Technical Data

Construction Equipment

CARRARO

Carraro Construction Equipment
Product Range

Established in 1932, Carraro became a reputed tractor manufacturer in the 1960s and entered the Off-Highway Market as a Drivelines provider in the late seventies, first in Agricultural Tractor Applications and then in Construction Equipment Machinery. Carraro is now a recognised World Leader in Driveline Systems (axles - transmissions - controls) for Agriculture, Construction Equipment and Material Handling Applications.

Carraro has developed a global footprint: it started in Europe, but the company has also been present in Asia for over ten years now, with state-of-the-art Operations in Qingdao (China), and Pune (India), not to mention Carraro Technology India, the largest R&D Centre operating out of Italy. The company is also present in South America with a plant and R&D Centre in Haedo (Argentina), and Caxias (Brazil). More recently, the company set up its Chinese Engineering Centre in Qingdao. Being organised in this manner allows for developing a profound understanding of the Local Market Requirements.

This, combined with its consolidated know-how of Hydraulics, Electronics and Engineering, renders Carraro a truly **Global Drivetrain Provider**.
Carraro puts particular focus on offering Driveline Systems for Medium-Sized Construction Machinery, such as Backhoe Loaders, Telescopic Boom Handlers, Mini-Compact and Small Wheel Loaders, Soil Compactors, Trenchers, Wheeled Excavators and many others.

To this end, Carraro has developed several Drivelines for both Hydrostatic Torque Converters and Electric-Driven Machines.

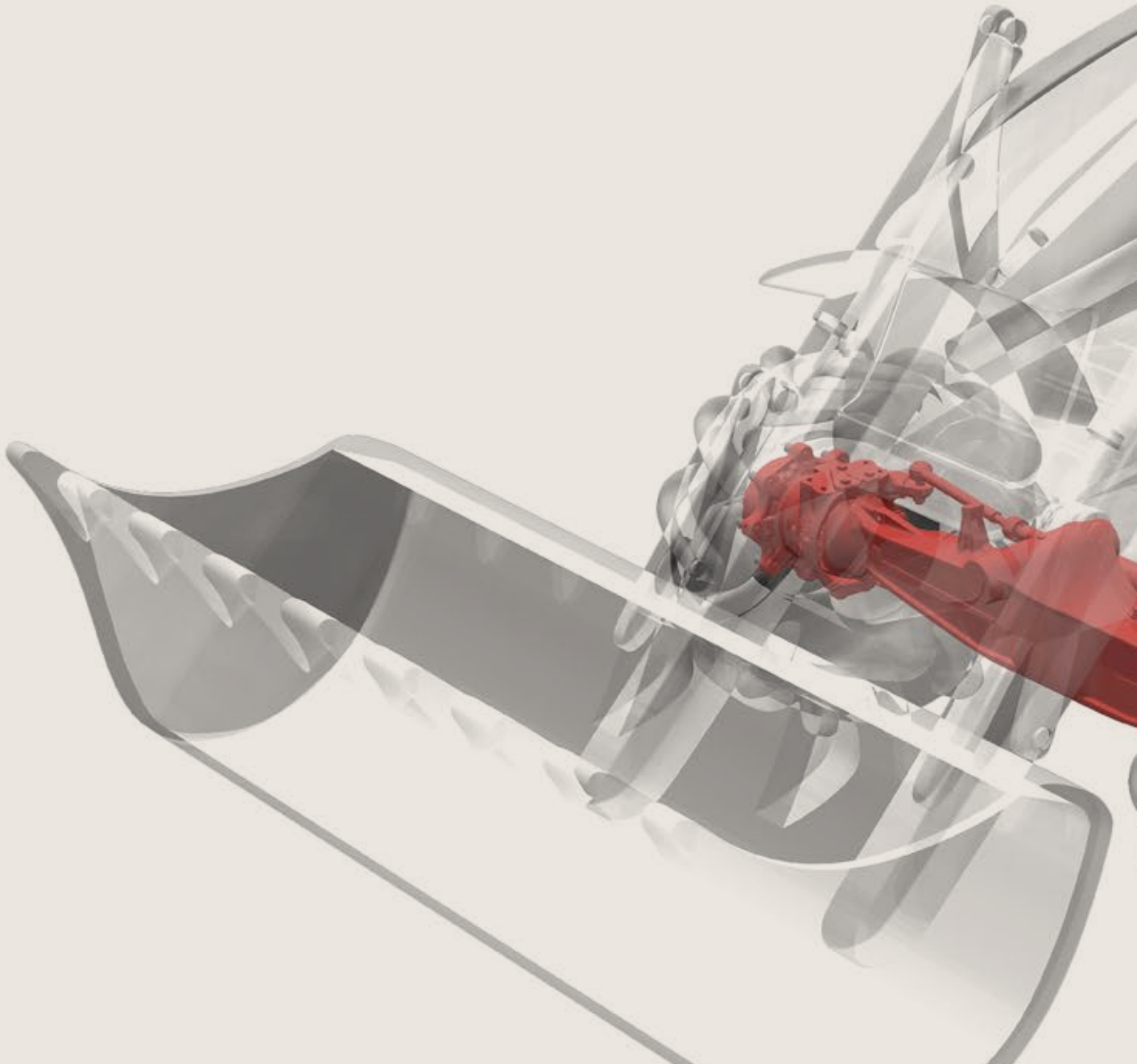
In each application, Carraro is able to offer complete Driveline Systems comprising axles and transmissions with electro-hydraulic controls, which are tailored and optimised per each performance target.

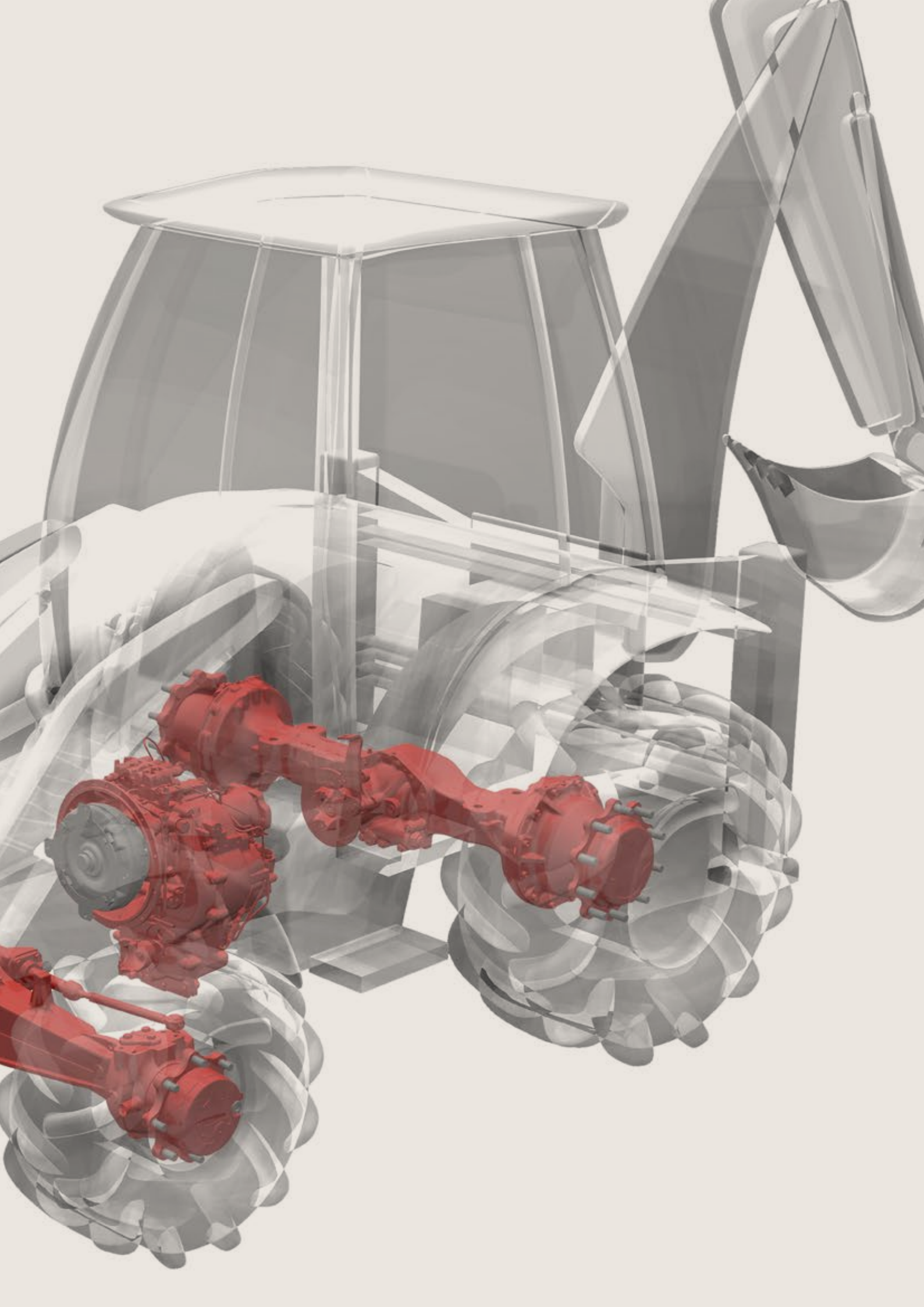
All Carraro Drivelines have been designed to achieve the best performance in Fuel Efficiency and Machine Productivity, while at the same time setting the benchmark for driver comfort.

Carraro is continuously expanding its offer of axles and transmissions for a wide array of applications, always aiming to achieve the best fuel efficiency and machine productivity. To do so, it has developed solutions that optimise the oil level and flow into the wet disc brakes, and minimise power loss in the transmission. For example, all Carraro Torque Converter Units, from the Synchro Shuttle to the Power Synchro and the Power Shift, can be equipped with the **Direct Drive** Function, which aims to optimise Transmission Responsiveness and Efficiency in all dynamic working conditions, and the **ECOlogy Mode** Function to minimise machine fuel consumption in stationary working conditions.

For the hydrostatic Drivelines, Carraro offers a wide range of configurations from the most simple gearboxes to fully electronically controlled multi-speed transmissions. In this field, the **Speedshift** Technology, where the Carraro proprietary ECU manages speed shifting and the Hydrostatic System simultaneously, makes it possible to obtain the best combination of Efficiency, Productivity and Driver Comfort. Furthermore, Carraro is able to achieve additional improvements on machine efficiency and productivity through simultaneously controlling the whole Powertrain (i.e., Engine and Transmission) thanks to the capabilities of its proprietary Electronic Control Unit. Indeed, the ECU, which is already Functional Safety compliant, is designed to customise and optimise machine performance for each application.

Backhoe Loaders Drivelines





Backhoe Loaders Drivelines

Carraro has established its reputation as a leader amongst BHL Driveline System providers by offering a unique variety of solutions for any machine size and architecture: from the lighter and simpler 2-Wheel Drive Machines mainly used in Emerging Countries, to the powerful, high performing, fully electronically controlled 4-Wheel Drive / Steering Machines requested in the more advanced Markets.

The Carraro BHL Axles embody solutions that are able to meet requirements for both entry level machines, which call for robust and flexible configurations, and premium machines, which demand the best performance in fuel efficiency and productivity.
Each axle model is available with several reduction ratios, multiple widths, and various vehicle mounting interfaces. These features, combined with the large number of available options, ensure that virtually any machine usage or application can be met.
Every axle has been designed for use under the severest conditions, with a high load capacity and robust gear design to ensure an extended service life with improved durability.
All Steering Axles enable a tight steering radius, while ensuring precise handling, high manoeuvrability, and minimum tyre wear. All Rear Axles are available with multiple differential configurations, from open to 100% locked, to ensure optimal traction under any ground conditions.

The Carraro BHL Drivelines are completed by the extensive Torque Converter Transmission product line, with 3 Speed Shifting Technologies: Synchro Shuttle, Power Servo Synchro and Power Shift.
All of these are interchangeable for dimension and ratios, and fully configurable with several different features: different types of 4WD engagements, Parking Brake Configurations, Boosted Brakes lines, Sensors and, naturally, the Carraro proprietary ECU, where necessary. This provides a very unique level of configurability for the entire Driveline, making it possible to meet the most specific requirements of each application.

