



Fuel and Costs Savings at the Terminal

ZF-AS Tronic mid for Terminal Tractors

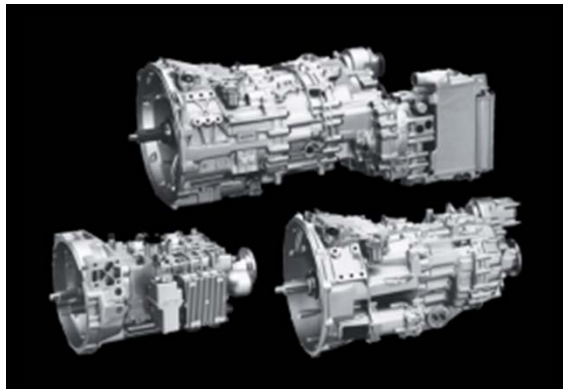
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IXSB

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High Demands on Terminal Tractors



LoLo Terminal Tractors

- Up to 24 hours/7 days operation time
- Constant stop/start work
- Different, unskilled drivers (shift worker)
- Higher demands on emission/fuel reduction
- Constant increase of container handling



ZF Transmission system with reduced fuel consumption, longer oil change and service intervals

We have your solution! – ZF-AS Tronic mid



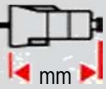



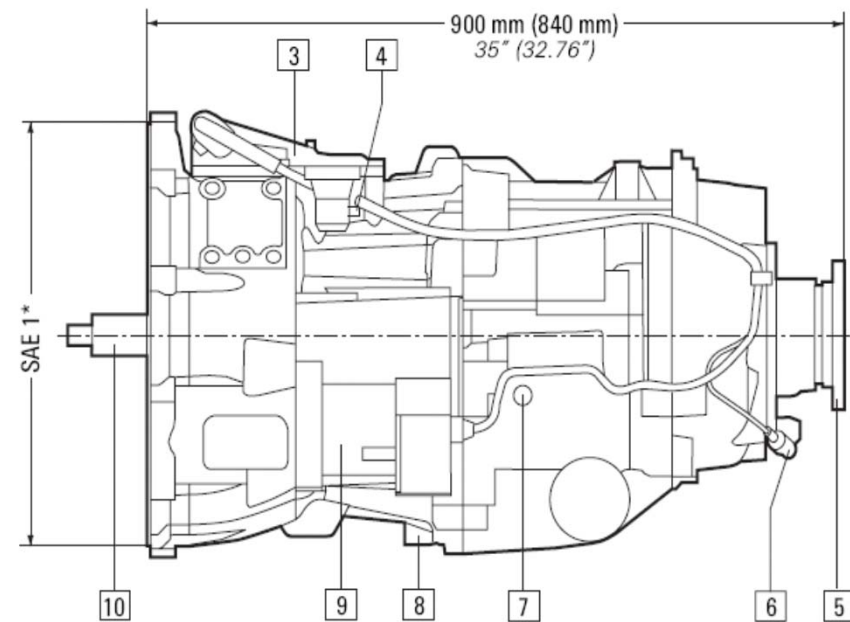
ZF offers you:

- Innovative, automatic transmission system without transmission cooling
- Reduced life cycle cost thanks to up to 4 years oil change interval
- Emission reduction
- Significant reduced fuel consumption up to 20%

ZF-AS Tronic mid – Technical Data



12-speed		
	12 AS 1210	12 AS 1620
	10.37 – 0.81 R 10.59	10.37 – 0.81 R 10.59
	1200	1600 / 1500
kg	190	205
dm³	7.8	9.3
	840	910
	1 / 2	1 / 2



