



Sales Program Rail

Edition 1/15
valid from 08/2015



Power. Passion. Partnership.



| | |
|--|--|
| <p>02 Contents</p> <p>04 Certified quality</p> <p>06 General specifications</p> <p>07 Engine designation</p> <p>08 Selection Guideline/Product portfolio</p> <ul style="list-style-type: none"> - PowerPacks® for railcars, underfloor installation 315 kW - 700 kW - Diesel engines for push-pull trains and locomotives 850 kW - 3300 kW <p>10 Applications</p> <p>28 References of Diesel engines and PowerPacks® in railcars/push-pull trains and locomotives</p> | <p>30 References of Diesel engines and PowerPacks® in special-purpose rail vehicles</p> <p>32 Repowering</p> <p>34 Automation</p> <ul style="list-style-type: none"> - All products and benefits at a glance - SAM – The reliable partner for your PowerPack® - Powerline for Series 1600 and Series 4000 - CaPoS powerline - CaPoS smart edition <p>48 After Sales MTU ValueCare</p> <p>54 Exhaust emissions Exhaust emission legislation for rail application</p> <p>59 Conversion table</p> |
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MTU: Certified quality.

MTU is the core brand of Rolls-Royce Power Systems AG, which is a world-leading provider of high- and medium-speed diesel and gas engines, complete drive systems, distributed energy systems and fuel injection systems for the most demanding requirements.

The development, production and maintenance of diesel traction systems for railway trains are among MTU's core capabilities – and have been for nearly 100 years. As long ago as 1924, we were developing and manufacturing production engines for scheduled-service trains. In 1933, our diesel engines provided the motive power for the legendary “Fliegende Hamburger”, the first high-speed railcar. And from the early Fifties until today, we supplied more than 5,500 diesel engines and PowerPacks® to the Deutsche Bundesbahn, thereby playing a major part in its full-scale program of conversion to diesel power. The extensive experience and unique specialist knowledge gained from that history and tradition are the basis of our comprehensive expertise in system engineering.

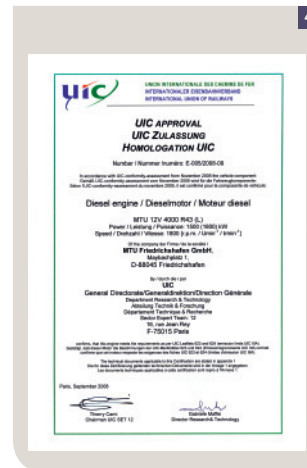
We are among today's leading providers of traction unit technology for railway applications. Locomotive and railcar producers all over the world place their trust in us as system suppliers. We and our partners are developing today the technologies that will drive us tomorrow. And that simply means that we offer the rail operator more: more performance, more efficiency – and more dependability.

Quality also is our passion:

We are the first diesel engine manufacturer meeting the International Railway Industry Standard - IRIS.



- 1 IRIS
- 2 ISO 9001
- 3 ISO 14001
- 4 UIC
- 5 MTU Friedrichshafen is a Q1 supplier to the Deutsche Bahn AG



Four-stroke diesel engine for traction

- > Direct injection
- > Liquid-cooled
- > V or In-line configuration
- > Suitable for mechanical, hydrodynamic, hydrostatic and electric power transmission

Power Definition

All power ratings are service standard power in accordance with UIC specifications.

- Ambient air pressure: 1000 mbar
- Height above sea level: 100 m
- Intake air temperature: 25 °C
- Charge-air coolant temp.: 45 °C

Fuel consumption in accordance with DIN/ISO 3046

Exhaust emission standards:

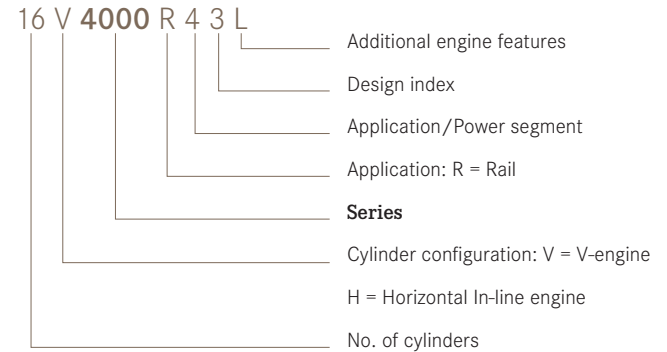
- EU = EU Nonroad Directive 97/68 EC (as amended by 2010/26/EC)
- EPA = US Regulation 40 CFR 9,85
- UIC = International Railway Association

Please note, specifications are subject to change without further notice. All dimensions are approximate, more detailed information is included within installation drawings.

For further information on MTU Rail products please contact your mtu distributor or visit: www.mtu-online.com

Series 1800, 1600, 4000

Example:



Additional engine features

| | |
|---------------------|---|
| Power uprated | L |
| Speed/power reduced | R |
| PowerPack-aggregat | P |

MTU PowerPacks® and Engines

All engines at a glance.

