAYS:

- via the charging socket on the onboard charger at the rear of the carrier
- via the generator (G) driven by the carrier's diesel engine

In both charging variants, an inverter converts the AC power into high-voltage DC power (700V) for the battery. Another inverter between the battery and electric motor converts the battery's DC output back into AC power to drive the electric motor.

Innovation and investment: Don’t wait for the future to happen.

The innovative Tadano hybrid crane is a sound investment in the future. As with other electric vehicles, the purchase price is higher than comparable combustion-engine models. But the hybrid crane pays off in the long term. How? Because it has added benefits not possible with diesel cranes, and because it provides futureproofing – a key consideration for such a long-life product. These factors put the Tadano hybrid crane in a league of its own.

Added benefits:
Because of its quiet, emission-free operability, the hybrid crane unlocks additional use scenarios and hence added sales potential.

- Use in indoor areas (e.g. buildings in the events, manufacturing and logistics sectors)
- Use in outdoor areas sensitive to exhaust and noise emissions (e.g., inner city areas, hospital grounds, zoos, nature reserves, work on occupied residential buildings)
- Use during quiet hours (at night, on Sundays and public holidays)

Futureproofing:
What will the economic environment look like in the future, when the hybrid crane has been in use for many years and still has several years of service life left? It’s highly likely that by the end of the 2030s, electricity will be a lot less expensive than diesel, compared to now. It’s highly likely that there will be additional, tougher regulations in place requiring crane operation to be zero-emission and low-noise. And it’s highly likely that customers will be glad they invested in a Tadano hybrid crane because they will have saved on fuel and engine maintenance over many years.

Impressive CO_2 savings: Just one hour of operation says it all.

Here's how operating the crane in full-electric mode reduces CO_2 emissions:

- 4 liters of diesel fuel per hour ←
  → 12 kWh of electric energy per hour
- 4 x 2.58 kg CO_2/L = approx. 10.3 kg of local CO_2 emissions from diesel combustion ←
  → no local CO_2 emissions
- + approx. 15% for production, transport, etc. = approx. 11.8 kg CO_2 ←
  → approx. 400 g/kWh CO_2 from electricity generation* = approx. 4.8 kg CO_2
- Approx. 60% CO_2 reduction

By avoiding a good seven hours of engine operation on the work site per day, the hybrid crane saves about 30 liters of diesel per day – important considering this fuel is getting more expensive every year.

*) Germany's annual average energy mix in 2024 (monthly fluctuation range 281-425 g/kWh)
(https://app.electricitymaps.com/zone/DE/12mo/monthly)