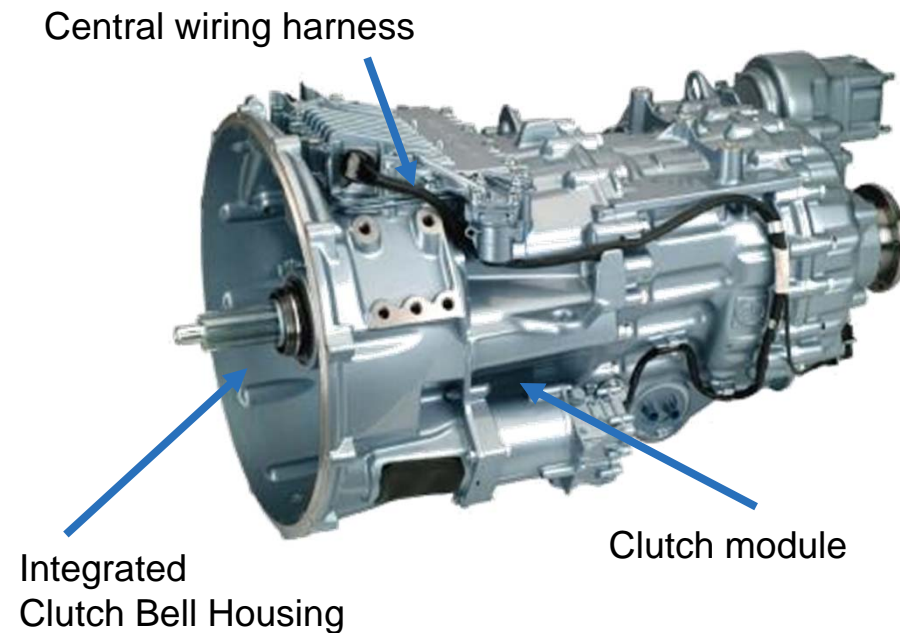
Maß in () gilt für 12 AS 1210 WO
 Dimension in () applies to 12 AS 1210 WO

* SAE2 als Option erhältlich / SAE2 optional available

ZF-AS Tronic mid – Insides of the Transmission System



Mechatronics module with integrated electronics



Operating elements:



Indicator for available shift options

RND status indicator (3xLED)

"Reverse"

"Neutral"

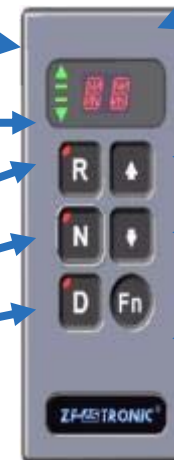
"Drive"

Two-digit alphanumeric display

"Upshift"

"Downshift"

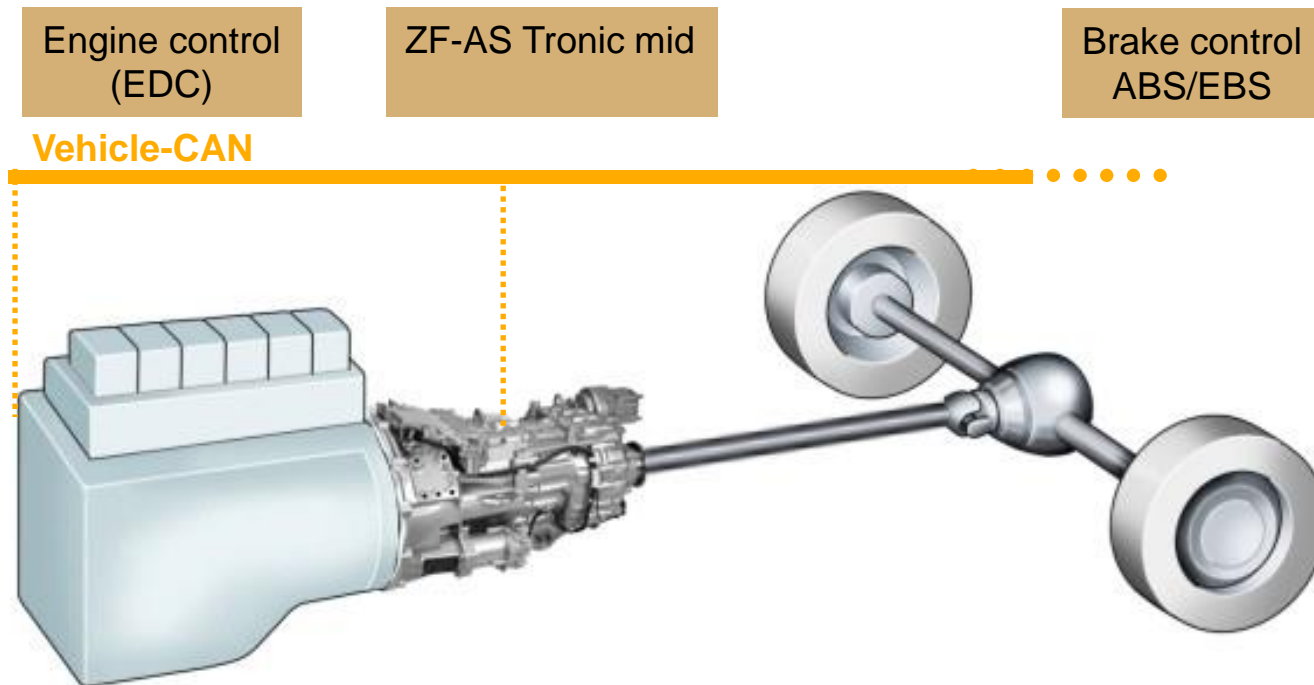
"Function"