In the BHL application Carraro offers the **Power Servo Synchro ™** Technology, proven to be effective and efficient, combining the low power loss of the Synchro Shuttle configuration with the advanced driving strategy of the Power Shift.

The Carraro **Power Servo Synchro** Units, fully electronically controlled, have electro-hydraulic actuation of the synchronizer for the speed shift and Powershift Forward-Reverse Shuttling. This enables fast response, high driver comfort and best-in-class fuel consumption.

Carraro is continuously upgrading its product offer, developing Modules that can be implemented with all of its Torque Converter Transmissions. **The Direct Drive** Module ensures optimisation of Transmission Responsiveness and Efficiency in all dynamic working conditions, while the **ECOlogy Mode** Function Module is designed to minimise machine fuel consumption in stationary working conditions.

The **Direct Drive** consists of a wet clutch that is electro-hydraulically engaged, controlled either manually (by operator) or automatically through the Carraro proprietary ECU. With this clutch, the Torque Converter is by-passed in all working conditions where it's not required, thus achieving faster, more reactive and fuel efficient machine behaviour.

The **ECOlogy Mode** Function is a hydraulic control block which reduces the transmission lube pump pressure when the machine is working in stationary conditions, thus reducing fuel consumption.

Augmented Contents

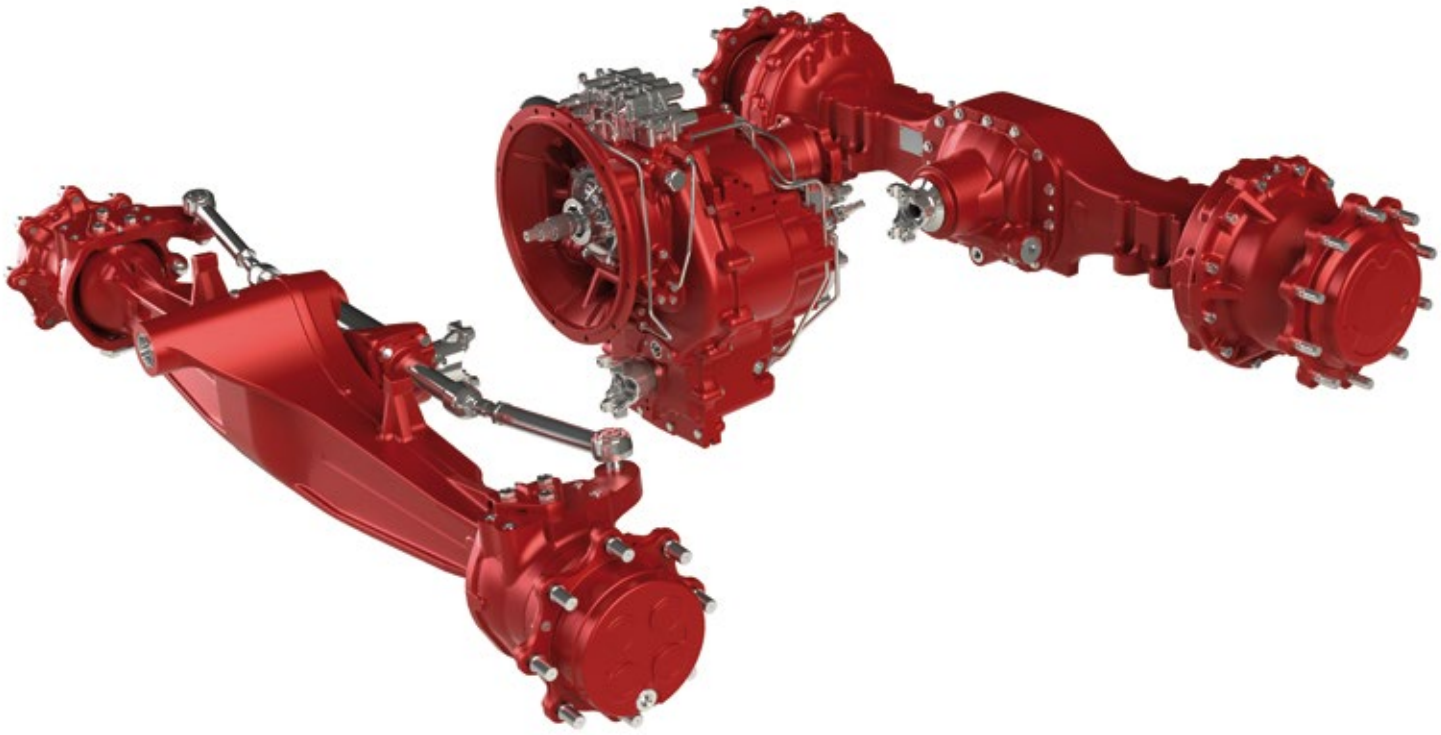
Direct Drive

ECOlogy Mode

2WS machine Engine power kW	Front axle	Rear axle	Transmission	ECU
From 50 up to 70	26.16	28.32 M 28.40 FR	TCB80 TCB56 2WD	
From 71 up to 77	26.22	28.43 M 28.44 FR	TCB80 SPS TCB80	Yes
From 78 up to 88	26.24	28.50 FR	TCB90 PS	Yes

4WS machine Engine power kW	Front axle	Rear axle	Transmission	ECU
From 71 up to 77	26.32	26.43 M	TCB80 SPS	Yes
From 78 up to 88	26.43	26.43 M	TCB90 PS	Yes

All specifications can be subject to changes without prior advice by Carraro



		2WS BHL FRONT STEER MODEL			
MODEL		**26.00**	**26.16**	**26.22**	**26.24**
Overall width	**mm**	1,900 2,000	1,980 2,080	2,080	2,165 2,080
Flange to flange distance	**mm**	1,820 1,910	1,820 1,920	1,920	1,905 1,920
Wheel mounting dimension	**mm**	n° 8 5/8"-18 on ø 203.2 mm	n° 8 M18x1.5 on ø 275 mm	n° 8 M18x1.5 on ø 275 mm	n° 8 M18x1.5 on ø 275 mm
Max steering angle		60°	55°	55°	55°
Peak torque	**kNm**	-	24	31	34
Dynamic load capacity	**kN**	80	80	95	95
Static load capacity	**kN**	200	200	237.5	237.5

		2WS BHL REAR RIGID MODEL				
MODEL		**28.40 FR**	**28.44 FR**	**28.50 FR**	**28.32 M**	**28.43 M**
Overall width	**mm**	1,784	1,930	1,930	1,860 2,006 2,106	1,913 2,060 2,160
Flange to flange distance	**mm**	1,654	1,800 1,654	1,800	1,654 1,800 1,900	1,654 1,800 1,900
Wheel mounting dimension	**mm**	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm
Peak torque	**kNm**	56	62	70	45	60
Dynamic load capacity	**kN**	75	80	95	75	80
Static load capacity	**kN**	187.5	200	237.5	187.5	200

		4WS BHL MODEL			
MODEL		**26.32**	**26.43**	**26.32 M**	**26.43 M**
Overall width	**mm**	2,105 2,350	2,105 2,350	2,105 2,350	2,105 2,350
Flange to flange distance	**mm**	1,900 2,145	1,900 2,145	1,900 2,145	1,900 2,145
Wheel mounting dimension	**mm**	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm
Max steering angle		45°	45°	45°	45°
Peak torque	**kNm**	45	60	45	60
Dynamic load capacity	**kN**	90	100	75	100
Static load capacity	**kN**	225	250	187.5	250

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Torque Converter Transmissions Synchro Shuttle

MAIN TECHNICAL DATA	TCB56 2WD	TCB80 2WD	TCB80 4WD
Power Rating	55 kW @ 2,200 rpm	82 kW @ 2,200 rpm	82 kW @ 2,200 rpm
Max input Torque	600 Nm	750 Nm	750 Nm
Max input speed	2,420 rpm	2,400 rpm	2,400 rpm
Internal Pump Type	Gerotor	Gear	Gear
Engine Flywheel Interface	SAE 3	SAE 3	SAE 3
Output Flage Type	Yoke 1410	Yoke 1410	Yoke 1410
2WD output drop from Engine	180 mm	180 mm	180 mm
4WD output drop from Engine	-	-	323 mm
Vehicle Pump Interface	SAE C	SAE C	SAE C
Torque Converter Size	W280	W300	W300
Speed Gear	3 Fwd + 3 Rev	4 Fwd + 4 Rev	4 Fwd + 4 Rev
Fwd/Rev Ratios Option	1:1	1:1 / 1:0.829	1:1 / 1:0.829
Fwd Speed Gear Ratios	1st 2nd 3rd	1st 2nd 3rd 4th	1st 2nd 3rd 4th
	4.62:1 2.73:1 0.87:1	5.603:1 3.481:1 1.585:1 0.793:1	5.603:1 3.481:1 1.585:1 0.793:1
MFD Ratio Options	-	-	0.8:1 / 0.818:1 / 0.895:1
Electronic Control	No	No	No
Reverser	Power Reverse	Power Reverse	Power Reverse
Gear Shifting	Synchro Shuttle	Synchro Shuttle	Synchro Shuttle
Direct Drive	Yes	Yes	Yes
MFD Connection Options	-	-	SAHR Dog Clutch / SAHR Collar Shift / Positive Clutch
Parking Brake Options	-	None / SAHR Wet Discs / Manual Wet Discs	None / SAHR Wet Discs / Manual Wet Discs
Spin-On Oil Filter Options	Vertical	Horizontal / Vertical / Remote	Horizontal / Vertical / Remote
Electric System Voltage	12V	12V	12V
Differential Lock Solenoid	None	On Control Valve Assy	On Control Valve Assy
Power Brake in/out Ports	18 bar nom.	15 bar nom.	15 bar nom.
Speed Sensor	Option	Available	Available
Temperature Sensor	Option	Available	Available
Pressure Sensor	N/A	Available	Available
Electrical Harness	N/A	N/A	N/A

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Torque Converter Transmissions Power Synchro

MAIN TECHNICAL DATA	**TCB80 SPS 4WD**	**TCB80 SPS Coaxial**
Power Rating	82 kW @ 2,200 rpm	82 kW @ 2,200 rpm
Max input Torque	750 Nm	750 Nm
Max input speed	2,400 rpm	2,400 rpm
Internal Pump Type	Gear	Gear
Engine Flywheel Interface	SAE 3	SAE 3
Output Flage Type	Yoke 1410	Yoke 1410
2WD output drop from Engine	180 mm	180 mm
4WD output drop from Engine	323 mm	334 mm
Vehicle Pump Interface	SAE C	SAE C
Torque Converter Size	W300	W300
Speed Gear	4 Fwd + 4 Rev	4 Fwd + 4 Rev
Fwd/Rev Ratios Option	1:1 / 1:0.829	1:1 / 1:0.829
FWD Speed Gear Ratios	1st 2nd 3rd 4th	1st 2nd 3rd 4th
	5.603:1 3.481:1 1.585:1 0.793:1	5.603:1 3.481:1 1.585:1 0.793:1
MFD Ratio Options	0.8:1 / 0.818:1 / 0.895:1	1:1
Electronic Control	Yes	Yes
Reverser	Power Reverse	Power Reverse
Gear Shifting	Servo Power Synchro	Servo Power Synchro
Direct Drive	Yes	Yes
MFD Connection Options	SAHR Dog Clutch / SAHR Collar Shift SAHR Wet Clutch / Positive Clutch	Permanent / SAHR Dog Clutch SAHR Collar Shift / SAHR Wet Clutch
Parking Brake Options	None / SAHR Wet Discs / Manual Wet Discs	None / SAHR Wet Discs / Manual Wet Discs
Spin-On Oil Filter Options	Vertical / Remote	Vertical / Remote
Electric System Voltage	12V	12V
Differential Lock Solenoid	On Control Valve Assy	On Control Valve Assy
Power Brake in/out Ports	15 bar nom.	15 bar nom.
Speed Sensor	Yes	Yes
Temperature Sensor	Yes	Yes
Pressure Sensor	Yes	Yes
Electrical Harness	Available	Available

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Torque Converter Transmissions Power Shift