Railcars
PowerPacks® for railcars - Underfloor installation

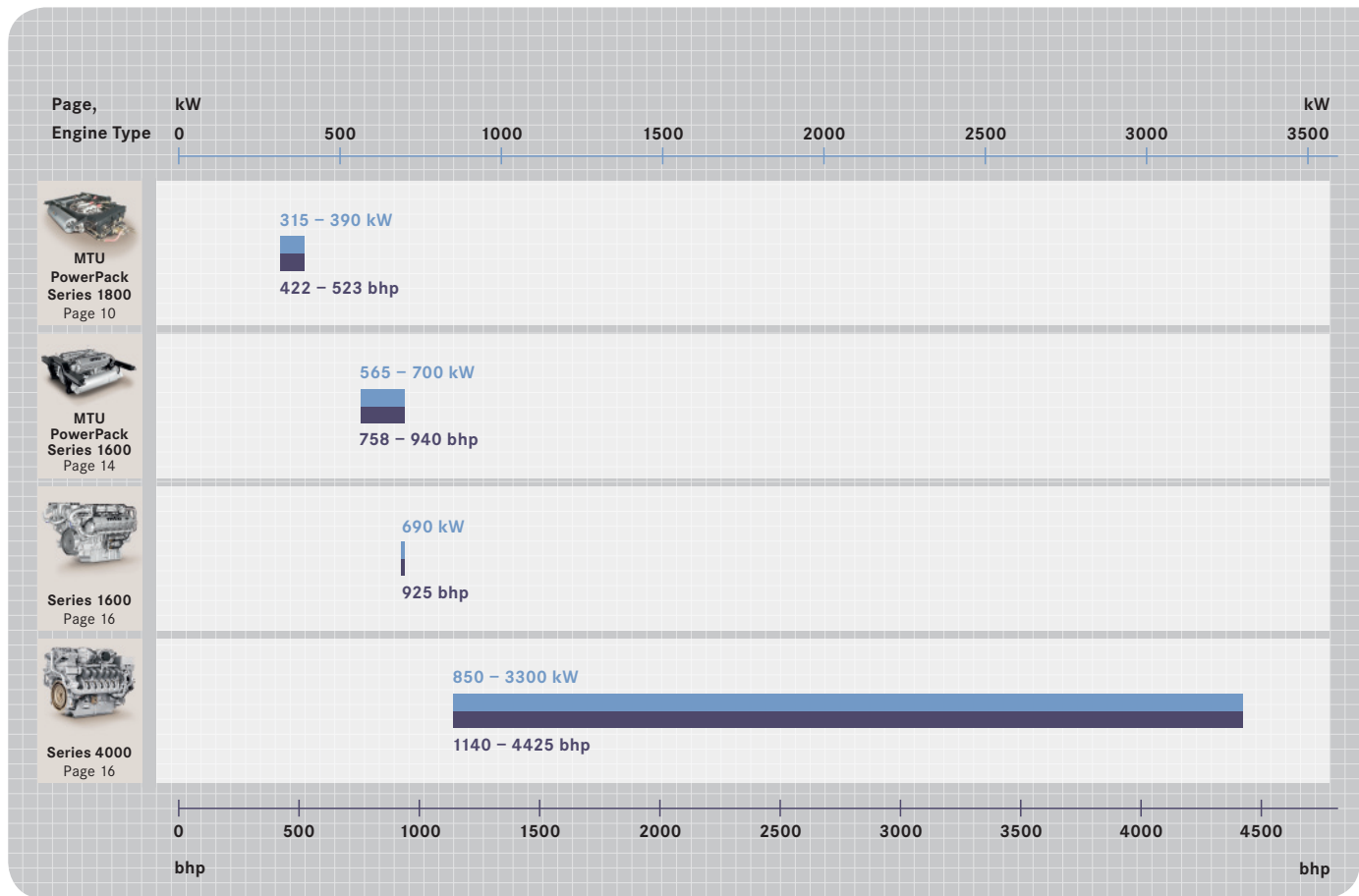
315 kW - 700 kW

Page 10 - 15

Push-pull trains/locomotives
Engines for push-pull trains and locomotives

690 kW - 3300 kW

Page 16 - 27



PowerPacks® for railcars

Underfloor installation

315 kW – 390 kW

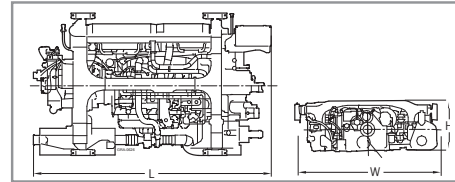
(422 bhp - 523 bhp)



- > For underfloor installation
- > Horizontally mounted inline engines

Dimensions:

PowerPacks® with standard equipment



| PowerPack® Model | | 6H1800R81P | 6H1800R82P |
|---|-------------|--|--|
| Rated Power | kW (bhp) | 315 (422) | 335 (449) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIA compl./ EPA Tier3 compl. | EU Stage IIIA compl./ EPA Tier3 compl. |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 216 | 214 |
| | l/h (gal/h) | 82.0 (21.7) | 86.4 (22.8) |
| at Best Point | g/kWh | 198 | 198 |
| Drive systems ¹⁾ | | DM/DH/DE | DM/DH/DE |
| PowerPack® – Dimensions & Masses | | | |
| Length (L) ²⁾ | mm | 2600 - 3600 | 2600 - 3600 |
| | (in) | (102.4 - 141.7) | (102.4 - 141.7) |
| Width (W) ²⁾ | mm | 2100 - 2800 | 2100 - 2800 |
| | (in) | (82.7 - 110.2) | (82.7 - 110.2) |
| Height (H) ²⁾ | mm | 770 - 850 | 770 - 850 |
| | (in) | (30.3 - 33.5) | (30.3 - 33.5) |
| Mass, dry ²⁾ | kg | 2900 - 3600 | 2900 - 3600 |
| | (lbs) | (6393 - 7936) | (6393 - 7936) |
| Mass, wet ²⁾ | kg | 3050 - 3900 | 3050 - 3900 |
| | (lbs) | (6724 - 8598) | (6724 - 8598) |
| Engine Main Data | | | |
| No. of Cylinders/Arrangement | | 6/inline | 6/inline |
| Bore / Stroke | mm | 128/166 | 128/166 |
| | (in) | (5.0/6.5) | (5.0/6.5) |
| Displacement/cyl. | | l (cu in) | 2.13 (130) |
| Displacement, total | | l (cu in) | 12.8 (781) |

| 6H1800R83P | | 6H1800R84P | |
|------------------------------|------------|--|--|
| Rated Power | kW (483) | 360 (483) | 390 (523) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIA compl./EPA Tier 3 compl. | EU Stage IIIA compl./EPA Tier 3 compl. |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 218 | 210 |
| | l/h (25.0) | 94.6 (25.0) | 98.7 (26.1) |
| at Best Point | g/kWh | 198 | 198 |
| Drive systems ¹⁾ | | DM/DH/DE | DM/DH/DE |
| Length (L) ²⁾ | mm | 2600 - 3600 | 2600 - 3600 |
| | (in) | (102.4 - 141.7) | (102.4 - 141.7) |
| Width (W) ²⁾ | mm | 2100 - 2800 | 2100 - 2800 |
| | (in) | (82.7 - 110.2) | (82.7 - 110.2) |
| Height (H) ²⁾ | mm | 770 - 850 | 770 - 850 |
| | (in) | (30.3 - 33.5) | (30.3 - 33.5) |
| Mass, dry ²⁾ | kg | 2900 - 3600 | 2900 - 3600 |
| | (lbs) | (6393 - 7936) | (6393 - 7936) |
| Mass, wet ²⁾ | kg | 3050 - 3900 | 3050 - 3900 |
| | (lbs) | (6724 - 8598) | (6724 - 8598) |
| No. of Cylinders/Arrangement | | 6/inline | 6/inline |
| Bore / Stroke | mm | 128/166 | 128/166 |
| | (in) | (5.0/6.5) | (5.0/6.5) |
| Displacement/cyl. | | l (cu in) | 2.13 (130) |
| Displacement, total | | l (cu in) | 12.8 (781) |

Further variations on demand

¹⁾ Drive systems: DM = diesel mechanical; DH = diesel hydraulic; DE = diesel electrical

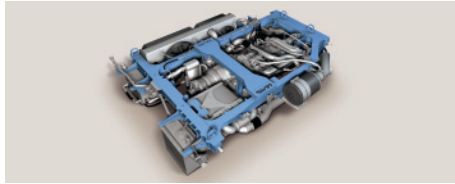
²⁾ depending on scope of supply

PowerPacks® for railcars

Underfloor installation

315 kW – 390 kW

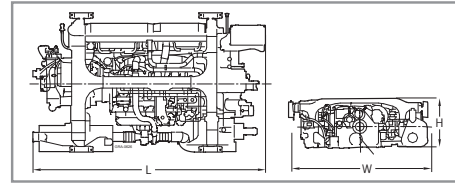
(422 bhp – 523 bhp)



- > For underfloor installation
- > Horizontally mounted inline engines

Dimensions:

PowerPacks® with standard equipment



| PowerPack® Model | | 6H1800R75P | 6H1800R75LP |
|---|-------------|----------------------|----------------------|
| Rated Power | kW (bhp) | 315 (422) | 335 (449) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIB | EU Stage IIIB |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 200 | 199 |
| | l/h (gal/h) | 75.53 (19.95) | 80.03 (21.14) |
| at Best Point | g/kWh | 183 | 183 |
| Drive systems ¹⁾ | | DM/DH/DE | DM/DH/DE |
| PowerPack® – Dimensions & Masses | | | |
| Length (L) ²⁾ | mm | 2600 - 3600 | 2600 - 3600 |
| | (in) | (102.4 - 141.7) | (102.4 - 141.7) |
| Width (W) ²⁾ | mm | 2100 - 2800 | 2100 - 2800 |
| | (in) | (82.7 - 110.2) | (82.7 - 110.2) |
| Height (H) ²⁾ | mm | 770 - 850 | 770 - 850 |
| | (in) | (30.3 - 33.5) | (30.3 - 33.5) |
| Mass, dry ²⁾ | kg | 2900 - 3600 | 2900 - 3600 |
| | (lbs) | (6393 - 7936) | (6393 - 7936) |
| Mass, wet ²⁾ | kg | 3050 - 3900 | 3050 - 3900 |
| | (lbs) | (6724 - 8598) | (6724 - 8598) |
| Engine Main Data | | | |
| No. of Cylinders/Arrangement | | 6/inline | 6/inline |
| Bore / Stroke | mm (in) | 128/166 (5.0/6.5) | 128/166 (5.0/6.5) |
| Displacement/cyl. | l (cu in) | 2.13 (130) | 2.13 (130) |
| Displacement, total | l (cu in) | 12.8 (781) | 12.8 (781) |

| 6H1800R85P | | 6H1800R85LP | |
|------------------------------|-------------|----------------------|----------------------|
| Rated Power | kW (483) | 360 (483) | 390 (523) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIB | EU Stage IIIB |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 202 | 208 |
| | l/h (gal/h) | 87.30 (23.06) | 97.33 (25.71) |
| at Best Point | g/kWh | 183 | 183 |
| Drive systems ¹⁾ | | DM/DH/DE | DM/DH/DE |
| Length (L) ²⁾ | mm | 2600 - 3600 | 2600 - 3600 |
| | (in) | (102.4 - 141.7) | (102.4 - 141.7) |
| Width (W) ²⁾ | mm | 2100 - 2800 | 2100 - 2800 |
| | (in) | (82.7 - 110.2) | (82.7 - 110.2) |
| Height (H) ²⁾ | mm | 770 - 850 | 770 - 850 |
| | (in) | (30.3 - 33.5) | (30.3 - 33.5) |
| Mass, dry ²⁾ | kg | 2900 - 3600 | 2900 - 3600 |
| | (lbs) | (6393 - 7936) | (6393 - 7936) |
| Mass, wet ²⁾ | kg | 3050 - 3900 | 3050 - 3900 |
| | (lbs) | (6724 - 8598) | (6724 - 8598) |
| No. of Cylinders/Arrangement | | 6/inline | 6/inline |
| Bore / Stroke | mm (in) | 128/166 (5.0/6.5) | 128/166 (5.0/6.5) |
| Displacement/cyl. | l (cu in) | 2.13 (130) | 2.13 (130) |
| Displacement, total | l (cu in) | 12.8 (781) | 12.8 (781) |

Further variations on demand

¹⁾ Drive systems: DM = diesel mechanical; DH = diesel hydraulic; DE = diesel electrical

²⁾ depending on scope of supply

PowerPacks® for railcars

Underfloor installation

565 kW – 700 kW

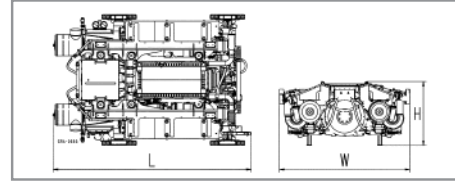
(758 bhp - 938 bhp)



> For underfloor installation

Dimensions and Masses:

PowerPacks® with standard equipment



| PowerPack® Model | | 12V1600R70P | 12V1600R70LP |
|---|-----------------|----------------------|----------------------|
| Rated Power | kW (bhp) | 565 (758) | 625 (838) |
| Speed | rpm | 2100 | 2100 |
| Exhaust Emissions | | EU Stage IIIB | EU Stage IIIB |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 207 | 207 |
| | l/h (gal/h) | 127.98 (33.8) | 139.31 (36.8) |
| at Best Point | g/kWh | 189 | 189 |
| Drive systems¹⁾ | | DM/DH/DE | DM/DH/DE |
| PowerPack® – Dimensions & Masses | | | |
| Length (L) ²⁾ | mm | 4000 - 5200 | 4000 - 5200 |
| | (in) | (157.5 - 204.7) | (157.5 - 204.7) |
| Width (W) ²⁾ | mm | 2100 - 2800 | 2100 - 2800 |
| | (in) | (82.7 - 110.2) | (82.7 - 110.2) |
| Height (H) ²⁾ | mm | 850 - 900 | 850 - 900 |
| | (in) | (31.5 - 35.4) | (31.5 - 35.4) |
| Mass, dry ²⁾ | kg | 5000 - 6500 | 5000 - 6500 |
| | (lbs) | (11023 - 14330) | (11023 - 14330) |
| Mass, wet ²⁾ | kg | 5200 - 6700 | 5200 - 6700 |
| | (lbs) | (11464 - 14770) | (11464 - 14770) |
| Engine Main Data | | | |
| No. of Cylinders/Arrangement | | 12 | 12 |
| Bore / Stroke | mm (in) | 122/150 (4.8/5.9) | 122/150 (4.8/5.9) |
| Displacement/cyl. | l (cu in) | 1.75 (106.8) | 1.75 (106.8) |
| Displacement, total | l (cu in) | 21.0 (1281.5) | 21.0 (1281.5) |

| 12V1600R80P | 12V1600R80LP |
|------------------|------------------|
| 660 (885) | 700 (938) |
| 1900 | 1900 |
| EU Stage IIIB | EU Stage IIIB |
| | |
| 199 | 200 |
| 155.06 (40.96) | 166.14 (43.88) |
| 195 | 195 |
| DE | DE |
| | |
| 4000 - 5200 | 4000 - 5200 |
| (157.5 - 204.7) | (157.5 - 204.7) |
| 2100 - 2800 | 2100 - 2800 |
| (82.7 - 110.2) | (82.7 - 110.2) |
| 850 - 900 | 850 - 900 |
| (31.5 - 35.4) | (31.5 - 35.4) |
| 5000 - 6500 | 5000 - 6500 |
| (11023 - 14330) | (11023 - 14330) |
| 5200 - 6700 | 5200 - 6700 |
| (11464 - 14770) | (11464 - 14770) |
| | |
| 12 | 12 |
| 122/150 | 122/150 |
| (4.8/5.9) | (4.8/5.9) |
| 1.75 (106.8) | 1.75 (106.8) |
| 21.0 (1281.5) | 21.0 (1281.5) |

Further variations on demand

¹⁾ Drive systems: DM = diesel mechanical; DH = diesel hydraulic; DE = diesel electrical

²⁾ depending on scope of supply

Engines

for push-pull trains and locomotives

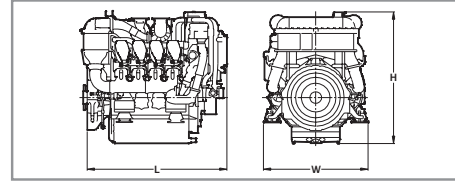


- > For new locomotives or repowering
- > Economical space requirements

690 kW - 1200 kW
(925 bhp - 1609 bhp)