ZF-AS Tronic mid – Communication in the Driveline

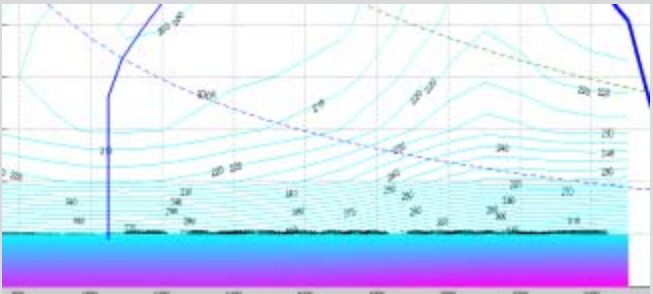


Connection to the truck's CAN system with conventional setup



Typical engine fuel map



Vehicle weight	41.5 t, empty vehicle: 18.5 t, ZGG: 65 t
fR	0.015 – Test Mr. Vesenjok, 23.03.2010 0.0135 – Test Mr. Vesenjok, 02.11.2010
rDyn.	0.557 m
Vehicle front surface	8.75 m ²
Cw-index	1.00
Axle ratio	12.28
Engine performance data	OM906LA, Euro 3, 147kW@2600min ⁻¹ ; 750Nm@1200-1600min ⁻¹ 
Transmission	AS Mid 12AS1620 (10.37, 8.43, 6.49, 5.27, 4.18, 3.4, 2.48, 2.02, 1.55, 1.26, 1, 0.81)



12-Speed – Always the Right Speed



Quite natural, when have to be fast
skip unnecessary stairs

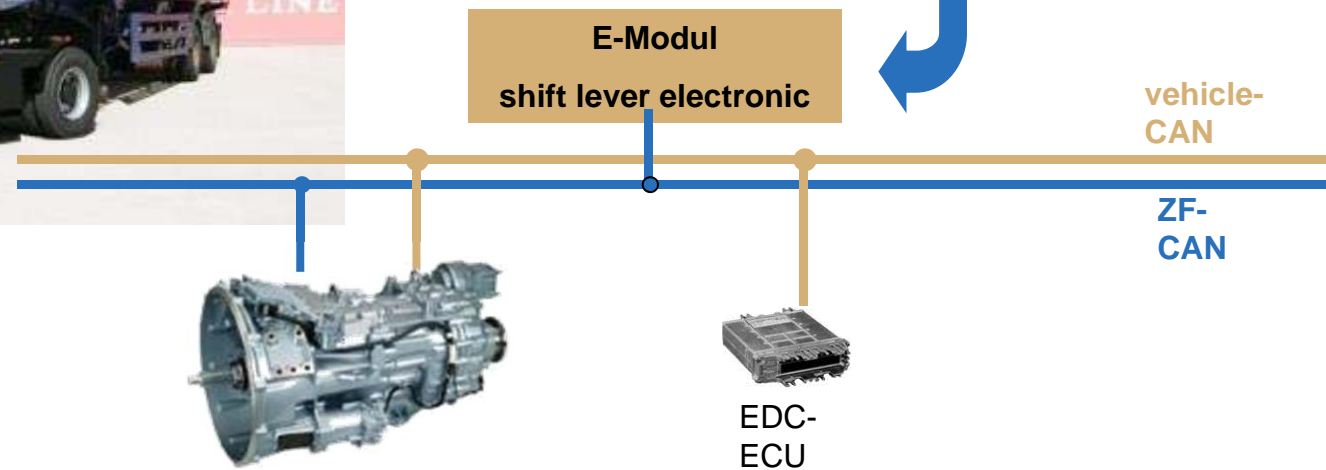
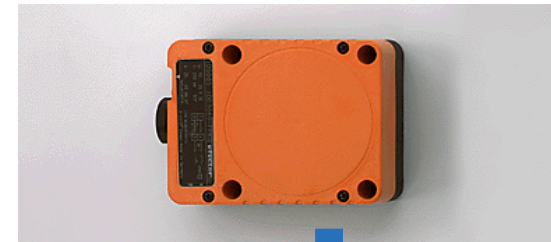
AS Tronic mid