MAIN TECHNICAL DATA	**TCB90 PS 4WD**				**TCB90 PS Coaxial**			
Power Rating	82 kW @ 2,200 rpm				82 kW @ 2,200 rpm			
Max input Torque	750 Nm				750 Nm			
Max input speed	2,400 rpm				2,400 rpm			
Internal Pump Type	Gear				Gear			
Engine Flywheel Interface	SAE 3				SAE 3			
Output Flage Type	Yoke 1410				Yoke 1410			
2WD output drop from Engine	188 mm				188 mm			
4WD output drop from Engine	350 mm				350 mm			
Vehicle Pump Interface	SAE C				SAE C			
Torque Converter Size	W300				W300			
Speed Gear	4 Fwd + 4 Rev				4 Fwd + 4 Rev			
Fwd/Rev Ratios Option	1:1 / 1:0.829				1:1 / 1:0.829			
FWD Speed Gear Ratios	1st	2nd	3rd	4th	1st	2nd	3rd	4th
	5.533:1	3.359:1	1.533:1	0.811:1	4.426:1	2.687:1	1.226:1	0.649:1
MFD Ratio Options	0.804:1				1:1			
Electronic Control	Yes				Yes			
Reverser	Power Reverse				Power Reverse			
Gear Shifting	Power Shift				Power Shift			
Direct Drive	Yes				Yes			
MFD Connection Options	SAHR Wet Clutch				Permanent / SAHR Wet Clutch			
Parking Brake Options	None / SAHR Wet Discs / Manual Wet Discs				None / SAHR Wet Discs / Manual Wet Discs			
Spin-On Oil Filter Options	Horizontal / Vertical / Remote				Horizontal / Vertical / Remote			
Electric System Voltage	12V				12V			
Differential Lock Solenoid	On Control Valve Assy				On Control Valve Assy			
Power Brake in/out Ports	15 bar nom.				15 bar nom.			
Speed Sensor	Yes				Yes			
Temperature Sensor	Yes				Yes			
Pressure Sensor	Yes				Yes			
Electrical Harness	Available				Available			

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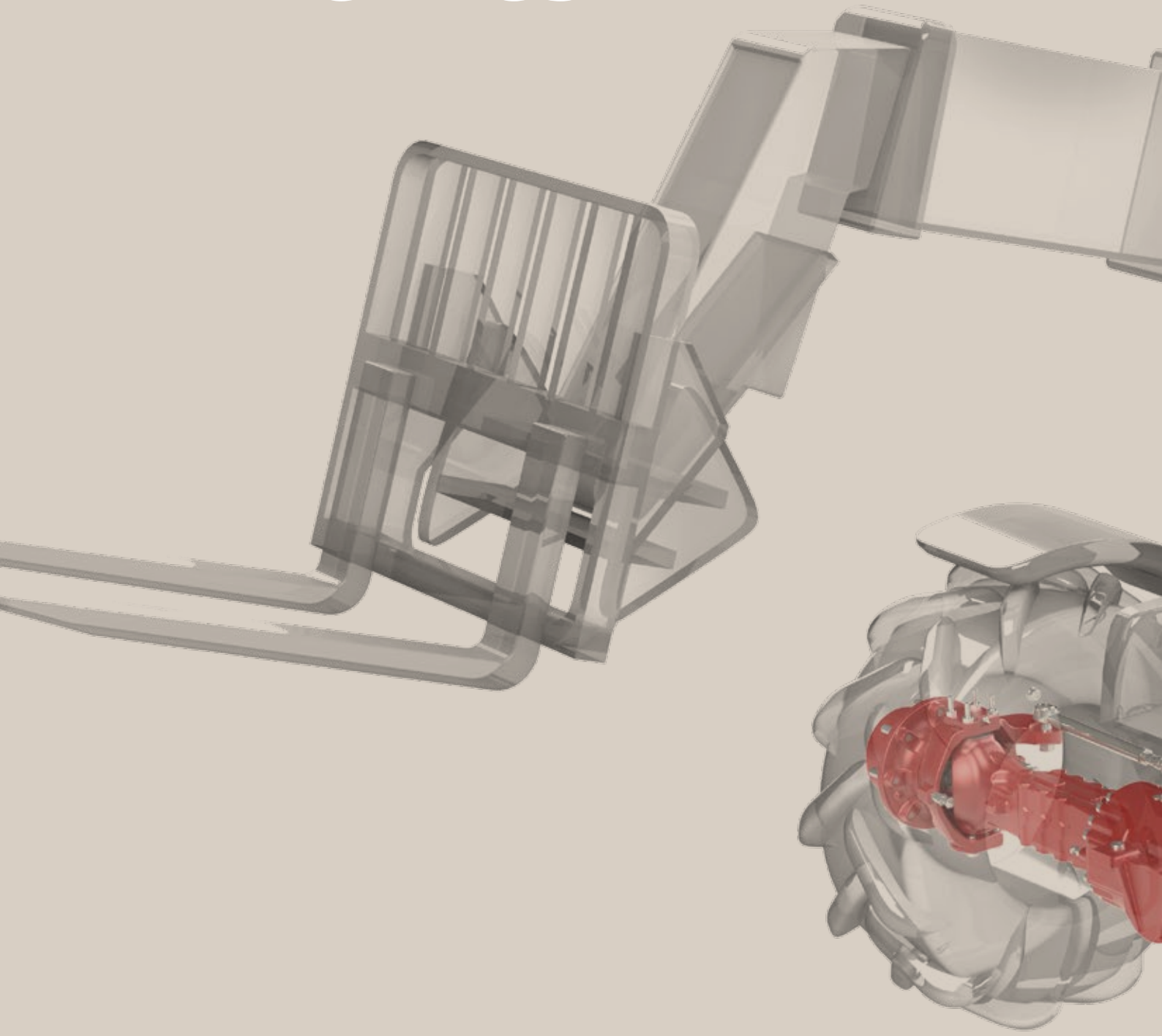
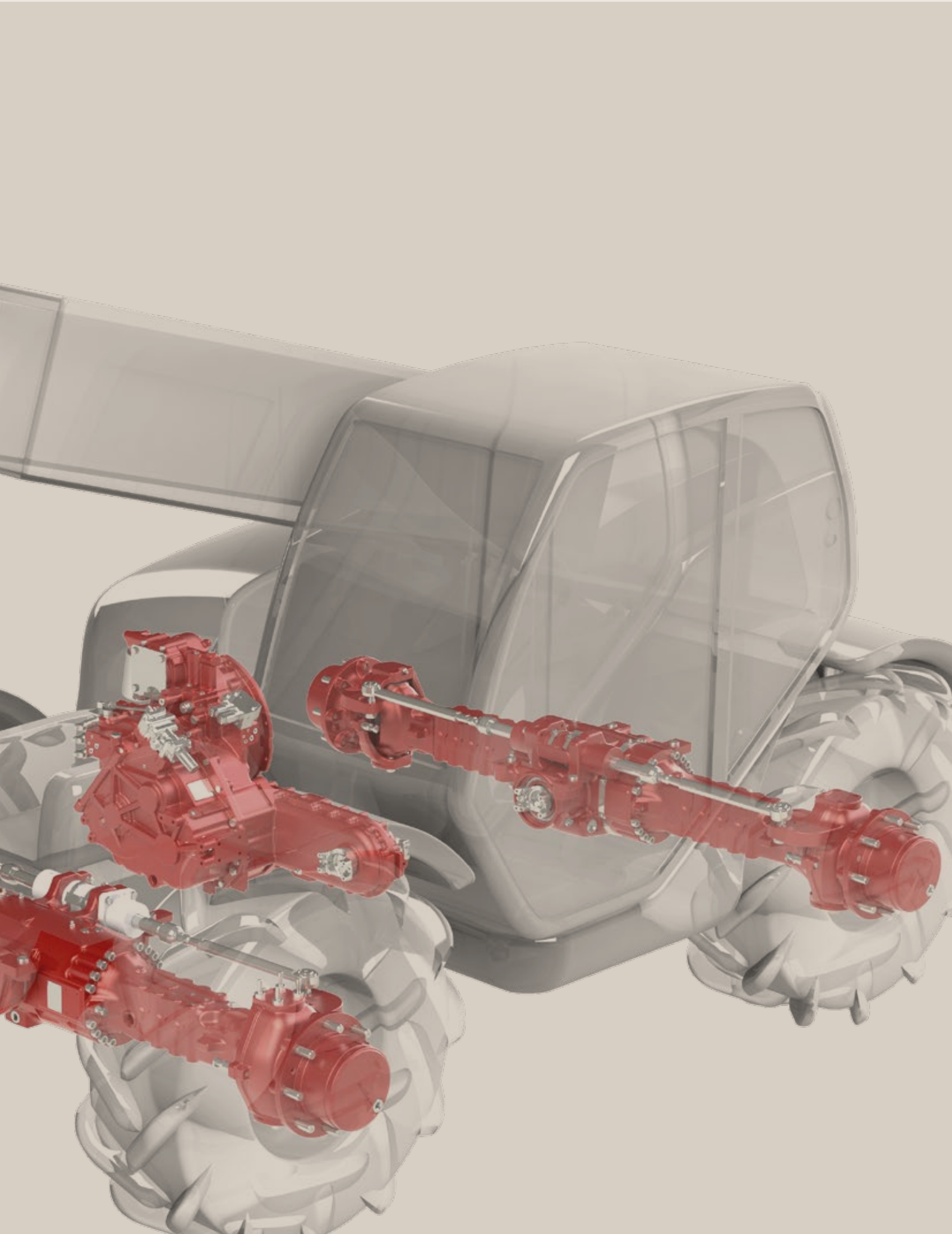
Telescopic Boom Handler Drivelines





Telescopic Boom Handler Drivelines

Carraro offers its renewed and complete range of Drivelines for Telescopic Handlers, which includes additional axle variants and a series of new transmission models, both for hydrostatic and torque converter machines.

The **Axle Range** covers machines with lifting capacities ranging from 1 to 5 tonnes. The configuration options, for both lighter and more compact machines as well as heavier and larger machines, include the axle structure in multiple flange-to-flange dimensions for each axle model, numerous ratio and differential lock configurations, multiple brake configurations (from the dry disc to wet inboard types, both for service and parking), and various sensor arrangements (steering, load, speed).
All Axles enable a tight steering radius, while ensuring precise handling, high manoeuvrability, and minimum tyre wear. All Rear Axles are available with multiple differential configurations, from open to 100% locked, to ensure optimal traction under any ground conditions. Moreover, every axle model has been designed and tested for use under the severest conditions, with a high load capacity and robust gear design to ensure an extended service life with improved durability.

The **Torque Converter Transmissions** are all in Full Powershift configuration both for Speed Shifting and Forward/Reverse Shuttling. They're available in Centre and Side Drive configurations, and with 4 to 6 speeds to accommodate all vehicle lay-outs and uses. These units have been developed with electro-hydraulic control or with full Electronic Control through Carraro's proprietary ECU. Torque Converter Lock-up solutions are also available as an option to improve the vehicle's fuel efficiency and productivity. All of these transmissions guarantee smooth, precise, and reliable response for all typical machine jobs, even under severe working conditions.

The **Hydrostatic Transmissions** span from compact Gearboxes, which are perfectly suited to the installation requirements in smaller machines, to fully electronically-controlled, on-the-fly shifting (**Speedshift**) versions, which are designed for the larger and higher performance machines. All the Hydrostatic Units are designed to minimise power loss and for easy installation in every vehicle lay-out, mounted either directly or remotely on the axles. The large number of available ratios allows for optimised speed/torque values with almost every application.

In the 2 Speed Unit Range, Carraro has developed **Speedshift Technology**, which combines the Auto-Shift function (through the simultaneous electronic control of Hydrostatic and Gearbox Shifting), with the best possible efficiency. As with all of its models, Carraro can provide complete control systems (SW & HW) for these units as well.