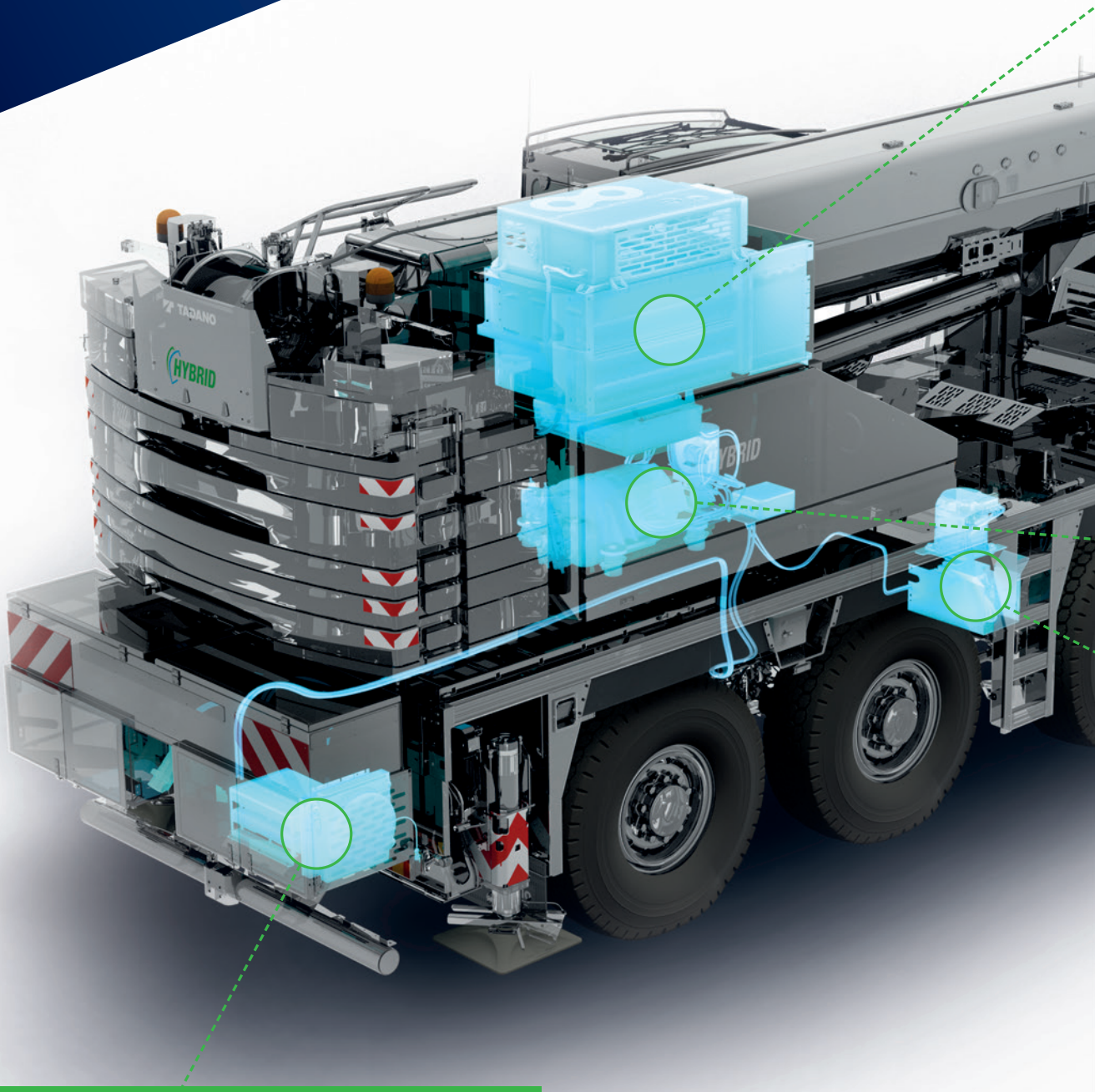
Benefits for everybody ...

for crane owners/providers
for crane operating personnel
for the working environment
for the planet

x				Reduced operating costs due to elimination of diesel engine in superstructure
	x			Noticeably lower engine vibrations in the superstructure cab
	x			Heating and air conditioning always available, even in standby mode
x	x	x		High operational reliability thanks to redundant energy supply
x	x			Maintenance-free superstructure electric motor
	x	x	x	No pollution from exhaust gas during crane operation
	x	x	x	Significantly reduced noise pollution
	x	x		Quiet crane operation makes acoustic commands easier to understand
x				New business working in areas sensitive to noise and exhaust emissions
x	x			Charging during crane operation much easier than refueling
x				Ability to charge using own solar system at depot
			x	Approx. 60% reduction in CO_2 emissions from crane operation
x	x	x		Boost to environmental image
x	x	x		Easy electrically powered de-rigging in an emergency

Proven product now even better:

AC 4.070HL-1

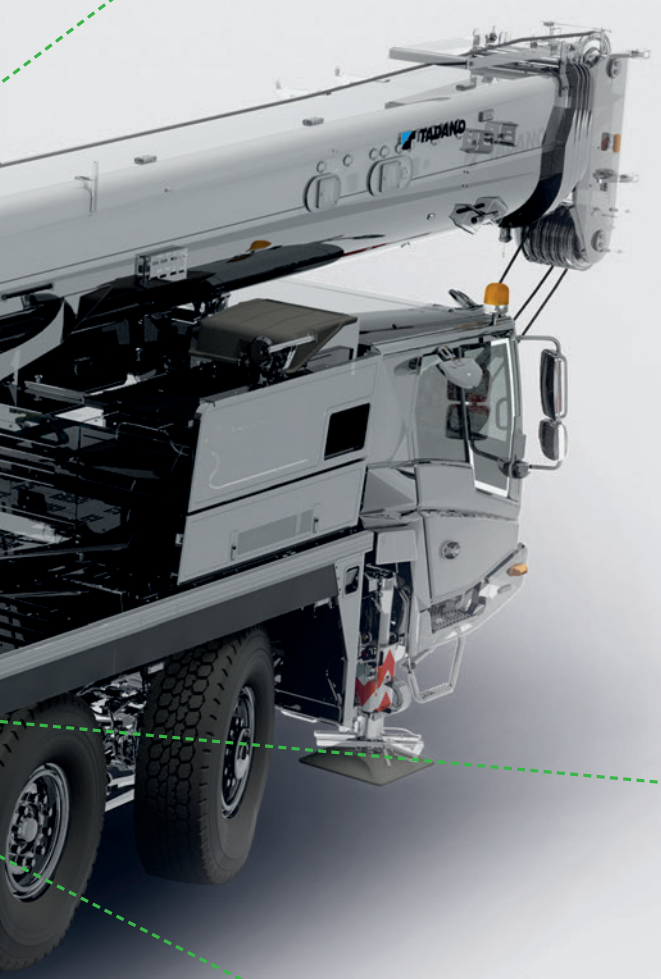


Onboard charger

- Connection for external power supply: CEE socket
- Charging capacity: 44 kW
- Three-phase, 400V, 63A, limitation to 32A possible

HV battery pack

- Battery capacity: 70 kWh gross, of which approx. 80% ~56 kWh is usable
- System voltage: 700V nominal, 800V maximum
- Design: lithium-ion accumulator, type NMC (nickel manganese cobalt)
- Service life: 80% residual capacity after 3,000 charging cycles



Battery runtime

- Load cycle 1: approx. 6.3 h
- Load cycle 3: approx. 3.9 h

Charging time

- Via onboard charger (63A)
  10–90% State of Charge approx. 1 h
- Via generator while operating on work site:
  10–90% State of Charge approx. 1 h
- Via generator during travel:
  +55% State of Charge approx. 1 h

Electric motor

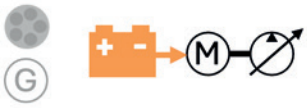
- Continuous output: 115 kW
- Nominal torque: 550 Nm
- Peak torque: 1,200 Nm

Generator

- Charging capacity: > 50 kW
- Continuous output: 85 kW
- Nominal torque: 186 Nm
- Peak torque: 500 Nm

Operating modes.

- **Battery-only mode**

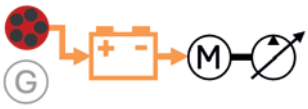


The charged high-voltage battery supplies all the power that the electric motor needs in order to drive the crane hydraulic pump. In this mode, the AC 4.070HL-1 can operate completely self-sufficiently for more than four hours. The upcoming AC 5.120H-1 can operate self-sufficiently for an entire working day.

- **Battery mode assisted by external power supply**

During crane operation and pauses in operation, the high-voltage battery is recharged via the external power supply connected to the charging socket. Depending on the set current (depending on the capacity of the external power source), the HV battery is thus discharged much more slowly overall, or even gains charge during low-load crane operation, thereby enabling continuous electric operation of the crane.

- **External-power-supply-only mode**



When the high-voltage battery is fully discharged, the crane can still operate if connected to a sufficiently powerful external power supply (work site mains power). Since the high-voltage battery is also charged during pauses in crane operation, it can buffer peak loads after only a short charging time, allowing the crane to temporarily draw more power than is fed in from the external source.

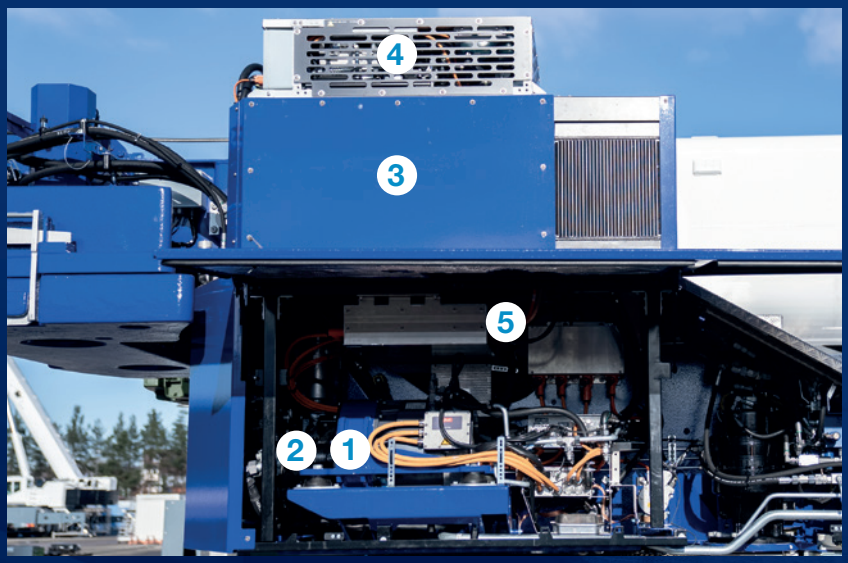
- **Battery mode assisted by generator**