Dimensions:

Engines with standard equipment



| Engine Model | | 12V1600R50 | 8V4000R41R |
|---------------------------------------|-------------|----------------------|----------------------|
| Rated Power | kW (bhp) | 690 (925) | 850 (1139) |
| Speed | rpm | 1800 | 1500 |
| Exhaust Emissions | | EU Stage IIIB | UIC II |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 197 | 204 |
| | l/h (gal/h) | 164 (43.3) | 208.9 (55.2) |
| at Best Point | g/kWh | 193 | 200 |
| Engine - Dimensions and Masses | | | |
| Length (L) | mm (in) | 1850 (72.8) | 1915 (75.4) |
| Width (W) | mm (in) | 1200 (47.2) | 1380 (54.3) |
| Height (H) | mm (in) | 1200 (47.2) | 1800 (70.9) |
| Mass, dry | kg (lbs) | 2300 (5071) | 4700 (10362) |
| Mass, wet | kg (lbs) | 2500 (5512) | 5020 (11067) |
| Engine Main Data | | | |
| No. of Cylinders | | 12 | 8 |
| Bore / Stroke | mm (in) | 122/150 (4.8/5.9) | 165/190 (6.5/7.5) |
| Displacement/cyl. | l (cu in) | 1.75 (106.8) | 4.06 (248) |
| Displacement, total | l (cu in) | 21.0 (1281.5) | 32.5 (1983) |

| 8V4000R43 | 8V4000R43L |
|--|--|
| 1000 (1341) | 1200 (1609) |
| 1800 | 1800 |
| EU Stage IIIA compliant ¹⁾ / UIC IIIA | EU Stage IIIA compliant ¹⁾ / UIC IIIA |
| 206 | 206 |
| 248.2 (65.2) | 297.8 (78.7) |
| 194 | 194 |
| 2000 (78.7) | 2000 (78.7) |
| 1565 (61.6) | 1565 (61.6) |
| 1860 (79.0) | 1860 (79.0) |
| 5220 (11508) | 5220 (11508) |
| 5570 (12280) | 5570 (12280) |
| 8 | 8 |
| 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| 4.77 (291) | 4.77 (291) |
| 38.2 (2331) | 38.2 (2331) |

¹⁾ EU IIIA type approved, EU IIIA certificate available

Engines

for push-pull trains and locomotives

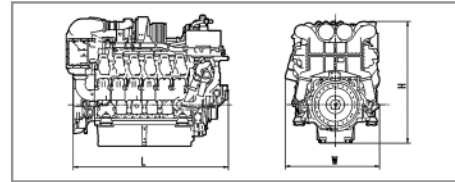
1380 kW - 1800 kW
(1851 bhp - 2414 bhp)



- > Well differentiated choice of engines spanning wide range of power outputs
- > High power-to-weight ratios for lightweight trains

Dimensions:

Engines with standard equipment



| Engine Model | | 12V4000R41R | 12V4000R43 |
|--------------------------------|-------------|----------------------|---|
| Rated Power | kW (bhp) | 1380 (1851) | 1500 (2012) |
| Speed | rpm | 1500 | 1800 |
| Exhaust Emissions | | UIC II | EU Stage IIIA compliant ¹⁾ / UIC IIIA |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 195 | 205 |
| | l/h (gal/h) | 324.2 (85.7) | 370.5 (97.9) |
| at Best Point | g/kWh | 193 | 192 |
| Engine - Dimensions and Masses | | | |
| Length (L) | mm (in) | 2405 (94.7) | 2386 (93.9) |
| Width (W) | mm (in) | 1390 (54.7) | 1562 (61.5) |
| Height (H) | mm (in) | 1795 (70.7) | 2015 (79.3) |
| Mass, dry | kg (lbs) | 6190 (13646) | 6800 (14991) |
| Mass, wet | kg (lbs) | 6630 (14616) | 7280 (16049) |
| Engine Main Data | | | |
| No. of Cylinders | | 12 | 12 |
| Bore / Stroke | mm (in) | 165/190 (6.5/7.5) | 170/210 (6.7/8.3) |
| Displacement/cyl. | l (cu in) | 4.06 (248) | 4.77 (291) |
| Displacement, total | l (cu in) | 48.7 (2978) | 57.2 (3491) |

| 12V4000R41L | | 12V4000R43L | |
|--------------------------------|-------------|----------------------|---|
| Rated Power | kW (bhp) | 1650 (2212) | 1800 (2414) |
| Speed | rpm | 1860 | 1800 |
| Exhaust Emissions | | UIC II | EU Stage IIIA compliant ¹⁾ / UIC IIIA |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 206 | 210 |
| | l/h (gal/h) | 409.5 (108.2) | 455.4 (120.3) |
| at Best Point | g/kWh | 198 | 190 |
| Engine - Dimensions and Masses | | | |
| Length (L) | mm (in) | 2405 (94.7) | 2386 (93.9) |
| Width (W) | mm (in) | 1390 (54.7) | 1562 (61.5) |
| Height (H) | mm (in) | 1795 (70.7) | 2015 (79.3) |
| Mass, dry | kg (lbs) | 6190 (13646) | 6800 (14991) |
| Mass, wet | kg (lbs) | 6630 (14616) | 7280 (16049) |
| Engine Main Data | | | |
| No. of Cylinders | | 12 | 12 |
| Bore / Stroke | mm (in) | 165/190 (6.5/7.5) | 170/210 (6.7/8.3) |
| Displacement/cyl. | l (cu in) | 4.06 (248) | 4.77 (291) |
| Displacement, total | l (cu in) | 48.7 (2978) | 57.2 (3491) |

¹⁾ EU IIIA type approved, EU IIIA certificate available

Engines

for push-pull trains and locomotives

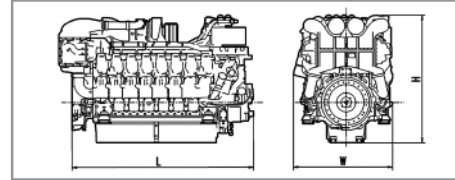
1500 kW - 1800 kW
(2012 bhp - 2414 bhp)



- > Well differentiated choice of engines spanning wide range of power outputs
- > High power-to-weight ratios for lightweight trains
- > Meeting emissions regulations EU Stage IIIB

Dimensions:

Engines with standard equipment



| Engine Model | 12V4000R64 | 12V4000R84 | 12V4000R54 |
|---------------------------------------|----------------------|----------------------|--------------------------------|
| Rated Power kW (bhp) | 1500 (2012) | 1800 (2414) | 1800 (2414) |
| Speed rpm | 1800 | 1800 | 1800 |
| Exhaust Emissions | EU Stage IIIB | EU Stage IIIB | EPA Tier 3 Carb ULEL compl. |
| Fuel Consumption | | | |
| at Rated Power g/kWh | 203 | 202 | 199 |
| l/h (gal/h) | 367.4 (97.1) | 436.5 (115.3) | 430.0 (113.5) |
| at Best Point g/kWh | 193 | 193 | on request |
| Engine - Dimensions and Masses | | | |
| Length (L) mm (in) | 2670 (105.1) | 2670 (105.1) | 2670 (105.1) |
| Width (W) mm (in) | 1696 (66.8) | 1696 (66.8) | 1696 (66.8) |
| Height (H) mm (in) | 2001 (78.8) | 2001 (78.8) | 2001 (78.8) |
| Mass, dry kg (lbs) | 7700 (16979) | 7700 (16979) | 7700 (16979) |
| Mass, wet kg (lbs) | 8230 (18147) | 8230 (18147) | 8230 (18147) |
| Engine Main Data | | | |
| No. of Cylinders | 12 | 12 | 12 |
| Bore / Stroke mm (in) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| Displacement/cyl. l (cu in) | 4.77 (291) | 4.77 (291) | 4.77 (291) |
| Displacement, total l (cu in) | 57.2 (3491) | 57.2 (3491) | 57.2 (3491) |

Series 4000-04 engines portfolio meeting EU Stage IIIB will be completed with 8V models.
For further information please contact your MTU distributor.