Augmented Contents

Direct Drive

ECOlogy Mode

Lift capacity kg	Front axle	Rear axle	Hydrostatic Transmissions	Torque Converter Transmissions	ECU
Up to 1,500	26.09M	26.09M	TB135 TB138-2	-	-
From 1,500 to 2,500	26.16M	26.16	TB135 TB138-2	-	-
From 2,500 to 3,000	26.20M	26.20	TB172 TB172-2 Speedshift	-	Yes
From 3,000 to 3,500	26.25M	26.25	TB172 TB172-2 Speedshift	TCH100 Center Drive TCH90 Side Drive	Yes
From 3,500 to 4,000	26.27M	26.27M	TB172 TB172-2 Speedshift	TCH100 Center Drive TCH90 Side Drive	Yes
From 4,000 to 4,500	26.32M	26.32M	TB172 TB172-2 Speedshift	TCH100 Center Drive TCH90 Side Drive TCH110 Side Drive	Yes
From 4,500 to 5,000	26.43M	26.43M	TB172 TB172-2 Speedshift	TCH100 Center Drive TCH90 Side Drive TCH110 Side Drive	Yes

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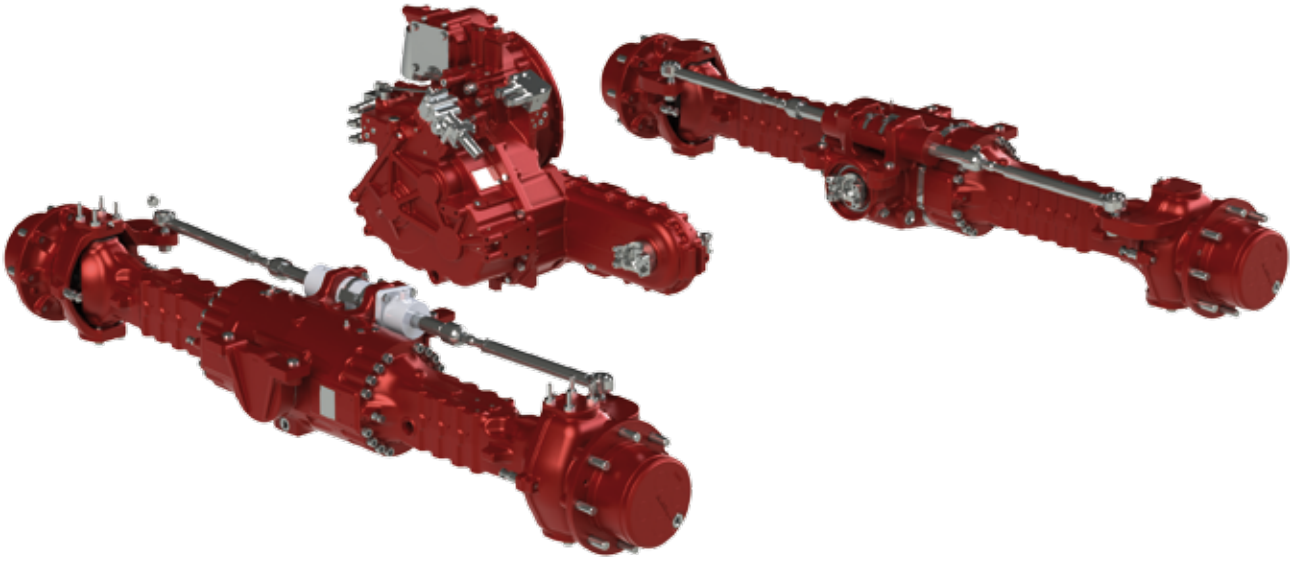


		26.09	26.16	26.20	26.25
Unladen vehicle weight	kg	3500	4400	7000	7500
Flange to Flange	mm	1270 1400 1530	1270 1400 1530 1640	1580 1680 1800 1900	1580 1680 1800 1900
Whell Mounting dimension		n° 6 M18 x 1.5 on ø 205 mm	n° 8 M18 x 1.5 on ø 275 mm	n° 8 M18 x 1.5 on ø 275 mm	n° 8 M18 x 1.5 on ø 275 mm
Wheel Peak Drive Torque	kNm	12	22	29,4	34
Dynamic Load Capacity	kN	45	50	70	75
Static Load Capacity	kN	112.5	125	175	187.5
Differential		Open Limited slip 100% Hydraulic lock	Open Limited slip 100% Hydraulic lock	Open Limited slip 100% Hydraulic lock	Open Limited slip 100% Hydraulic lock
Max. Steering Angle		40°	40°	45°	45°
Service Brakes		Dry Caliper at Axle Input Wet Disc	Dry Caliper at Axle Input Wet Disc	Dry Caliper at Axle Input Wet Disc	Dry Caliper at Axle Input Wet Disc
Parking Brake		Dry Caliper at Axle Input Wet Disc SAHR	Dry Caliper at Axle Input Wet Disc SAHR	Dry Caliper at Axle Input Wet Disc SAHR	Dry Caliper at Axle Input Wet Disc SAHR
Vehicle Frame Mounting		Pads Trunnion ACP	Pads Trunnion ACP	Pads Trunnion ACP	Pads Trunnion ACP

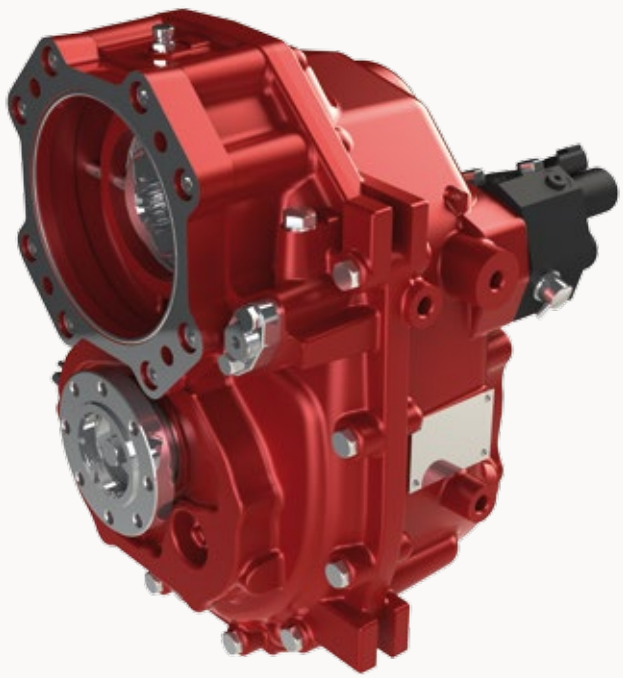
		26.27	26.32	26.43
Unladen vehicle weight	kg	8500	10500	12500
Flange to Flange	mm	1920 2050	1950	1950
Whell Mounting dimension		n° 8 M18 x 1.5 on ø 275 mm	n° 10 M22 x 1.5 on ø 335 mm	n° 10 M22 x 1.5 on ø 335 mm
Wheel Peak Drive Torque	kNm	34	45	50
Dynamic Load Capacity	kN	88	105	120
Static Load Capacity	kN	220	262.5	300
Differential		Open Limited slip 100% Hydraulic lock	Open Limited slip 100% Hydraulic lock	Open Limited slip 100% Hydraulic lock
Max. Steering Angle		55°	55°	55°
Service Brakes		Wet Disc	Wet Disc	Wet Disc
Parking Brake		Dry Caliper at Axle Input Wet Disc SAHR	Dry Caliper at Axle Input Wet Disc SAHR	Dry Caliper at Axle Input Wet Disc SAHR
Vehicle Frame Mounting		Pads Trunnion ACP	Pads Trunnion ACP	Pads Trunnion ACP

			TCH100 Center Drive	TCH90 NEW Side Drive				TCH110 NEW Side Drive			
*Power rating		kW	95	85				110			
Max input torque		Nm	850	700				850			
Rated engine speed		rpm	2400	2400				2400			
Maximum input speed		rpm	2530	2640				2640			
Charge pump type			Gear	Gerotor				Gerotor			
Engine flywheel interface			SAE 3	SAE 3				SAE 3			
Output flange type			Yoke 1410	Yoke 1410				Yoke 1480			
Output axis position from engine	Off-set	mm	0	656.5				656.5			
	Drop	mm	350	226.5				226.5			
PTO pump interface			SAE C - 4 bolts	SAE C - 4 bolts				SAE C - 4 bolts			
PTO torque		Nm	350	300				400			
Torque converter size		mm	300	280				300			
Speed gear			**4Fwd + 3Rev**	**4Fwd + 3Rev**		**6Fwd + 3Rev**		**4Fwd + 3Rev**		**6Fwd + 3Rev**	
Fwd speed gear ratio	xx:1	**1**	4.43	3.59	4.31	3.59	4.31	3.59	4.31	3.59	4.31
		2	2.69	1.66	1.99	2.54	3.05	1.66	1.99	2.54	3.05
		3	1.23	0.84	1.01	1.66	1.99	0.84	1.01	1.66	1.99
		4	0.65	0.60	0.71	1.18	1.41	0.60	0.71	1.18	1.41
		5	–	–	–	0.84	1.01	–	–	0.84	1.01
		6	–	–	–	0.60	0.71	–	–	0.60	0.71
Rev speed gear ratio	xx:1	**1**	4.43	3.60	4.33	3.60	4.33	3.60	4.33	3.60	4.33
		2	2.69	1.67	2.00	1.67	2.00	1.67	2.00	1.67	2.00
		3	1.23	0.84	1.01	0.84	1.01	0.84	1.01	0.84	1.01
4WD ratio	xx:1		1.1:1	1:1		1:1		1:1		1:1	
Shifting control			ECU	Manual		ECU		Manual		ECU	
Reverser			Power reverser	Power reverser		Power reverser		Power reverser		Power reverser	
Gear shifting			Power-Shift	Power-Shift		Power-Shift		Power-Shift		Power-Shift	
Clutches modulations			ECU modulation	Mech-Hydr		ECU modulation		Mech-Hydr		ECU modulation	
MFD connection			Permanent/Disconnect	Permanent		Permanent		Permanent		Permanent	
Parking brake option			Wet SAHR and Manual	None		None		None		None	
Spin-on filter option			Vertical or remote	Vertical		Vertical		Vertical		Vertical	
Electric system voltage		V	12	12		12		12		12	
Rear axle differential lock solenoid			Available	None		None		None		None	
Power brake in/out ports		bar	15 nominal	16 nominal		16 nominal		16 nominal		16 nominal	
Inching			Option	None		Option		None		Option	
TC Lock-Up			Direct Drive Option	None		None		Option		Option	
Speed sensor			Standard	Option		Standard		Option		Standard	
Temperature sensor			Standard	Option		Standard		Option		Standard	
Pressure switch			Standard	Option		Standard		Option		Standard	
Electric harness			Option	None		Option		None		Option	