The carrier's diesel engine charges the high-voltage battery via the generator. Because the battery buffers the power fed in, the crane hydraulics can briefly draw loads that are much greater than the maximum continuous power supplied by the generator. The generator can be used during travel and when stationary and can work in three operating modes:

- **Silent Mode** → particularly quiet operation at the diesel engine's idling speed
- **Eco Mode** → adapted generator output in the diesel engine's optimal speed range
- **Power Mode** → full generator output at higher diesel engine speed

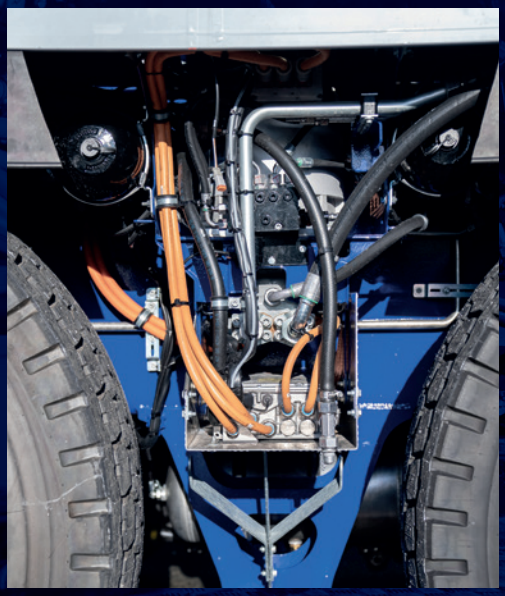
Under the hood:
The hybrid technology in detail.

The high-voltage components and their auxiliary systems are arranged in the superstructure for maximum ease of maintenance and repair. The compact electric motor **(1)** is in the exact same position as the diesel engine it replaces and operates at the same maximum speed. Consequently, the hydraulic unit **(2)** for crane operation, which can be smoothly activated and deactivate, remains technically unchanged and in its original position – a major plus when it comes to maintenance and spare parts.



The high-voltage battery **(3)** is located above the electric motor, surrounded by components of the battery thermal management system **(4)** (compressor, heat exchanger, fan) and the battery management system **(5)** (voltage converter, power distributor, fuses).

The arrangement of the HV components is optimized for short cable runs, good coolant flow to the cooling elements and ease of maintenance. When selecting the HV components, Tadano follows its proven strategy of using components from reputable suppliers in accordance with established industry standards. For example, the HV battery is modular in structure and is readily replaceable thanks to its easily accessible mounting – in stark contrast to the proprietary HV batteries used in other makes of vehicle.



Generator on AC 4.070HL-1

Charging socket at right rear

The Tadano hybrid is no ordinary hybrid.

The electric-motor-powered hydraulic crane system performs every bit as well as the diesel-motor-powered variant. Therefor the hybrid crane does not entail any compromises on performance, nor any additional technical overhead overall. The electrification has not resulted in any major increase in vehicle weight, so the lifting capacities, lifting performance and axle loads of the Tadano hybrid cranes are identical to those of their conventional counterparts. And while only the crane function of the superstructure is electrified, the electrification also benefits the vehicle's driving operation. Thanks to the manual regenerative braking function, the carrier's diesel engine can charge the high-voltage battery via the generator when the vehicle is coasting, thereby saving fuel. The benefit for the driving operation is that this reduces the load on the retarder and boosts the braking effect.

For those inevitable outages: Emergency mode.

If the high-voltage system fails, the hybrid crane can still be de-rigged with the aid of the 24V on-board electrical system. This is enabled by connecting the on-board system via a power cable to a special socket on the superstructure. In their normal state of charge, the 24V batteries have sufficient voltage and capacity to retract the telescoping sections and lower the boom into the transport position.

Quiet performer: The electric motor in practice.

In the Tadano hybrid crane, the electric motor in the superstructure really plays to its design-related strengths in stand-by mode by completely eliminating diesel engine idling noise. Consequently, the crane operator is much better able to hear important noises and instructions on the construction site.

