

New Electric Counterbalanced Forklifts “ALESIS”



Mitsubishi Logisnext Co., Ltd.

Mitsubishi Logisnext Co., Ltd. carried out a full model change of our electric counterbalance forklifts with a loading capacity of 0.9 to 2.5 tons, and started selling them in November 2019 as “ALESIS”, our first newly-developed product. We pursued design, operability, safety, etc., to develop these new forklifts, aiming at realizing products that can be used for a long time by all customers with peace of mind, regardless of whether the operators are beginners or experienced. In addition, traveling stability with a sense of security resulting from the low center of gravity and a system to set the operation characteristics suitable for operator preferences were added in response to the diversification of operators. This report presents the features of the new “ALESIS”.

1. Introduction

Our company was established by the business integration of Mitsubishi Nichiyu Forklift Co., Ltd. and UniCarriers Co., Ltd in October 2017. Before the corporate integration, electric counterbalance forklifts for the Japanese market included Transer and Forcea from Nichiyu and FB-VIII and AGRES BX from UniCarrier. This time, the manufacturing experience and technology cultivated by each company were integrated into this single model, ALESIS, by fully utilizing the synergy effects from the corporate integration as shown in **Figure 1**.



Figure 1 Electric counterbalance forklifts before corporate integration

2. Design

Based on the concept of “cool design that everybody wishes to operate,” we pursued styling for ALESIS that is powerful enough to dispel the image of electric forklifts, which are considered weaker compared to engine forklifts. As a result of adopting a layout in which the battery is accommodated in the bottom of the forklift body in the pursuit of traveling stability, a low silhouette design with a sense of stability and lightness was realized. The seating position was lower by about 60 mm compared to the existing model, which improved the comfort and ease of access to the seat.

We made an exterior design, giving 1-ton class models and 2-ton class models a sense of unity as shown in **Figure 2**, and created a design around the operator's seat with a slim and lean

image in consideration of comfort, ease of access to the seat and forward visibility.

Brand development for models destined for Asia and Oceania is realized through variations in only color and decals as shown in **Figure 3**.



Figure 2 Exterior design



Figure 3 Exterior design of overseas brands

3. Improvement of safety

3.1 Improvement of travel and turning stabilities

- Bottom battery layout. The new ALESIS has a layout in which the heavy lead-acid battery is accommodated into the bottom of the forklift body, in contrast to existing models with a high center of gravity due to the battery being mounted above the rear wheels. As a result, a low center of gravity was attained and the traveling stability was improved. A low silhouette design was also realized as shown in **Figure 4**.
- The adoption of a high mounted rear axle with a higher swing center that supports the rear axle reduces the movement of the forklift's center of gravity when turning and improves the turning stability as shown in **Figure 5**.
- Pitching reduction control. The pitching phenomenon when traveling, which causes the forklift body to swing up/down and back/forth due to bumps on the floor surface, is suppressed.
- Control to mitigate the impact due to backlash of the drive gear at the start of traveling. This eliminates the shock at the time of starting and realizes smooth traveling.
- Optional good running function that prevents the cargo from being shaken during traveling.

The hydraulic circuit for cargo handling is equipped with two accumulators for high pressure and low pressure. Regardless of whether the load is heavy or light, the shock caused by shaking can be absorbed and the collapse of the load can be prevented.



Figure 4 Battery mounting position

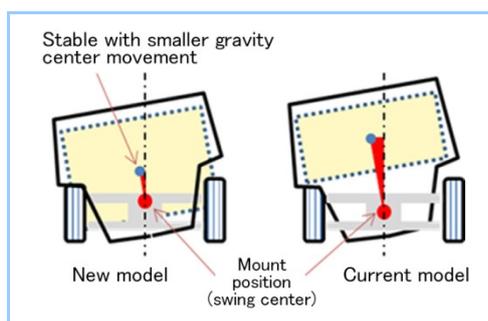


Figure 5 High mounted rear axle

3.2 Safety when charging

- A charge plug with a handle (gun grip) that is easy to insert and remove and is less likely to cause an insertion failure and damage to the plug is adopted.
- A charge monitoring system that warns of the danger of ignition by monitoring abnormalities during charging is available as an option. When abnormal current through the transformer or abnormal temperature at the charge port on the forklift body side is detected, charging is stopped and the horn sounds to notify the surroundings of the abnormality.

3.3 Other safety functions

- Other safety functions include an optional rear LED line and blue spotlight that alert workers around the forklift

4. Improvement of ease of use and comfort

4.1 Operation characteristic customization system adopted as standard

The operation characteristic customization system adopted as standard makes it possible to set the acceleration, reaction, and lever characteristics suitable for various operator preferences as shown in **Figure 6**.

In a distribution warehouse, etc., the cargo to be handled changes from time to time, so a wide variety of approaches may be required such as focusing on speed, handling with care, etc.

This system can address not only operator preferences, but also the safety management policies of each logistics site, and aims to facilitate safer and more secure cargo handling.

The operation characteristic customization system is also based on the function first adopted for “Platter”, the electric reach forklift launched in 2015. In addition, the number of types of settings is increased and a finer adjustment of the operation characteristic customization can be made.