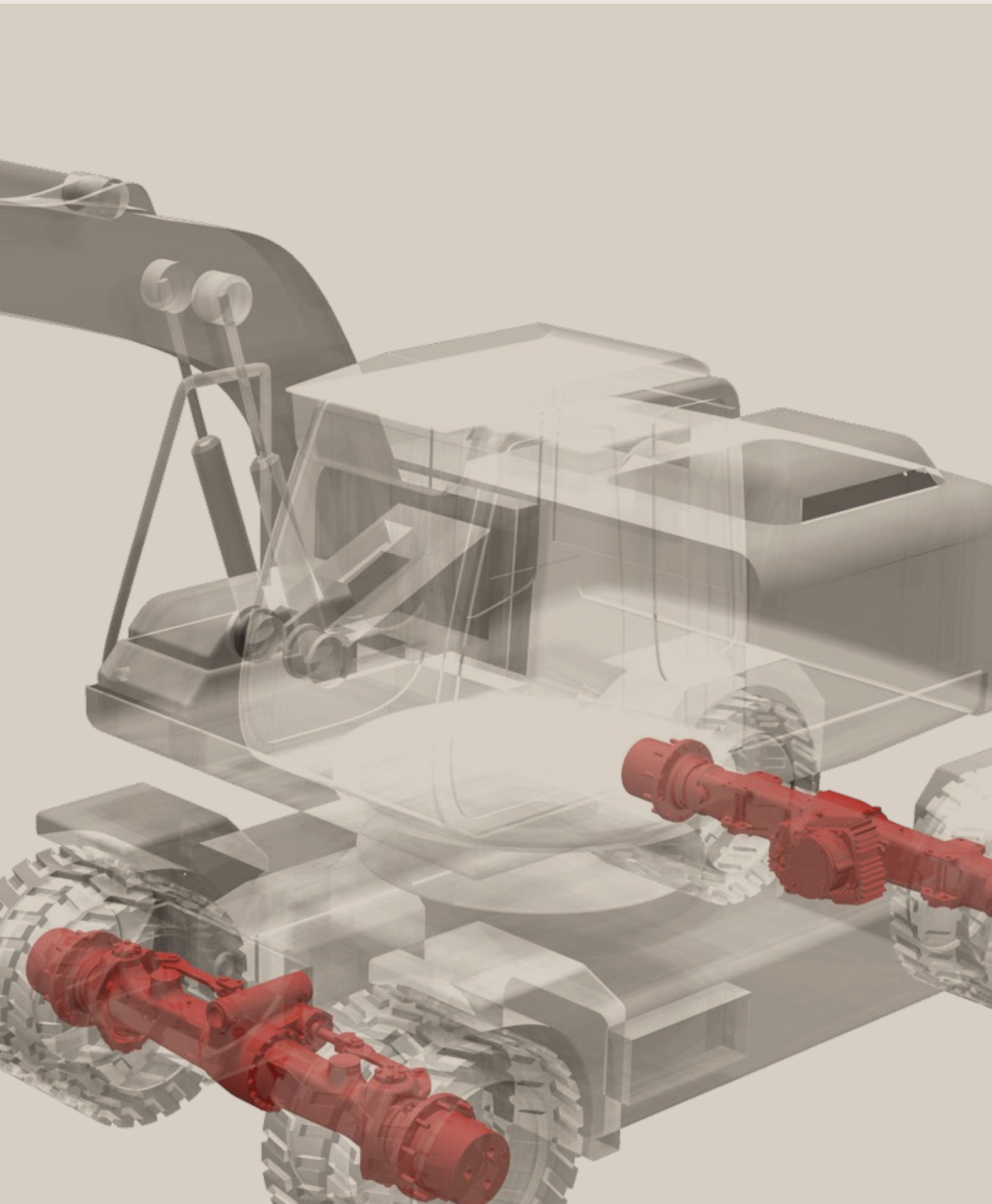
Center Drive

Side Drive

MODEL		**TB135**	**TB138-2**		**TB172**	**TB172-2**		**TB172-2 Speedshift**	
Description		Single speed Single Motor Gearbox	Dual speed Single Motor Gearbox		Single speed Single Motor Gearbox	Dual Speed Single Motor Gearbox		Dual Speed Single Motor Gearbox	
Motor Size	cc	up 60	up 80		80-160	80-160		80-160	
Max Input torque	Nm	450	510		1020	1020		1020	
Max Input speed	rpm	6000	5500		5500	5500		5500	
In/Out Centerline distance	mm	135	138.5		172	172		172	
Onput Interfaces		DIN 13010	DIN 100 x 8 holes		DIN 13010/1410	DIN 13010/1410		DIN 13010/1410	
					SAE 1410/1480	SAE 1410/1480		SAE 1410/1480	
Reduction ratios		Single Ratio	1st	2nd	Single Ratio	1st	2nd	1st	2nd
		2.3	2.75	1.163	1.196	2.971	1.129	2.971	1.129
		1.853			1.795	3.515	1.273	3.515	1.273
		3			2.027	4.286	1.359	4.286	1.359
					2.469				
					3.148				
Speed Shifting			Electro-Hydraulic Vehicle stopped			Electro-Hydraulic Vehicle stopped		Electro-Hydraulic Vehicle on the go	



Wheel Excavators Drivelines



Wheel Excavators Drivelines

Carraro offers Drivelines that have been designed for both Compact and Standard Wheel Excavator Loaders with up to 24 tonnes of Unladen Machine Mass.

The Compact Range comprises several configuration options for axle structures in multiple flange-to-flange dimensions for each axle model, numerous ratio and differential lock configurations, multiple brake configurations (from the dry disc to wet inboard types, both for service and parking), and various sensor arrangements (steering, load, speed).

Besides offering the utmost in configurability, the Standard Range also includes the wheel speed wet brake configuration, which is key to minimising machine movement while digging on wheel.
The unique brake design ensures very low axle power loss while ensuring higher vehicle speed and lower fuel consumption.
Every axle model has been designed and tested for use under the severest conditions and offers a high load capacity and robust gear design to ensure an extended service life with improved durability.

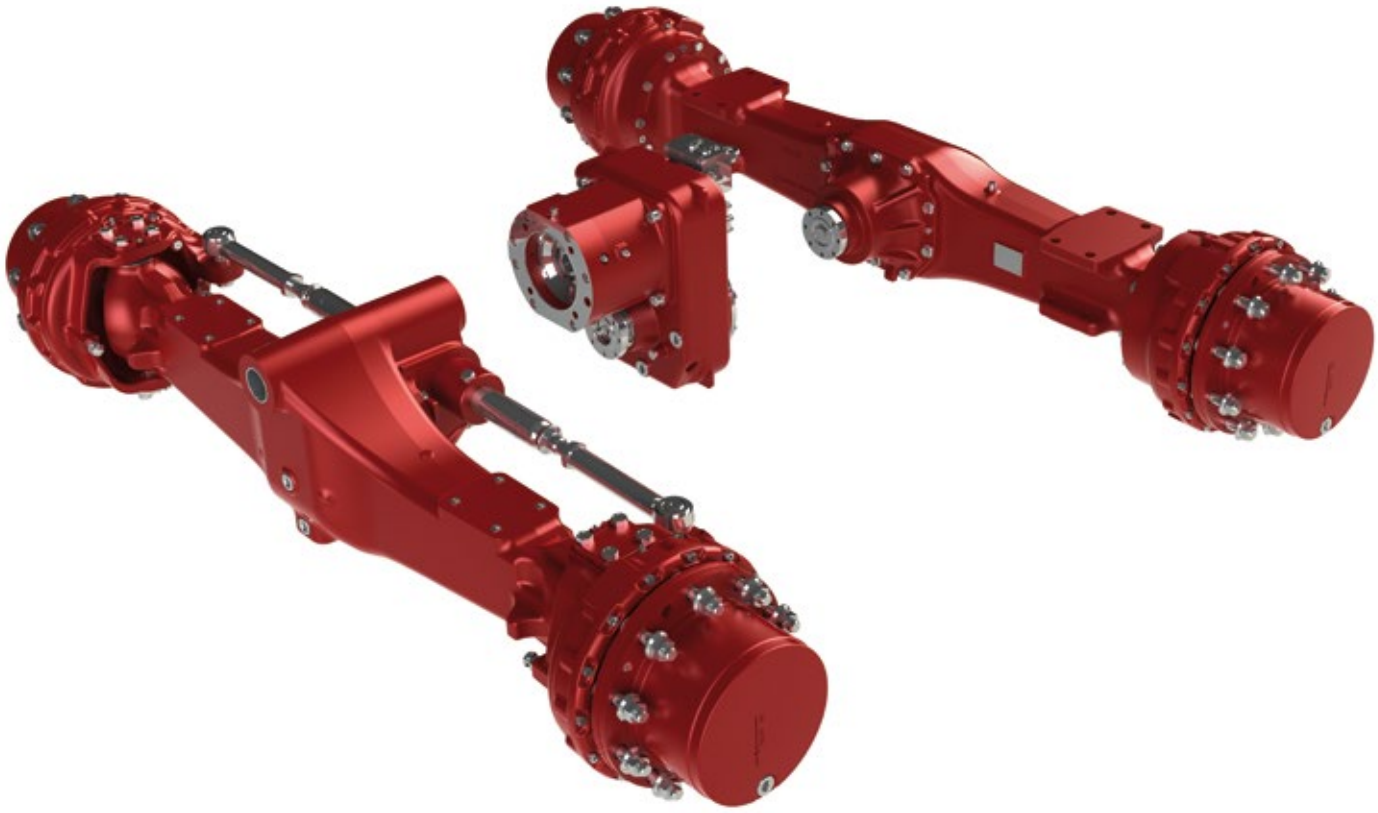
The Wheel Excavator Drivelines are completed by the Carraro Hydrostatic Transmissions.
These range from compact Gearboxes, best suited for installation in the most compact machines, to fully electronically-controlled, on-the-fly shifting (**Speedshift**) versions, designed for faster, higher performance machines. All the Hydrostatic Units work to minimise power loss and provide easy installation in every vehicle lay-out. The large number of available ratios allows for optimised speed/torque values to better fit every application.

Carraro has developed **Speedshift Technology** for its Compact Excavators as well, combining the Auto-Shift function (through simultaneous electronic control of Hydrostatic and Gearbox Shifting), with the best possible efficiency. As with all of its models, Carraro can provide complete control systems (SW & HW) for these units as well.

Moreover, for the Standard Excavator Class Carraro has developed two models of dual-speed Powershift hydrostatic transmissions with electro hydraulic controls.

Vehicle weight tons	**Front axle model**	**Rear axle model**	**Transmissions**
From 5 to 7	26.16 E	28.16 E	TB 172 TB 172-2
From 8 to 10	26.25 E	28.25 E	TB 172 TB 172-2
From 11 to 16	26.32 E	28.32 E	FLS 3.2 LS 3.2
From 17 to 19	26.44 E	28.44 E	FLS 3.2 / 4.2 LS 3.2 / 4.2
From 20 to 24	26.54 E	28.54 E	FLS 4.2 LS 4.2

All specifications can be subject to changes without prior advice by Carraro



AXLES – WHEEL EXCAVATORS

MODEL		26.16 E	26.25 E	26.32 E	26.44 E	26.54 E
Overall width	mm	1,954	2,074	2,241	2,241	2,421
Flange to flange distance	mm	1,720	1,832	1,920	1,920	2,100
Wheel mounting dimension		n° 8 M18 x 1.5 on ø 275 mm or n° 8 M20 x 1.5 on ø 275 mm	n° 8 M18 x 1.5 on ø 275 mm or n° 8 M20 x 1.5 on ø 275 mm	n° 10 M22 x 1.5 on ø 335 mm	n° 10 M22 x 1.5 on ø 335 mm	n° 10 M22 x 1.5 on ø 335 mm
Max. steering angle		45 °	45 °	40 °	40 °	40 °
Peak torque	kNm	22	35	45	54	68
Dynamic load capacity	kN	70	85	95	120	150
Static load capacity	kN	175	212.5	237.5	300	380

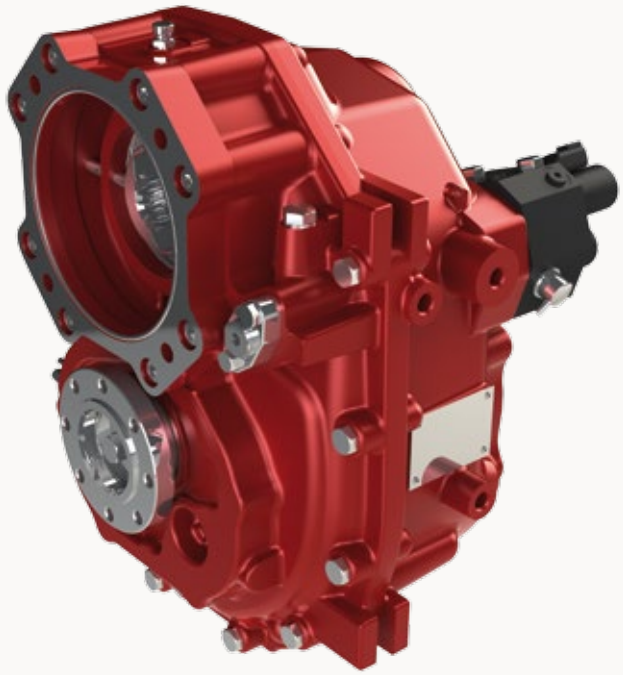
MODEL		28.16 E	28.25 E	28.32 E	28.44 E	28.54 E
Overall width	mm	1,954	1,980	2,241	2,241	2,421
Flange to flange distance	mm	1,720	1,838	1,920	1,920	2,100
Wheel mounting dimension		n° 8 M18 x 1.5 on ø 275 mm or n° 8 M20 x 1.5 on ø 275 mm	n° 8 M18 x 1.5 on ø 275 mm or n° 8 M20 x 1.5 on ø 275 mm	n° 10 M22 x 1.5 on ø 335 mm	n° 10 M22 x 1.5 on ø 335 mm	n° 10 M22 x 1.5 on ø 335 mm
Peak torque	kNm	22	35	45	54	68
Dynamic load capacity	kN	80	85	95	120	150
Static load capacity	kN	200	212.5	237.5	300	380