The electric motor ...

- generates full torque from a standstill, requires no idle run and therefore does not need a disconnect clutch.
- is optimally connected to the hydraulic pump, which is in the exact same position as in the diesel-motor-powered variant.
- operates efficiently over a very wide speed and load range.
- has an outstanding efficiency of over 90% (compared to a maximum of 40% in a diesel engine).
- does not produce any exhaust emissions.
- runs very quietly and produces practically zero vibrations.
- has a high power density and is correspondingly compact.
- is maintenance-free (incl. no need for oil and filter changes).
- is technologically mature, reliable and proven.

The crane functions remain hydraulically powered, giving crane operators the same familiar, highly responsive control experience. The hybrid crane produces significantly less noise and vibration, but its operation, display and control experience is unchanged. What better recommendation for a new product?

Technology built to last.

This hybrid crane technology is designed to last. That's because the entire vehicle structure, the chassis, hydraulic system and the crane mechanical systems all boast proven Tadano robustness. It's also because the high-voltage system is built from long-life, modular components. Thanks to the sophisticated battery thermal management system, the HV battery always works at its optimal operating temperature and achieves maximum service life.
The result: a high residual capacity of about 80% of new-battery capacity even after 3,000 charging cycles. Partial charges only count proportionally and have a more positive effect on lifespan the more frequently and longer the state of charge remains in the middle range.

Software from us.

Tadano does not take any shortcuts on the software used to integrate and control the high-voltage system. We develop this software in-house using our own IT resources. That way, we can ensure that the hybrid crane works optimally with our tried and proven crane control system in everyday use. We are confident that this commitment to in-house development will serve you well.

AC 4.070HL-1 basic specifications.

As quiet as a whisper and as powerful as a rhino – the AC 4.070HL-1 delivers the same impressive performance as its diesel-driven counterpart. The working speed, lifting capacity, axle loads, counterweights, and load charts are exactly the same – see for yourself!

AXLE LOADS.*

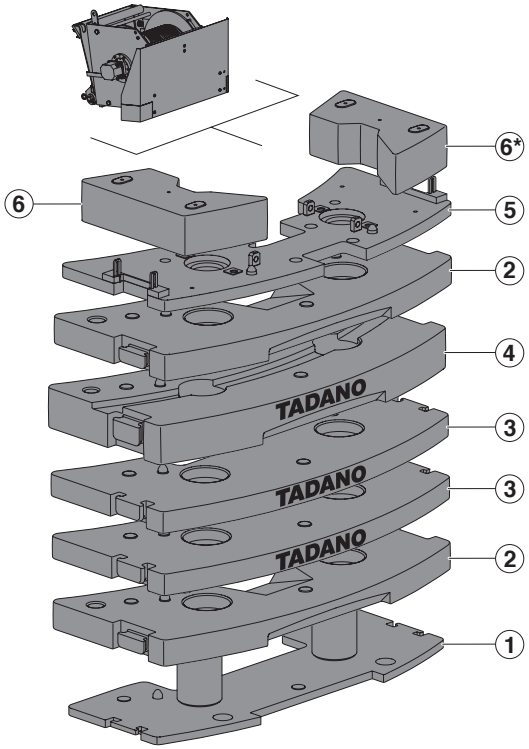
	Total					
< 10 t	< 40 t	8 x 6	445/95R25	6 t	16 m	2.6 t
< 10 t	< 40 t	8 x 6	445/95R25	32 t	–	3.6 t
< 12 t	< 48 t	8 x 6	445/95R25	32 t / 6 t	16 m	10.2 t
< 12 t	< 48 t	8 x 6	445/95R25	32 t	–	11.4 t
< 16.5 t	< 54 t	8 x 6	445/95R25	32 t / 6 t	16 m	15.7 t

* Preliminary

COUNTERWEIGHTS.

	2.6 t	3.6 t	4.6 t	6.1 t	7.9 t	9.4 t	10.2 t	11.4 t	13.7 t	15.7 t
① 1.0 t		1			1	1	1	1	1	1
② 2.3 t					1	1	2	1	2	2
③ 2.0 t			1		1		1	1	1	2
④ 3.5 t				1		1		1	1	1
⑤ 1.0 t	1	1	1	1	1	1	1	1	1	1
⑥* 0.8 t	2	2	2	2	2	2	2	2	2	2

* Can be replaced with hoist 2



LOAD CHART.