The operation characteristic customization system of the existing model had three modes: P (power), N (normal), and E (economy). The new model's system has C (custom) mode in addition to P and N modes. In C mode, seven parameters can be set for traveling operation: acceleration, reaction, accelerator characteristic, braking force, regenerative braking while releasing accelerator, plugging force, and speed limit; four parameters for the lifting operation: acceleration, reaction, lever characteristic, and speed; and four parameters for the tilting operation: acceleration, reaction, lever characteristic, and speed. Settings for ten people, from a soft setting for beginners to an agile setting for experienced operators, can be registered. This system contributes to the improvement of work efficiency according to the operator's skill level, measures for safe work, and stress-free operation.

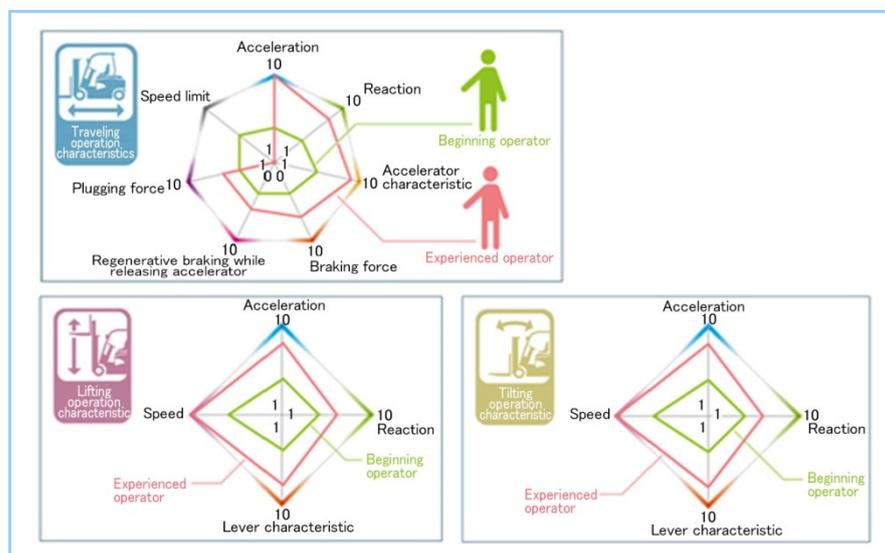


Figure 6 Operation characteristic customization

4.2 IPx4 water resistant, safe for outdoor use

The water resistance rating is improved from the conventional IPx3 (rain-proof), which indicates that no harmful effects result from water drops falling within a range of 60 degrees from vertical, to IPx4 (splash-proof), which indicates that no harmful effects result from splashes from any direction.

5. Energy saving

ECO mode, which is newly adopted for ALESIS, reduces the maximum performance of the traveling speed and lifting speed to reduce power consumption, which contributes to environmental friendliness and long-term operation. In the case of a standard 1.5-ton model (battery capacity 415

Ah, JIVAS F30 pattern), the duration of operation is 10 hours 40 minutes in P+ECO mode vs. 10 hours in P mode, and 11 hours 30 minutes in N+ECO mode vs. 10 hours 45 minutes in N mode. This means that ECO mode extends the operation time by approximately 7%.

6. Main specifications

Table 1 lists main specifications of standard model.

Table 1 Specifications (standard model)

Classification	Item	Note	Unit	STD								Long wheelbase	
				SB9P	FB10P	FB14P	FB15P	FB18P	FB20P	FB25P	FBB20P	FBB25P	
Type	Allowable load (rated)		kg	900	1000	1350	1500	1750	2000	2500	2000	2500	
	Center of load		mm	500									
	Voltage		V	48V									
	Type of motor			AC									
Dimensions	Standard lift		mm	3000									
	Free lift		mm	115				140					
	Tilt angle (fork tilt angle)	Forward tilt	°	7									
		Backward tilt	°	11									
	Fork	Length × Width × Thickness	mm	770×100×35		920×100×35		920×122×40	1070×122×40	920×122×40	1070×122×40		
	Length		mm	2850		3000		3040	3225	3415	3385	3535	
	Width		mm	1100			1115	1155					
	Head guard height		mm	2110									
	Mast height		mm	1990				1995					
	Height when lifting to highest point		mm	4055									
	Front overhang		mm	395				445					
	Ground height	At wheelbase center	mm	110									
	Minimum turning radius		mm	1850				1880	2030	2080	2215		
Weight	Forklift weight		kg	2570	2675	2805	2855	3085	3705	4130	4030	4040	
Performance	Traveling speed	Under load	km/h	14.0				13.5	14.0				
		No load	km/h	16.0				15.5	16.0				
	Lifting speed	Under load	mm/s	390		370	350	330	290	260	290	260	
		No load	mm/s	540		540	540	540	470	470	470	470	
Traveling device	Tire	Front		6.00-9 10PR				21×8-9 14PR	21×8-9 16PR				
		Rear		5.00-8 8P				18×7-8 14PR					
	Wheelbase		mm	1410				1520		1680			
	Tread	Front	mm	930			925		955				
Rear		mm	900				965						
Steering system			Electro-hydraulic power steering										
Battery	Voltage 48V	5-hour rate capacity	Ah/5HR	280	370		415	510	565	725			
Control method				AC inverter control									
Electric motor	Traveling motor	AC induction type	kW	7.0				8.5					
	Cargo handling motor	AC induction type		9.5				11.5					
	Power steering motor	AC induction type		1.5									
Charger		3-phase 200V		Semi-constant voltage automatic charger, on-board type									
			kVA	5.2	6.4			7.0		11.0			

7. Future prospects

Forklifts are mature conveying vehicles, but they are energy saving and environmentally-friendly. We will continue to respond to customer needs such as the diversification of human resources, safety, logistics efficiency, etc.