ALL MODELS AVAILABLE WITH	
Frame MTG	Rear: Rigid with pads / Front: Offset oscill. ACP
Service brakes	Wet immersed disc acting “on wheel” for WE axles

All specifications can be subject to changes without prior advice by Carraro

Hydrostatic Transmissions

MODEL		**TB135**	**TB138-2**		**TB172**	**TB172-2**		**TB172-2 Speedshift**	
Description		Single speed Single Motor Gearbox	Dual speed Single Motor Gearbox		Single speed Single Motor Gearbox	Dual Speed Single Motor Gearbox		Dual Speed Single Motor Gearbox	
Motor Size	cc	up 60	up 80		80-160	80-160		80-160	
Max Input torque	Nm	450	510		1020	1020		1020	
Max Input speed	rpm	6000	5500		5500	5500		5500	
In/Out Centerline distance	mm	135	138.5		172	172		172	
Onput Interfaces		DIN 13010	DIN 100 x 8 holes		DIN 13010/1410	DIN 13010/1410		DIN 13010/1410	
					SAE 1410/1480	SAE 1410/1480		SAE 1410/1480	
Reduction ratios		Single Ratio	1st	2nd	Single Ratio	1st	2nd	1st	2nd
		2.3	2.75	1.163	1.196	2.971	1.129	2.971	1.129
		1.853			1.795	3.515	1.273	3.515	1.273
		3			2.027	4.286	1.359	4.286	1.359
					2.469				
					3.148				
Speed Shifting			Electro-Hydraulic Vehicle stopped			Electro-Hydraulic Vehicle stopped		Electro-Hydraulic Vehicle on the go	

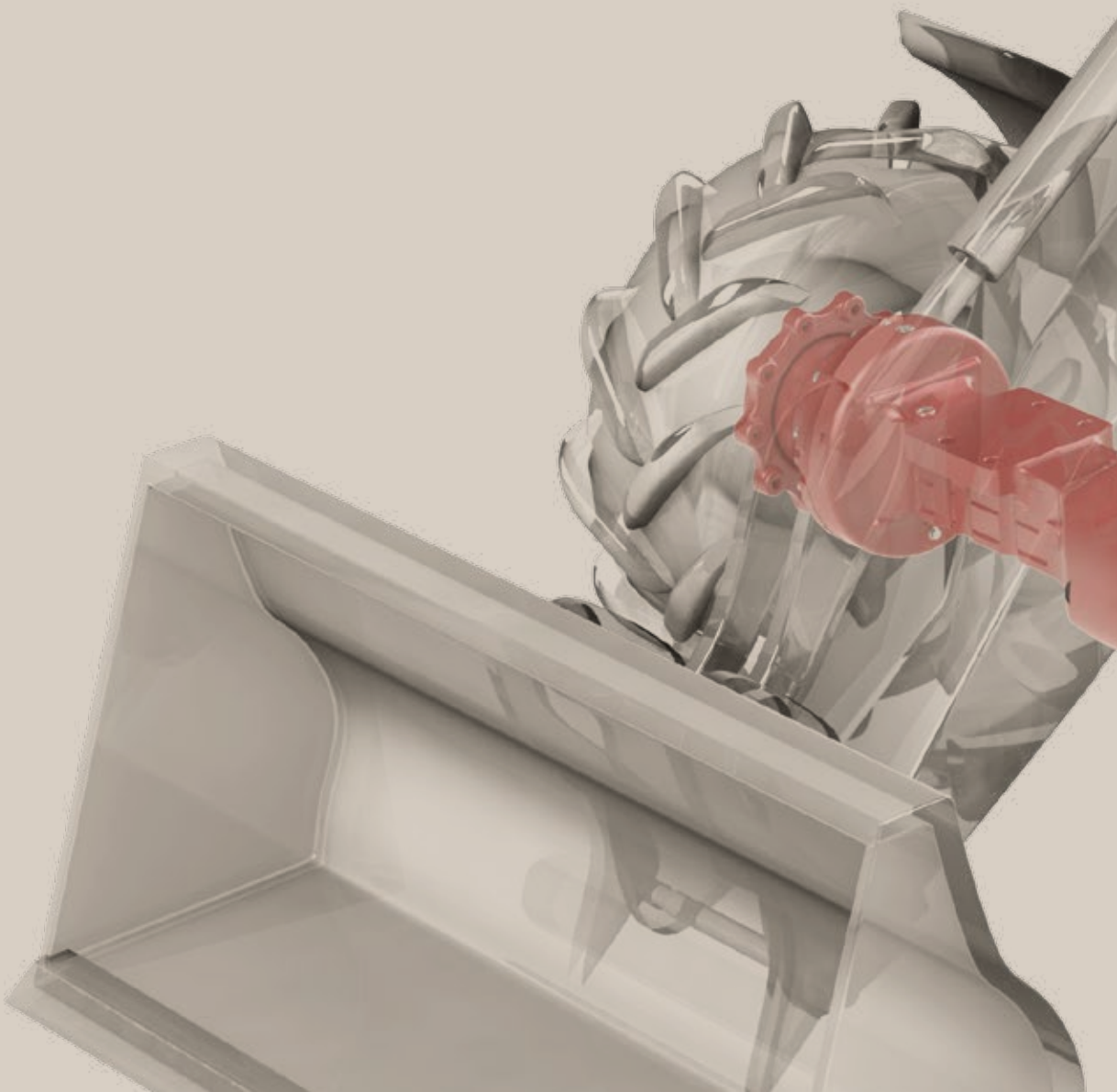


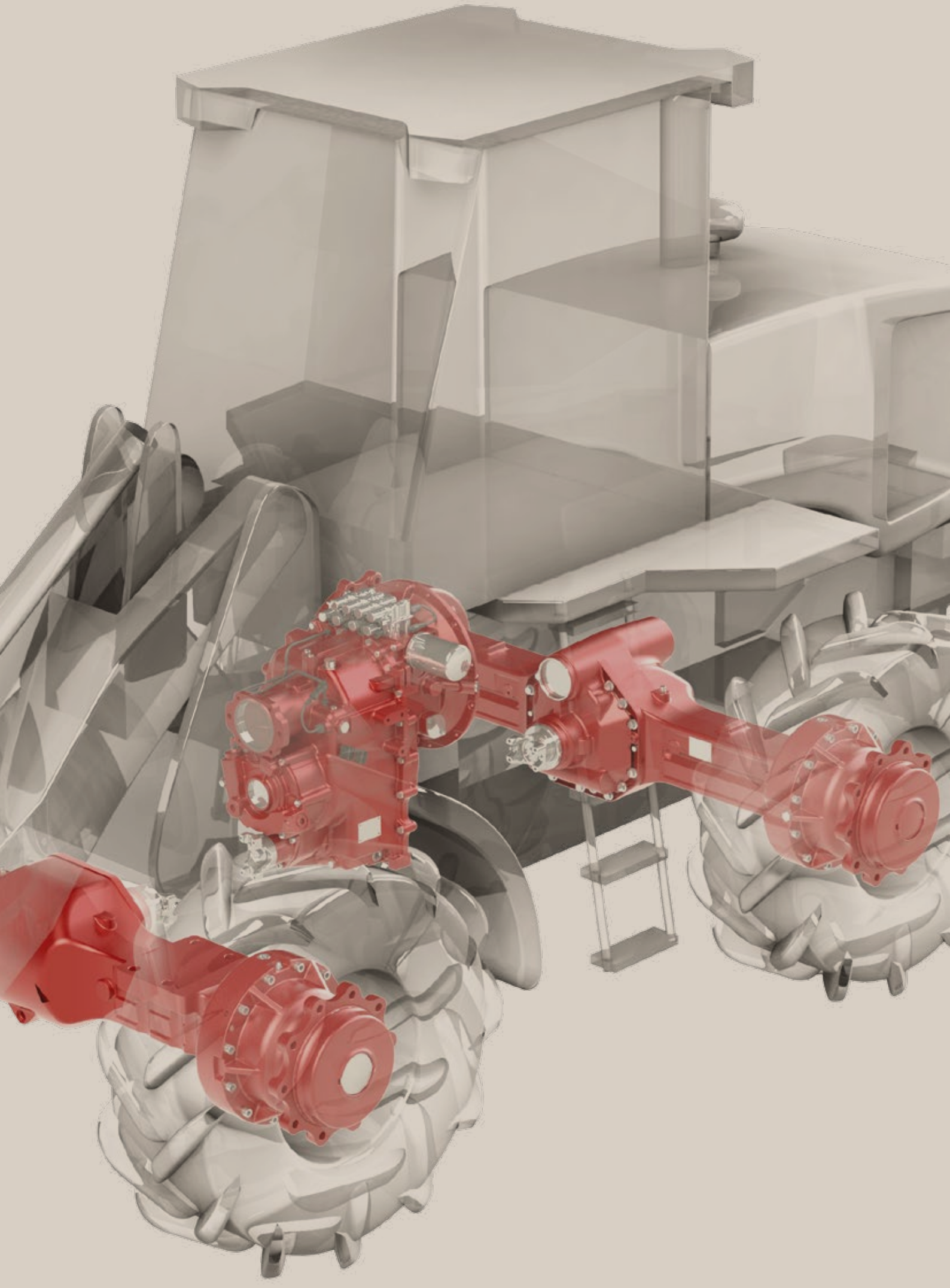
Hydrostatic Powershift Transmissions

MODEL		**FLS 3.2**		**LS 4.2**	
Description		2 speed power shift		2 speed power shift	
Output drop from engine	mm	185		176	
Input interfaces cc		Hydraulic motor		Hydraulic motor	
		107		80/140	
Reduction ratios		1st	2nd	1st	2nd
		4,217	1.022	5.143:1	1.371:1
				4.934:1	1.316:1
				4.423:1	1.179:1
Max Input	rpm	5,500		5,500	
Max Input torque	Nm	770		1,100	
Park brake type					

All specifications can be subject to changes without prior advice by Carraro

Wheel Loaders Drivelines





Wheel Loaders Drivelines

Throughout the years, Carraro has gained invaluable experience as Driveline provider for Wheel Loaders ranging from 2 to 12 tonnes of Unladen Machine Mass.

The Carraro **Axle Range** offers the utmost in configurability for each model with respect to the axle structure, which is available in multiple flange-to-flange dimensions for the numerous ratio and differential lock configurations, and for the multiple brake configurations, from the dry disc to wet inboard types both for service and parking (Mechanical or SAHR actuation). This large number of options ensures that the specific requirements of each application are met in the best way possible. Moreover, every axle model has been designed and tested for use under the severest conditions, with a high load capacity and robust gear design to ensure an extended service life with improved durability.

The **Hydrostatic Transmissions** complete the Carraro product offer for these machines.
The Carraro Hydrostatic Transmission Range spans from compact Gearboxes, best suited for installation in the most compact machines, to fully electronically-controlled, on-the-fly shifting (**Speedshift**) versions, designed for the larger and higher performance machines. All the Hydrostatic Units are designed to minimise power loss and for easy installation in every vehicle lay-out. The large number of available ratios allows for optimised speed/torque values to better fit every application. Carraro has also developed **Speedshift Technology**, which combines the Auto-Shift function (through simultaneous electronic control of Hydrostatic and Gearbox Shifting), with the best possible efficiency. As with all of its models, Carraro can provide complete control systems (SW & HW) for these units as well.