15.7 t						6.40 m x 7.90 m				360°			EN13000
	11.1 m*	11.1 m	14.9 m	18.8 m	22.6 m	26.4 m	30.2 m	34.1 m	37.9 m	41.7 m	45.3 m	49.1 m	52.1 m	
m	t	t	t	t	t	t	t	t	t	t	t	t	t	m
2.5	70.0**	57.6	54.9	53.7	39.9	-	-	-	-	-	-	-	-	2.5
3	62.5	52.4	50.5	48.7	39.9	35.1	-	-	-	-	-	-	-	3
3.5	57.4	48.1	46.3	44.6	39.9	33.4	20.8	-	-	-	-	-	-	3.5
4	53.0	44.4	42.7	41.1	39.9	31.0	24.7	13.2	-	-	-	-	-	4
4.5	49.1	40.9	39.6	38.1	37.5	28.9	24.7	19.5	-	-	-	-	-	4.5
5	45.7	37.1	37.0	35.5	34.9	27.0	24.7	19.5	12.9	-	-	-	-	5
6	39.1	31.1	31.2	30.7	30.7	26.2	23.0	19.5	14.2	10.9	-	-	-	6
7	33.0	26.5	26.6	26.6	26.5	26.2	20.8	19.5	14.2	10.9	8.3	-	-	7
8	27.6	23.0	23.1	23.0	22.9	23.5	20.5	18.0	14.2	10.9	8.3	6.8	5.8	8
9	-	-	20.5	20.2	20.5	20.6	19.2	16.5	14.2	10.9	8.3	6.8	5.8	9
10	-	-	18.2	17.8	18.5	18.2	18.0	15.1	13.4	10.9	8.3	6.8	5.8	10
12	-	-	14.3	14.7	14.6	14.8	14.6	12.9	11.7	10.6	8.3	6.8	5.8	12
14	-	-	-	11.3	11.7	11.8	11.4	11.0	10.4	9.4	8.3	6.8	5.8	14
16	-	-	-	9.0	9.5	9.4	9.1	9.0	9.1	8.4	7.8	6.8	5.8	16
18	-	-	-	-	7.8	7.7	7.6	7.8	7.4	7.1	7.1	6.6	5.8	18
20	-	-	-	-	6.4	6.4	6.8	6.5	6.2	6.0	6.1	6.1	5.7	20
22	-	-	-	-	-	5.9	5.7	5.4	5.6	5.3	5.3	5.3	5.3	22
24	-	-	-	-	-	4.4	4.9	4.9	4.7	4.4	4.7	4.4	4.4	24
26	-	-	-	-	-	-	4.2	4.3	4.1	4.1	4.0	3.7	3.7	26
28	-	-	-	-	-	-	-	3.8	3.8	3.6	3.4	3.2	3.2	28
30	-	-	-	-	-	-	-	3.3	3.3	3.1	2.9	2.7	2.7	30
32	-	-	-	-	-	-	-	-	2.8	2.6	2.5	2.2	2.2	32
34	-	-	-	-	-	-	-	-	2.5	2.3	2.1	1.9	1.9	34
36	-	-	-	-	-	-	-	-	-	2.0	1.8	1.5	1.6	36
38	-	-	-	-	-	-	-	-	-	1.7	1.5	1.3	1.3	38
40	-	-	-	-	-	-	-	-	-	-	1.3	1.0	1.0	40
42	-	-	-	-	-	-	-	-	-	-	1.1	0.8	0.8	42
44	-	-	-	-	-	-	-	-	-	-	-	0.6	0.6	44

* Over rear ** Max. lifting capacity – with additional special equipment

CARRIER.

340-5 engine	Mercedes-Benz OM471LA; diesel engine; output of 340 kW / 1600 rpm (462 hp), torque of 2200 Nm / 1300 rpm; approved in conformity with EU Stage V/Tier 4F; exhaust system made completely of stainless steel with SCR catalytic converter.
Fuel tank	400 l diesel (no RME/biodiesel); 40 l AdBlue tank.
ZF TraXon transmission	Automatic transmission with 12 forward gears and 2 reverse gears, two-stage transfer case with disengageable center-differential lock.
8 x 6 x 8 axles	All four axles are steered, and axles 2–4 are driven and feature a disengageable axle-differential lock.
Generator	Danfoss EM-PMI240-T180; electric motor; output of 85 kW (continuous), torque of 185 Nm (continuous) / 500 Nm (peak)
Charging	Charging from the grid is possible with max. 44 kW (63 A / 400 V, 3-phase); charging current can be limited
Outriggers	H-4-point design; fully hydraulic vertical and horizontal movement; manual or automatic leveling; 4 outrigger bases: 2.40 m, 4.40 m, 5.40 m, and 6.40 m. 4 square outrigger pads with transport position on vertical cylinder.