Engines

for push-pull trains and locomotives

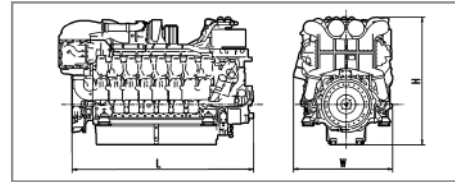
1700 kW - 2400 kW
(2280 bhp - 3218 bhp)



- > Cutting-edge technology with built-in potential
- > Uniquely low emissions and consumption
- > Market leader in its class for European diesel locomotives

Dimensions:

Engines with standard equipment



| Engine Model | 16V4000R41R | 16V4000R43R |
|---------------------------------------|----------------------|---|
| Rated Power kW (bhp) | 1700 (2280) | 2000 (2682) |
| Speed rpm | 1500 | 1800 |
| Exhaust Emissions | UIC II | EU Stage IIIA compliant ¹⁾ / UIC IIIA |
| Fuel Consumption | | |
| at Rated Power g/kWh | 198 | 207 |
| l/h (gal/h) | 405.5 (107.1) | 498.8 (131.8) |
| at Best Point g/kWh | 198 | 196 |
| Engine - Dimensions and Masses | | |
| Length (L) mm (in) | 2875 (113.2) | 2865 (112.8) |
| Width (W) mm (in) | 1405 (55.3) | 1562 (61.5) |
| Height (H) mm (in) | 1815 (71.5) | 2015 (79.3) |
| Mass, dry kg (lbs) | 7400 (16314) | 8175 (18023) |
| Mass, wet kg (lbs) | 7880 (17373) | 8770 (19334) |
| Engine Main Data | | |
| No. of Cylinders | 16 | 16 |
| Bore / Stroke mm (in) | 165/190 (6.5/7.5) | 170/210 (6.7/8.3) |
| Displacement/cyl. l (cu in) | 4.06 (248) | 4.77 (291) |
| Displacement, total l (cu in) | 65 (3967) | 76.3 (4656) |

| 16V4000R43 | 16V4000R43L |
|---|---|
| 2200 (2950) | 2400 (3218) |
| 1800 | 1800 |
| EU Stage IIIA compliant ¹⁾ / UIC IIIA | EU Stage IIIA compliant ¹⁾ / UIC IIIA |
| 206 | 205 |
| 546.0 (144.3) | 592.8 (156.6) |
| 196 | 196 |
| 2865 (112.8) | 2865 (112.8) |
| 1562 (61.5) | 1562 (61.5) |
| 2015 (79.3) | 2015 (79.3) |
| 8175 (18023) | 8175 (18023) |
| 8770 (19334) | 8770 (19334) |
| 16 | 16 |
| 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| 4.77 (291) | 4.77 (291) |
| 76.3 (4656) | 76.3 (4656) |

¹⁾ EU IIIA type approved, EU IIIA certificate available

Engines

for push-pull trains and locomotives

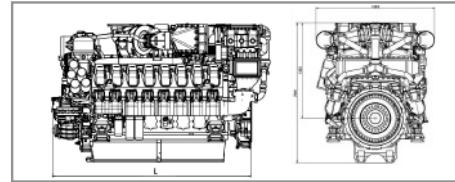
2000 kW – 2400 kW (2682 bhp - 3218 bhp)



- > Cutting-edge technology with built-in potential
- > Uniquely low emissions and low consumption
- > Meeting emissions regulations EU Stage IIIB

Dimensions:

Engines with standard equipment



| Engine Model | | 16V4000R64 | 16V4000R74 |
|---------------------------------------|-------------|----------------------|----------------------|
| Rated Power | kW (bhp) | 2000 (2682) | 2200 (2950) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIB | EU Stage IIIB |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 201 | 202 |
| | l/h (gal/h) | 482.6 (127.5) | 533.5 (140.94) |
| at Best Point | g/kWh | 190 | 190 |
| Engine – Dimensions and Masses | | | |
| Length (L) | mm (in) | 3140 (123.6) | 3140 (123.6) |
| Width (W) | mm (in) | 1696 (66.8) | 1696 (66.8) |
| Height (H) | mm (in) | 2001 (78.8) | 2001 (78.8) |
| Mass, dry | kg (lbs) | 9200 (20282) | 9200 (20282) |
| Mass, wet | kg (lbs) | 9773 (21546) | 9773 (21546) |
| Engine Main Data | | | |
| No. of Cylinders | | 16 | 16 |
| Bore / Stroke | mm (in) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| Displacement/cyl. | l (cu in) | 4.77 (291) | 4.77 (291) |
| Displacement, total | l (cu in) | 76.3 (4666) | 76.3 (4666) |

| 16V4000R84 | | 16V4000R54 | |
|---------------------------------------|-------------|----------------------|--------------------------------|
| Rated Power | kW (bhp) | 2400 (3218) | 2400 (3218) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIB | EPA Tier 3 Carb ULEL compl. |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 199 | 199 |
| | l/h (gal/h) | 573.35 (151.46) | 592.8 (156.6) |
| at Best Point | g/kWh | 190 | on request |
| Engine – Dimensions and Masses | | | |
| Length (L) | mm (in) | 3140 (123.6) | 3140 (123.6) |
| Width (W) | mm (in) | 1696 (66.8) | 1696 (66.8) |
| Height (H) | mm (in) | 2001 (78.8) | 2001 (78.8) |
| Mass, dry | kg (lbs) | 9200 (20282) | 9200 (20282) |
| Mass, wet | kg (lbs) | 9773 (21546) | 9773 (21546) |
| Engine Main Data | | | |
| No. of Cylinders | | 16 | 16 |
| Bore / Stroke | mm (in) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| Displacement/cyl. | l (cu in) | 4.77 (291) | 4.77 (291) |
| Displacement, total | l (cu in) | 76.3 (4666) | 76.3 (4666) |

Series 4000-04 engines portfolio meeting EU Stage IIIB will be completed with 8V models. For further information please contact your MTU distributor.