Augmented Contents

Direct Drive

ECOlogy Mode

Machine operative weight kg	Engine power kW	Front axle model	Rear axle model	Transmissions
Hydrostatic Applications				
3,500	37	28.09 26.09*	28.09 26.09*	TB135 / TB172 TB138-2 / TB172-2
5,500	51	28.16 26.16*	28.16 26.16*	TB135 / TB172 TB138-2 / TB172-2
6,500	63	28.25 26.25*	28.20 26.25*	TB135 / TB172 TB138-2 / TB172-2
7,500	66	28.28 26.28*	28.28 26.28*	TB135 / TB172 TB138-2 / TB172-2

* Four Wheels Steering Applications

Torque Converter Applications				
7,000	70	28.32	28.32	TCB90 PS coaxial
8,500	81	28.44	28.44	TCB90 PS coaxial
10,000	96	28.56	28.56	TCB90 PS coaxial
12,500	118	28.64	28.64	TCB90 PS coaxial

All specifications can be subject to changes without prior advice by Carraro

MODEL		28.09 26.09*	28.16 26.16*	28.20 26.20*	28.25 26.25*	28.28 26.28*
Articulated Frame						
Overall width	mm	1,400 1,550	1,550 1,650	1,570 1,810 1,910	1,570 1,810 1,910	1,640 1,840 1,940
Flange to flange distance	mm	1,250 1,400	1,400 1,500	1,430 1,570 1,760	1,430 1,570 1,760	1,430 1,630 1,730
Wheel mounting dimension	mm	n° 6 M18x1.5 on ø 205 mm	n° 8 M18x1.5 on ø 275 mm	n° 8 M20x1.5 on ø 275 mm	n° 8 M20x1.5 on ø 275 mm	n° 10 M22x1.5 on ø 335 mm
Peak torque	kNm	14	25	30	36	40
Dynamic load capacity	kN	40	55	90	90	100
Static load capacity	kN	100	137	225	225	250

* Steering versions with steering angle up to 55°, depending on axle model

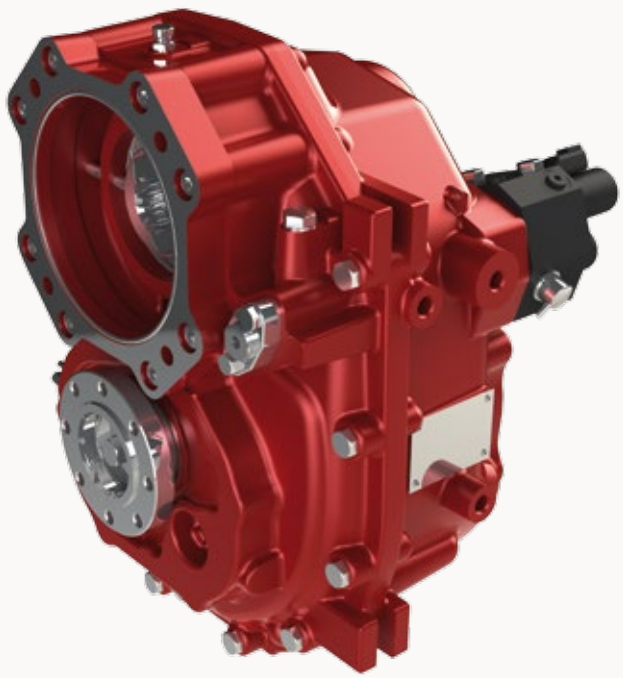
MODEL		28.32	28.44	28.50	28.56	28.64
Overall width	mm	2,050	1,930	1,930	2,070	2,070
Flange to flange distance	mm	1,800	1,800	1,800	1,930	1,930
Wheel mounting dimension	mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 10 M22x1.5 on ø 335 mm	n° 12 M22x1.5 on ø 425 mm
Peak torque	kNm	44.8	62	70	78	88
Dynamic load capacity	kN	100	110	110	120	140
Static load capacity	kN	250	275	275	300	350

ALL MODELS AVAILABLE WITH	
Frame MTG	Rigid with pads / Center oscill. TRU / Offset oscill. ACP
Service brakes	Single dry / Wet immersed disc
Parking brake	Ext. single dry

All specifications can be subject to changes without prior advice by Carraro

Hydrostatic Transmissions

MODEL		**TB135**	**TB138-2**		**TB172**	**TB172-2**		**TB172-2 Speedshift**	
Description		Single speed Single Motor Gearbox	Dual speed Single Motor Gearbox		Single speed Single Motor Gearbox	Dual Speed Single Motor Gearbox		Dual Speed Single Motor Gearbox	
Motor Size	cc	up 60	up 80		80-160	80-160		80-160	
Max Input torque	Nm	450	510		1020	1020		1020	
Max Input speed	rpm	6000	5500		5500	5500		5500	
In/Out Centerline distance	mm	135	138.5		172	172		172	
Onput Interfaces		DIN 13010	DIN 100 x 8 holes		DIN 13010/1410	DIN 13010/1410		DIN 13010/1410	
					SAE 1410/1480	SAE 1410/1480		SAE 1410/1480	
Reduction ratios		Single Ratio	1st	2nd	Single Ratio	1st	2nd	1st	2nd
		2.3	2.75	1.163	1.196	2.971	1.129	2.971	1.129
		1.853			1.795	3.515	1.273	3.515	1.273
		3			2.027	4.286	1.359	4.286	1.359
					2.469				
					3.148				
Speed Shifting			Electro-Hydraulic Vehicle stopped			Electro-Hydraulic Vehicle stopped		Electro-Hydraulic Vehicle on the go	

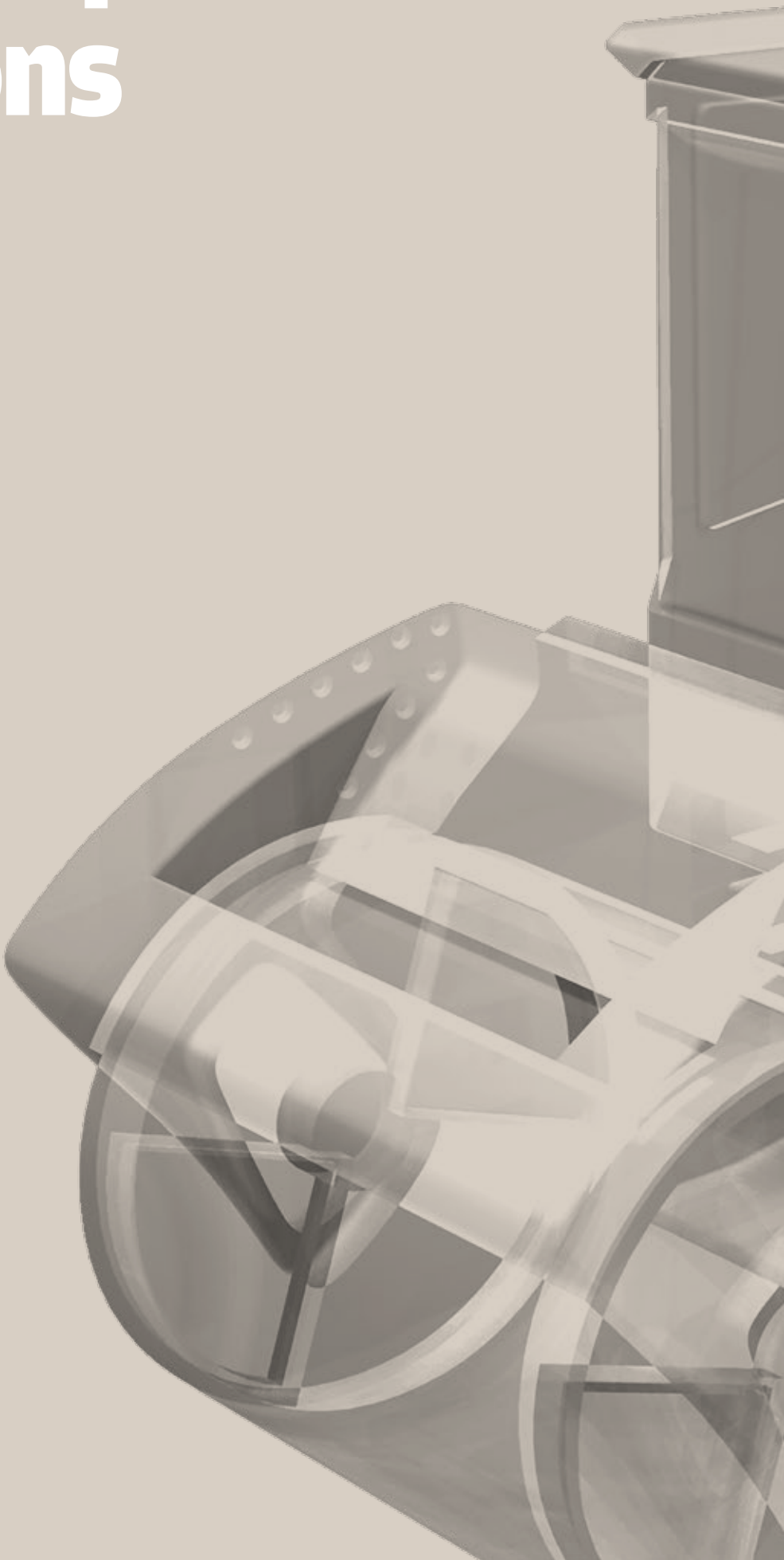


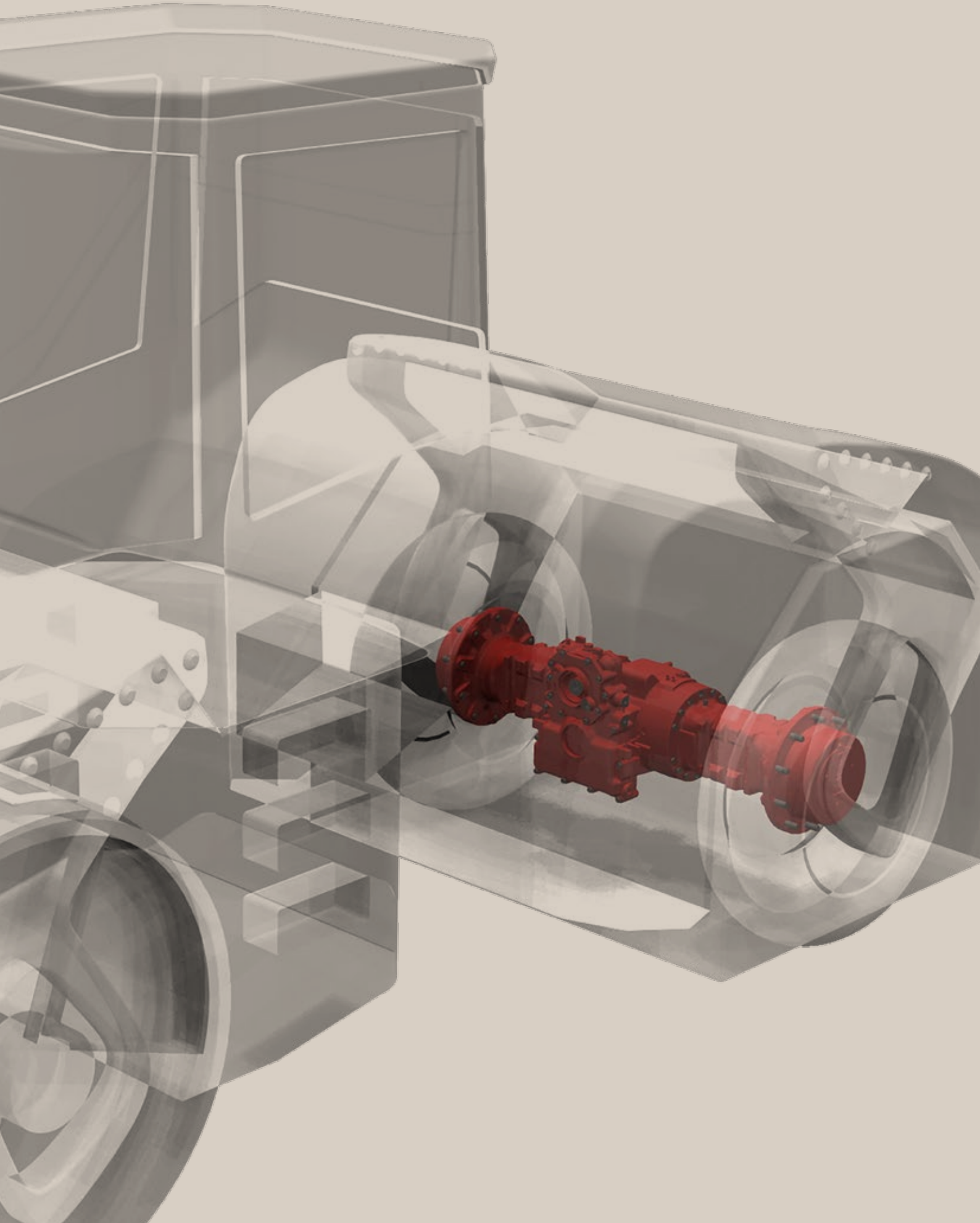
Torque Converter Transmissions Power Shift

MAIN TECHNICAL DATA	**TCB90 PS Coaxial**			
Power Rating	82 kW @ 2,200 rpm			
Max input Torque	750 Nm			
Max input speed	2,400 rpm			
Internal Pump Type	Gear			
Engine Flywheel Interface	SAE 3			
Output Flage Type	Yoke 1410			
2WD output drop from Engine	188 mm			
4WD output drop from Engine	350 mm			
Vehicle Pump Interface	SAE C			
Torque Converter Size	W300			
Speed Gear	4 Fwd + 4 Rev			
Fwd/Rev Ratios Option	1:1 / 1:0.829			
FWD Speed Gear Ratios	1st	2nd	3rd	4th
	4.426:1	2.687:1	1.226:1	0.649:1
MFD Ratio Options	1:1			
Electronic Control	Yes			
Reverser	Power Reverse			
Gear Shifting	Power Shift			
MFD Connection Options	Permanent / SAHR Wet Clutch			
Parking Brake Options	None / SAHR Wet Discs / Manual Wet Discs			
Spin-On Oil Filter Options	Horizontal / Vertical / Remote			
Electric System Voltage	12V			
Differential Lock Solenoid	On Control Valve Assy			
Power Brake in/out Ports	15 bar nom.			
Speed Sensor	Yes			
Temperature Sensor	Yes			
Pressure Sensor	Yes			
Electrical Harness	Available			

All specifications can be subject to changes without prior advice by Carraro

Soil Compactor Solutions





Soil Compactor solutions

Carraro has created a complete range of rear-drive axles for Soil Compactor Machines, whether they be very compact or quite large.