SUPERSTRUCTURE.

Motor	Danfoss EM-PMI375-T500; electric motor; output of 115 kW (continuous), torque of 550 Nm (continuous) / 1200 Nm (peak)
High-voltage battery	Battery system with 700 V (nominal) / 800 V (max.), capacity of 70 kWh; with thermal management system (heating, cooling)
HA52 telescopic boom	HA52 11.1 m – 52.1 m; single-cylinder telescoping system, automatic telescoping; attachments for all equipment and extensions; 6 sheaves in boom head for max. lifting capacity of 62.5 t.
SmartChart	Intelligent crane control system for combined main boom and rooster sheave operation allows for larger lifting capacities, especially when lifting over the outriggers Safe use of the crane's full lifting capacity, even with asymmetrical outrigger configurations. Shows the entire working range in the operator cab. Lifting simulation in the cab.

Big brother with extra staying power:

Key features of the AC 5.120H-1

The hybrid crane approach is readily transferable between models: Tadano's electrification concept for the AC 5.120H-1 is based directly on that of the AC 4.070HL-1.

The forward section of the five-axle crane's superstructure supports an optional second HV battery pack. This doubling of the battery capacity enables all-day battery electric operation – without any external charging.

Thanks to the optimized compact rear storage box adjacent to charging socket, the machine can easily carry the usual crane equipment.

The generator drive has been further optimized and runs maintenance-free directly off the transfer case between the second and third axles.

- **Battery capacity with two battery packs:** 140 kWh gross, of which approx. 80% ~112 kWh is usable
- **Additional weight of hybrid variant with two battery packs, compared to conventional counterpart:** approx. 1,500 kg

Everything at a glance: What's new, what's unchanged and what has been dropped ...

New components in the superstructure

- HV battery pack (lithium-ion)
  - 2 modules, each with 16 prismatic NMC cells
- Battery thermal management system for conditioning the HV battery
- Cooling system for HV components
- Air conditioning circuit for superstructure cab
  - HV auxiliary heater
  - Electric refrigerant compressor
- Crane battery system interface, battery management system (BMS), power distributor and fuses
- Electric motor
- Inverter (AC/DC converter: direct voltage, HV battery ← → alternating voltage, electric motor)
- DC/DC converter (700V, HV battery → 24V on-board supply for all vehicle and crane electrics)
- 24V socket for emergency power for crane de-rigging using the 24V on-board electrical system

Components eliminated from the superstructure

- Diesel engine and its cooling and exhaust systems
- Fuel tank and AdBlue® tank

Drive components retained in the superstructure

- Hydraulic system
- 24V onboard electrical system

New components in the carrier

- Generator, driven by carrier diesel engine
- Inverter (AC/DC converter: direct voltage, HV battery ← → alternating voltage, generator)
- CEE charging socket, IEC-60309-2, 400V, 63A (red)
- Onboard charger at rear
  (convert 400V three-phase AC, charging socket ← → 700V DC, HV battery)
- Inverter (AC/DC converter: direct current, HV battery ← → alternating current, charging socket)
- Cooling system for onboard charger

New functions

- Regenerative braking function that can be activated manually during travel
- Main display in superstructure and carrier cockpits
  - Display showing charging progress, state of charge, voltage and temperature of HV battery
- New control panel with 4" display, located directly above the charging socket
  - Selection and display of current from external power supply (63A/32A)
  - Display of HV battery state of charge both graphically and as a percentage

info@tadano.com
www.tadano.com

Tadano Ltd.
Kanda Square 18th Floor, 2-2-1 Kanda-Nishikicho, Chiyoda-ku, Tokyo 101-0054, Japan
Phone: +81-3-6811-7309 (International Division)

Tadano Europe Holdings GmbH
Dinglerstr. 24, 66482 Zweibrücken, Germany
Phone: +49 (0) 6332 83-0

March 2025.

Reaching new heights

TADANO