- choosing the right speed out of 12
- if possible in 4 steps to maximum vehicle speed
- maximum acceleration for maximum productivity
- all the time in the most economic engine speed

CLC – Container Load Control Principle



2 driving programs for loaded or empty vehicles



Engine off – no fuel is burned



Save the max

- Even a pretty close to perfect engine burns fuel.
- Pay when you need it, run your engine when you need it.
- Engine off while waiting with start stop systems

Yes, we are start-stop system ready

- Start-stop systems are highly developed systems.
- You need to have control of all power using systems like A/C etc. Start-stop systems are part of the carmaker.
- Yes, ZF AS Tronic is start-stop ready.
- Yes, ZF AS Tronic is ready to save the max for you!

ZF-AS Tronic mid – Conclusion of your Advantages



Economic efficiency



Comfort



Safety



Service



- Fuel savings up to 20% (dry clutch instead of torque converter)
- Emission reduction and Start-stop system ready
- No extra cooling system necessary
- Select between manual or automatic gear changing
- Easy to handle even for unskilled drivers
- Driver can focus on traffic and cargo (automatically shifting)
- Longer oil change intervals (up to 4 years)
- No oil filter change necessary
- Transmission overhaul after 4 years



New Configuration and Testing Results (2007)



1. Results from PSA Port of Singapore

- 750 vehicles running in the port of Singapore since 2007 with AS mid
- Configuration SAE1 clutch and Mercedes engine with 750 Nm
- Fuel consumption 8% lower than 6-speed AT
- Total overhaul cost roughly 3.300 € (one overhaul in 8 years vehicle life time)
- Oil change interval 4 years, no oil filter change



New Configuration and Testing Results (2010)



2. Results from Ports of Malaysia and Europe

- First vehicles running since 2010 in different ports
- Configuration SAE2 clutch and Cat C 6 or Cummins QSB 6.7 engine with 950 Nm
- Fuel consumption between 15 and 20% lower than 4-speed AT
- Oil change interval 4 years, no oil filter change
- Clutch durability 5 years+
- Significant better shift and driving performance thanks to SAE 2 clutch and higher engine power



New Configuration and Testing Results – Fuel Consumption Comparison



- Monthly fuel savings from PTP (Terminal Malaysia) (July 2010 till December 2010)
- Results from PTP show an average of 13.6% fuel savings based on fuel usage per moving trip parameter

	Competitor	ZF	
	Fuel/Move (Litre)	Fuel/Move (Litre)	Fuel save (%)
JULY	1.9577	1.5126	22.74
AUGUST	1.5243	1.2183	20.07
SEPTEMBER	1.8826	1.7516	6.96
OCTOBER	2.1872	2.0286	7.25
NOVEMBER	1.9414	1.5479	20.27
DECEMBER	1.9569	1.8755	4.16

- $(22.74 + 20.07 + 6.96 + 7.25 + 20.27 + 4.16) / 6 = 13.6\%$ average fuel save
- Calculated in operating hours

ZF-AS Tronic mid – Makes the Difference



- Dry clutch instead of torque converter
- No extra cooling necessary
- Large gear range (12 speeds allows exact tuning due to vehicles mission)
- Longer oil change intervals (4 years)
- Start-stop system ready
- Light weight transmission

Thank you very much for your attention!



Check it out, get in contact at www.ZF.com
or visit us at our booth no. 5



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