All these axles are made with a modular structure which leverages common components to other applications, although some features have been specifically designed for this application, such as: direct mounting for the hydrostatic motor; a high reduction ratio, obtained through either a hypoid gear set or an input reduction box; Spring Applied Hydraulic Release Wet disc brakes; NO SPIN or Limited Slip differential.

Every axle model has been designed to offer a high load capacity and a robust gear design to ensure an extended service life with improved durability, even under the specific, demanding working conditions of this application.

Vehicle weight tons	Rear axle model	Gearbox option
From 1.5 to 4	28.16 R Hypoid	TB172 Hydrostatic single speed
From 5 to 8	28.25 R Hypoid	TB172 Hydrostatic single speed
From 9 to 11	28.32 R Hypoid	TB172 Hydrostatic single speed
From 12 to 15	28.48 R Hypoid	TB172 Hydrostatic single speed
From 16 to 19	28.60 R Hypoid	TB172 Hydrostatic single speed
From 20 to 25	28.80 R Hypoid	TB172 Hydrostatic single speed

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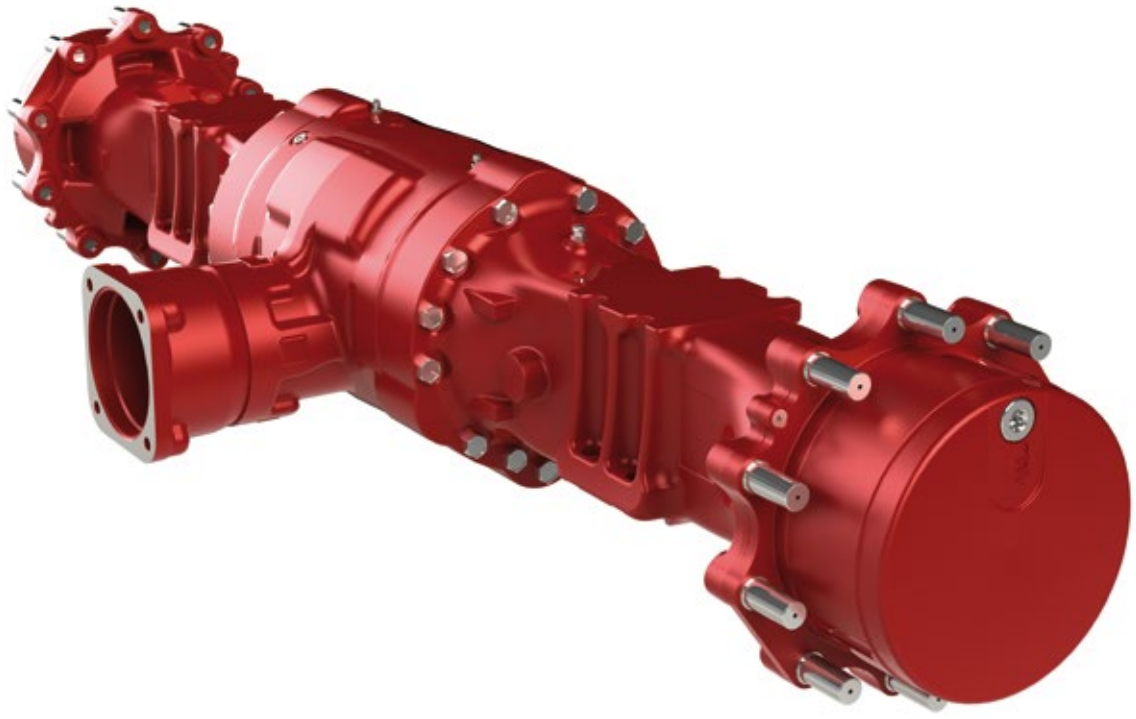
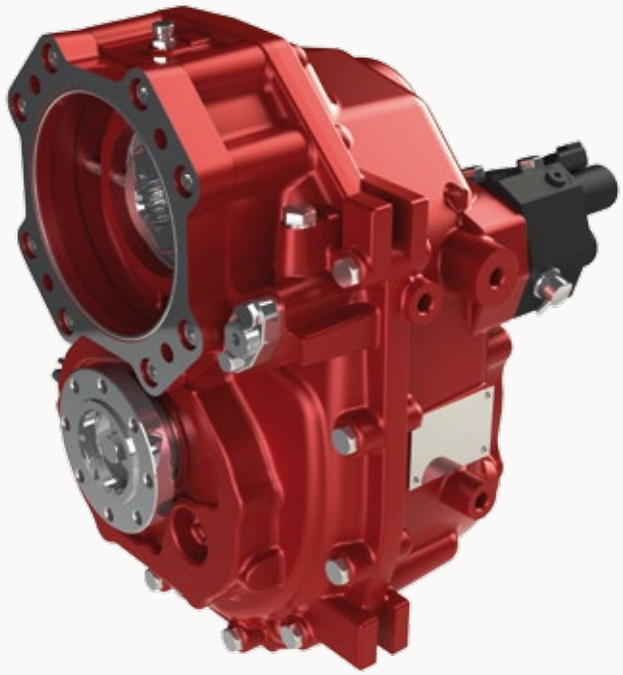


MODEL		28.16 R	28.25 R	28.32 R
Overall width	mm	1,260	1,512	1,860
Flange to flange distance	mm	1,100	1,270	1,654
Wheel mounting dimension		n° 6 M18 x 1.5 on ø 205 mm n° 8 M18 x 1.5 on ø 275 mm	n° 8 M18 x 1.5 on ø 275 mm	n° 10 M22 x 1.5 on ø 335 mm
Total reduction		From 30 to 110	From 40 to 110	From 40 to 110
Peak torque	kNm	22.5	35	45
Dynamic load capacity	kN	50	80	90
Static load capacity	kN	125	200	225

MODEL		28.48 R	28.60 R	28.80 R
Overall width	mm	1,988	1,928	2,040
Flange to flange distance	mm	1,700	1,640	1,740
Wheel mounting dimension		n° 10 M20 x 1.5 on ø 335 mm	n° 10 M20 x 1.5 on ø 335 mm	n° 12 M22 x 1.5 on ø 425 mm
Total reduction		From 43 to 110	From 43 to 110	From 43 to 110
Peak torque	kNm	67.2	84	112
Dynamic load capacity	kN	90	110	120
Static load capacity	kN	225	275	300

All specifications can be subject to changes without prior advice by Carraro

MODEL		**TB172**
Description		Single speed Single Motor Gearbox
Motor Size	cc	80-160
Max Input torque	Nm	1020
Max Input speed	rpm	5500
In/Out Centerline distance	mm	172
Onput Interfaces		DIN 13010/1410
		SAE 1410/1480
Reduction ratios		Single Ratio
		1.196
		1.795
		2.027
		2.469
		3.148



Electronic Control Unit

Carraro offers a complete family of proprietary ECUs that are specifically designed to manage its electronically controlled Modules and Transmissions. With a profound understanding of the application and internal electronic control know-how, the company has developed its SW entirely in-house, while its HW is produced externally in accordance with Carraro's technical specifications. These ECUs were created to optimise the overall System performance by governing the mechanical, hydraulic, and electronic modules concurrently, in the best possible manner.
The SW is extremely versatile, as its parameters can be fully configured and customised to suit each application.

All Carraro ECUs offer high I/O and CPU capacities, and are therefore capable of managing not only the Carraro Drivetrain, but also additional vehicle functions as well, including the Rear Lift, the Power Take Off, and other auxiliaries.
Moreover, their versatility and robustness also support their use as Vehicle ECUs.
The most recent units have been developed to ensure Functional Safety Compliance (ISO25119, ISO13849), and are capable of supporting various CAN protocols, including XCP, SAE J1939 and KWP2000.

	TRAX	TEQ2 NEW	TEQ2 RDX NEW
APPLICATION			
	Transmission and Suspension Systems under ECU monitoring Warnings and error signals to detect failure conditions and excessive working parameters Data exchange support according to CAN protocols as SAE J1939 and KWP2000. Alternative ECU service interface through proprietary RS232 protocol.	Transmission Systems under ECU monitoring Compliant with ISO13849 for a performance level PL=d (equivalent to IEC/EN61508 SIL2). Support Safety Certification of the systems if needed. Designed to provide calculation capacity adequate to control system & transmissions with top features Support several CAN protocols as XCP, SAE J1939 and KWP2000.	
HW FEATURES			
	32 bit CPU 256KB ROM 16KB RAM	32 bit main CPU 1MB ROM 64KB RAM Auxiliary CPU to monitor main CPU activities	
SW FEATURES			
	Configurable according application needs. Setup parameters available for maximum operating comfort and proper vehicle responsiveness.	Model based application software design structured to balance transmissions control and customer requirements.	
INTERFACE			
Nominal supply voltage	12 Vdc	12 - 24 Vdc	12 - 24 Vdc
Analog inputs	Up to 5 (voltage/current/resistance, software configurable inputs)	Up to 20 (voltage/current/ resistance, software configurable inputs)	Up to 20 (voltage/current/resistance, software configurable inputs)
Digital inputs	Up to 16 (pull-up/pull-down, software configurable inputs)	Up to 54 (pull-up/pull-down, software configurable inputs)	Up to 44 (pull-up/pull-down, software configurable inputs)
Frequency inputs	Up to 3 (pull-up software configurable)	Up to 8 (pull-up software configurable / magneto-resistive sensors support)	Up to 6 (pull-up software configurable)
PWM outputs	Up to 4 (all High side + Low side)	Up to 8 (High side / High side + Low side)	Up to 6 (High side / High side + Low side)
Digital outputs	Up to 12 (High side / Low side)	Up to 26 (High side / Low side)	Up to 14 (High side / Low side)
Output supply	5 Vdc	5 Vdc - 8 Vdc	5 Vdc - 8 Vdc
Communication	1 RS232 asincronous, 1 CAN bus compliant with CAN 2.0b specifications (SAE J1939 / ISO 11783 / ISO 11898)	1 RS232 asincronous, 2 CAN bus compliant with CAN 2.0b specifications (SAE J1939 / ISO 11783 / ISO 11898)	1 RS232 asincronous, 2 CAN bus compliant with CAN 2.0b specifications (SAE J1939 / ISO 11783 / ISO 11898)
GENERAL			
Operating temperature	-40/+85 °C	-40/+85 °C	-40/+85 °C
Protection rating	IP67	IP67	IP67
Electrical connections	56 pins board mounted	121 pins board mounted	121 pins board mounted
Housing material	High temperature nylon (black)	Aluminium	Aluminium
Dimensions [for reference only]	193 x 40 x 145 cm	285 x 50 x 230 mm	285 x 50 x 230 mm
Weight [for reference only]	0.420 Kg	2.1 Kg	2.1 Kg

The Power Transmission Excellence is our Passion

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