Engines

for push-pull trains and locomotives

2700 kW - 3300 kW

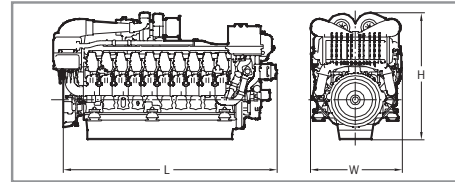
(3621 bhp - 4425 bhp)



- > Outstanding power density. Unbeaten power-to-weight ratio
- > Up to 3,300 kW for 4-axle locomotives and 6-axle locomotives

Dimensions:

Engines with standard equipment



| Engine Model | | 20V4000R43 | 20V4000R63R |
|---------------------------------------|-------------|--|-----------------------------------|
| Rated Power | kW (bhp) | 2700 (3621) | 2700 (3621) |
| Speed | rpm | 1800 | 1800 |
| Exhaust Emissions | | EU Stage IIIA compliant ¹⁾ / UIC IIIA | EU Stage IIIA compliant/ UIC IIIA |
| Fuel Consumption | | | |
| at Rated Power | g/kWh | 208 | 204 |
| | l/h (gal/h) | 676.6 (178.8) | 664 (175) |
| at Best Point | g/kWh | 194 | 194 |
| Engine - Dimensions and Masses | | | |
| Length (L) | mm (in) | 3335 (131.5) | 3335 (131.5) |
| Width (W) | mm (in) | 1562 (61.5) | 1562 (61.5) |
| Height (H) | mm (in) | 2015 (79.3) | 2015 (79.3) |
| Mass, dry | kg (lbs) | 9850 (21716) | 10400 (22932) |
| Mass, wet | kg (lbs) | 10520 (23193) | 11070 (24410) |
| Engine Main Data | | | |
| No. of Cylinders | | 20 | 20 |
| Bore / Stroke | mm (in) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| Displacement/cyl. | l (cu in) | 4.77 (291) | 4.77 (291) |
| Displacement, total | l (cu in) | 95.4 (5822) | 95.4 (5822) |

| 20V4000R43L | 20V4000R63 | 20V4000R63L |
|--|-----------------------------------|-----------------------------------|
| 3000 (4023) | 3000 (4023) | 3300 (4425) |
| 1800 | 1800 | 1800 |
| EU Stage IIIA compliant ¹⁾ / UIC IIIA | EU Stage IIIA compliant/ UIC IIIA | EU Stage IIIA compliant/ UIC IIIA |
| 210 | 206 | 206 |
| 759.0 (200.5) | 745 (197) | 819 (216) |
| 194 | 197 | 195 |
| 3335 (131.5) | 3335 (131.5) | 3335 (131.5) |
| 1562 (61.5) | 1562 (61.5) | 1562 (61.5) |
| 2015 (79.3) | 2015 (79.3) | 2015 (79.3) |
| 9850 (21716) | 10400 (22932) | 10400 (22932) |
| 10520 (23193) | 11070 (24410) | 11070 (24410) |
| 20 | 20 | 20 |
| 170/210 (6.7/8.3) | 170/210 (6.7/8.3) | 170/210 (6.7/8.3) |
| 4.77 (291) | 4.77 (291) | 4.77 (291) |
| 95.4 (5822) | 95.4 (5822) | 95.4 (5822) |

¹⁾ EU IIIA type approved, EU IIIA certificate available

References

Diesel engines and PowerPacks® in railcars/
push-pull trains and locomotives

High-Speed-Trains and Locomotives

Railcars

**Deutsche Bahn
V290
1 x 1000 kW**



**CNR Dalian
DL class
1 x 2700 kW**



**Siemens ER 20D
„EURORUNNER“
1 x 2000 kW**



**PKP Cargo
ST 46
1 x 1800 kW**



**Siemens/Alstom
BB 475000
1 x 2000 kW**



**Alstom Lint 41
PowerPack®
1-4 x 390 kW
(depending on
class)**



**PESA
Link
2 x 390 kW**



**Hitachi IEP
PowerPack
1-5 x 700 kW
(depending on
class)**



**Bombardier
Turbo Star
PowerPack®
2 x 390 kW**



**Rotem
Class 22000
3 x 360 kW**

References

Diesel engines and PowerPacks® for special-purpose rail vehicles

- > Individual traction system solutions
- > Flexibility in design and installation

- > Emissions optimized engines for tunnel operations with particle filter/ exhaust catalyst

Remote-controlled shunter



Rotary Snow-Plow



Fire Fighting and Rescue Train



Auxiliary locomotive for tunnel operations



Grinding train



Railroad inspection vehicle



Track layer



Rail crane



Overhead line inspection railcar

Further applications with MTU system solutions are e.g.:

- Locomotives for underground railways
- Mountain railways

Repowering

with MTU Diesel engines

For economical reasons, many railway companies and locomotive operators have decided to repower older locomotives and rail cars which are in good general condition with modern diesel engines. Due to their high technical standards, MTU engines fulfill all technical criteria for repowering projects:

- > Economical alternative to new procurement
- > Reduced investment costs
- > Increased availability equal to that of a new vehicle
- > Individual solutions to suit existing system interfaces




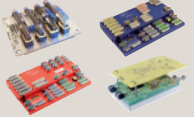




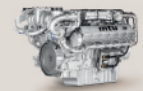

MTU is your competent partner for a successful repowering project, we offer everything you require:

- > Active support provided by a professional engineering service during all phases of a repowering project
- > Design and realisation of the traction plant
- > Engines adaptable to existing parameters
- > Reliable and sturdy engines with low fuel and lube oil consumption rates
- > Long maintenance intervals and low life-cycle costs
- > Compact dimensions for easy installation in existing engine rooms
- > Low installation and maintenance effort
- > The accessories incorporate clearly defined interfaces and are mounted to the engine in such a manner as to be easily accessible for maintenance operations
- > Excellent power-to-weight ratios permit installation of higher power ratings without exceeding permissible axle loads
- > Qualified support by the MTU Product Support organisation
- > Meet all applicable exhaust gas and noise emissions limit values



Automation systems

All products and benefits at a glance

| Automation system | SAM | Powerline | CaPoS (Capacitor Power System) | CaPoS smart edition |
|---|---|--|---|---|
| |  |  |  |  |
| Components | <ul style="list-style-type: none"> - PowerPack Automation - MR2 - PEM | <ul style="list-style-type: none"> - ADEC (ECU 7/ECU 9) - MDEC (ECU 4) - PAU Engine - PAU Traction - POM | <ul style="list-style-type: none"> - Ultracap - DC/DC voltage transformer - Connection cable | <ul style="list-style-type: none"> - Ultracap |
| Advantages at a glance | <ul style="list-style-type: none"> - Central interface for complete system - For new-production and repowering projects | <ul style="list-style-type: none"> - Special rail automation system - Central interface for complete system - For new-production and repowering projects - Certified for rail applications | <ul style="list-style-type: none"> - Electrical system voltage 16VDC-154VDC - CAN interface - Maintenance-free | <ul style="list-style-type: none"> - Integral charger - Standalone component - Enclosure rating IP66 - Maintenance-free |
| MTU PowerPacks® for Railcars Series 1800  | ■ | | ■ | ■ |
| Series 1600  | | | ■ | ■ |
| MTU Engines for Railcar Trainsets and Locomotives Series 1600  | | ■ | ■ | ■ |
| Series 4000  | | ■ | ■ | ■ |
| Page | 36 | 38 | 44 | 46 |

Automation

SAM – The reliable partner for your PowerPack®

The smart module.

The System PowerPack Automation (SAM) is an innovative high-end technology of MTU for rail vehicles – e.g. for rail cars. PowerPack Automation (SAM) optimizes the control, regulation and monitoring of the entire drive system. Representing a modular system, it ensures perfect adaptation of the drive system to the most complex operating conditions in rail applications.

PowerPack Automation (SAM) allows:

- > Easy integration in new or – in case of retrofits – existing vehicle control systems
- > Flexible adaptation to the vehicle or its components and to project-specific requirements
- > Automatic power adjustment or, if required, engine shutdown by the integrated safety system as well as all other required monitoring and safety functions
- > Traction optimization by the integrated load management (torque control) feature depending on the consumers connected (e.g. generator, compressor etc.)

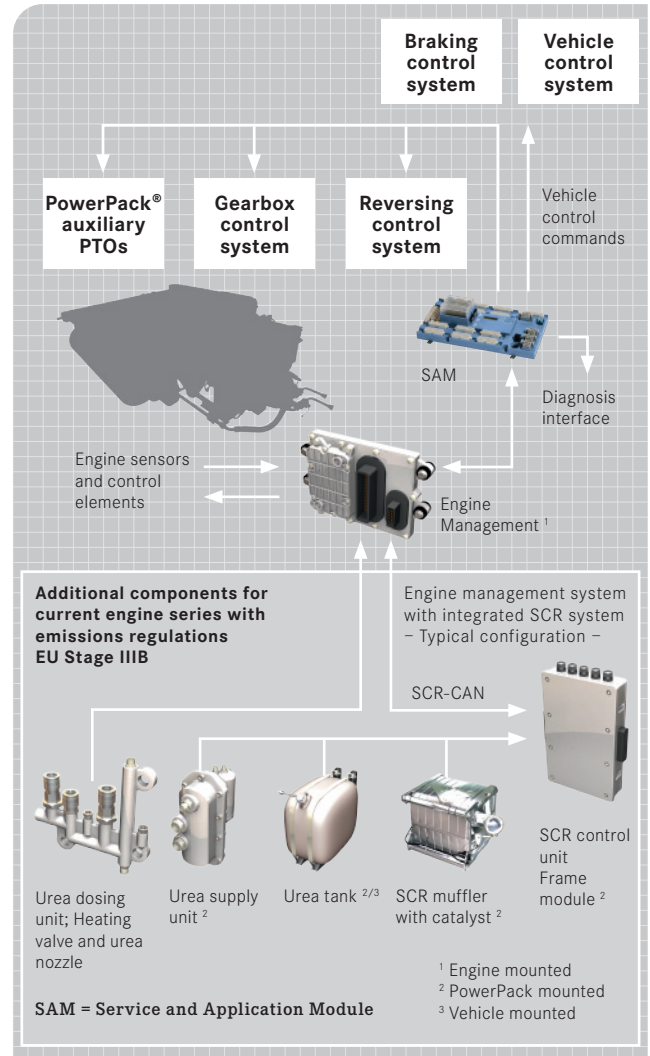
Thus, the new PowerPack® generation provides

- > High power efficiency
- > Lowest fuel consumption
- > Minimum exhaust emissions which are considerably below the statutory requirements (e.g. valid EU Stage IIIA and EU Stage IIIB)
- > Flexible and standardized interface solutions

Diagnosis and maintenance

- > Interface to the central railcar computer system, including the drive system components.

SAM = Service and Application Module



System highlights and benefits:

- > Complete system supplied from one single source
- > Modular design
- > Optimized diagnostic function
- > Intelligent CAN bus technology
- > Fast project implementation
- > Easy integration

Automation

powerline for Series 1600 and Series 4000

powerline – MTU’s automation system for train drive units – represents a step into a whole new future of technology for rail vehicles. Even with only the basic components ADEC, POM and PAU, the **powerline** automation system makes the integration of the engine into the locomotive a simple process. POM, like ADEC, is an electronic module mounted permanently to the engine. Control, regulation and monitoring are all part of the package that MTU delivers. With the help of optimized interface technology, the engine is quick and easy to install.

MDEC / ADEC engine control systems

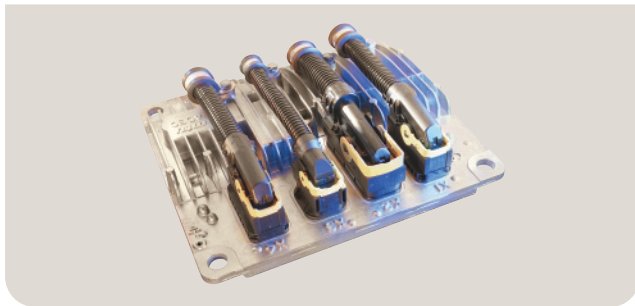
The engine control systems

- MDEC (MTU Diesel Engine Control) for Series 4000 R41
- ADEC (Advanced Diesel Engine Control) for Series 1600, 4000 R03/R04 are systems that have been developed and produced by MTU specifically for use with the very latest high-performance diesel engine technology – designed not only for full control of the Common Rail technology in the Series 4000, but above all for the management of frequent extreme loads and sudden load changes, which can be overcome effortlessly and smoothly using this system.

The most important features at a glance:

- Component mounted on and wired into the engine
- Integrated control and monitoring system
- Fuel-optimized output regulation
- Integrated safety and self-test system
- Data bus interface

ADEC - Engine Management

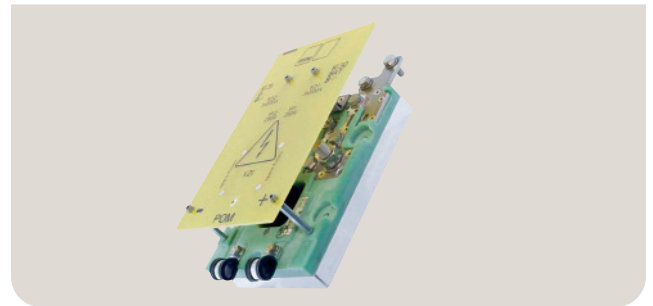


POM (Power Output Module) for Series 1600, 4000 R03/R04

Module with actuating function for the starter motor and alternator, with the following features:

- Component mounted on the engine
- Starter relay and other conventional power routing not required
- Optimization of start-up process; starter motor monitoring with engaging function
- Alternator function monitoring
- Line break and short circuit monitoring
- Battery voltage monitoring with start-up intervention plus status indication and error report function
- ADEC and POM linked via CAN data bus
- Fully automated start-up control with ADEC

POM - Interface Module



Automation

powerline for Series 1600 and Series 4000

powerline for new locomotives or repowering with Series 1600 and 4000

PAU Engine (Power Automation Unit)

Module for the monitoring, control and system integration of peripheral engine components, with the following features:

- Stand-alone component with (redundant) CAN open interface to vehicle control system
- Transfer of all engine-related operational data including diagnostics to the vehicle control system
- Additional monitoring and control of peripheral engine systems
 - Coolant level monitoring
 - Fuel pump actuation
 - Air filter monitoring
 - Integrated safety functions
 - Data output for fuel consumption indicator
 - Ethernet diagnosis interface (e.g. service laptop)
 - Fault ring buffer
 - Cooling fan regulation

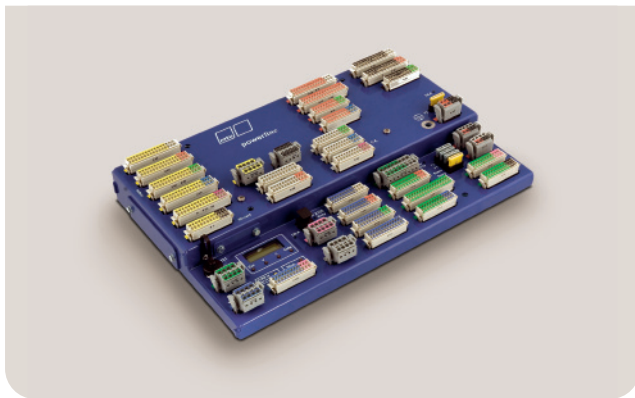
powerline additional module for repowering of diesel-electric locomotive drive systems

PAU Traction (Power Automation Unit)

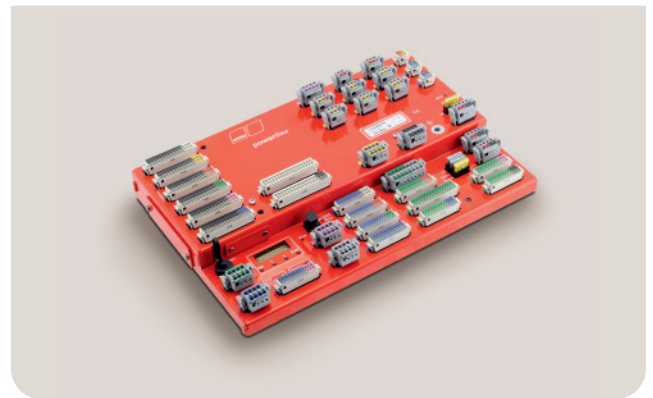
Module for the monitoring, control, regulation and system integration of the traction generator and rectifier, with the following features:

- For drive systems with direct-current series-wound engines
- Optimized output regulation, configured for the diesel engine
- Generator, rectifier and vehicle engine monitoring
- Field weakening control for vehicle engine
- Wheel-slip protection
- Integrated safety functions (e.g. power shut-off)
- Ethernet interface (e.g. service laptop)
- Fault ring buffer
- Locomotive safety functions
- Specification includes current and voltage transformers plus amplifier for generator excitation

PAU - Engine

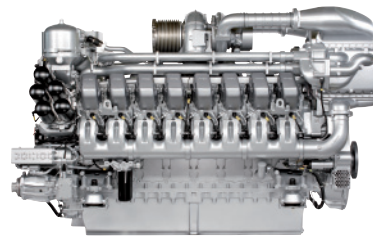


PAU - Traction

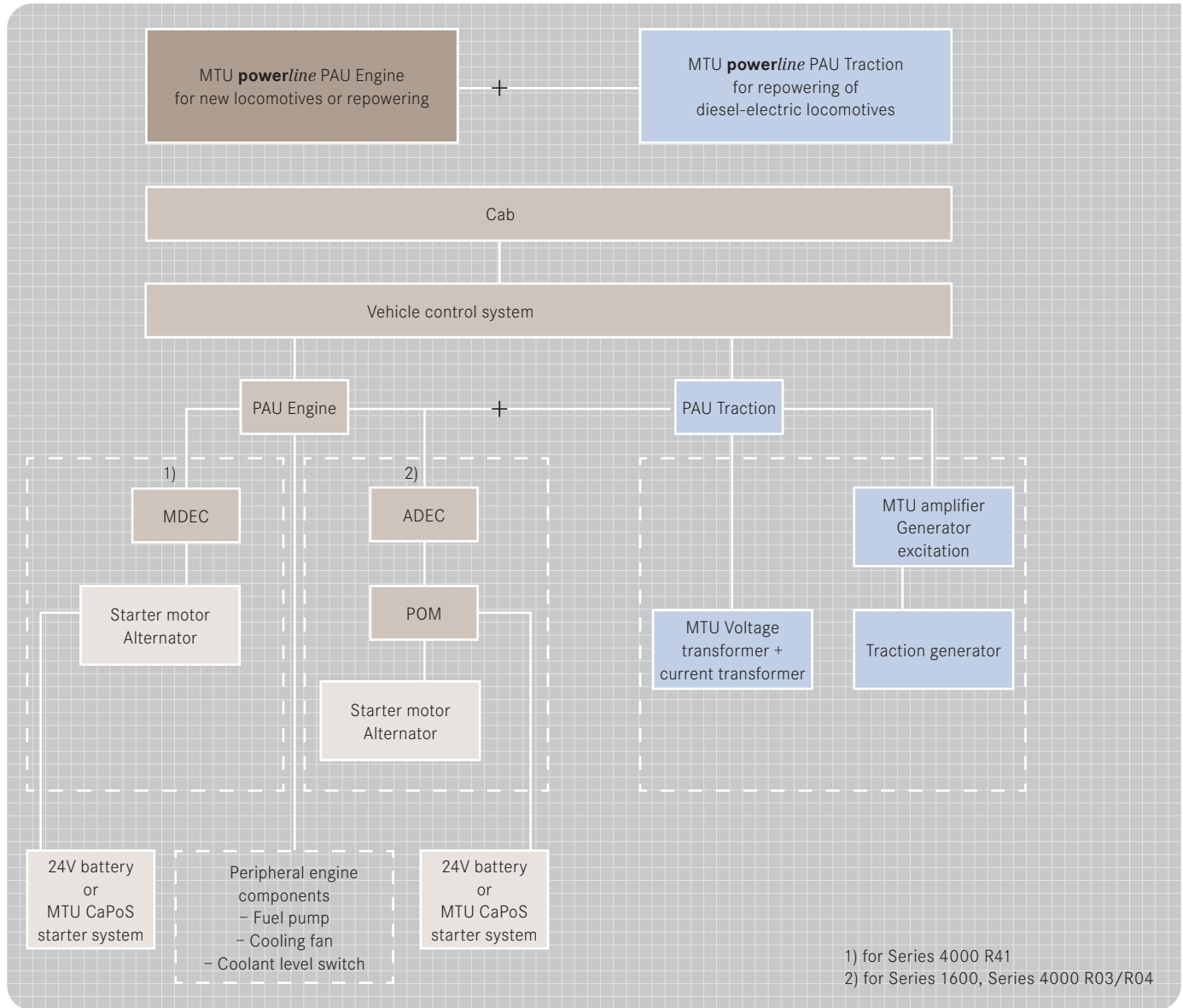


Automation

powerline for Series 1600 and Series 4000



ADEC = Advanced Diesel Engine Control
MDEC = MTU Diesel Engine Control
PAU = Power Automation Unit
POM = Power Output Module



Automation

Automation

CaPoS – Capacitor Power System for Series 1600, 1800 and 4000

Innovation right from the start.

CaPoS is an innovative UltraCap voltage supply system which obviates the need for conventional starter batteries in railroad applications.

CaPoS uses capacitor technology to optimize startup behavior. The number of UltraCap modules to be used depends on the type of engine involved and its breakaway torque. CaPoS may be used autonomously or in conjunction with the **powerline** automation system.

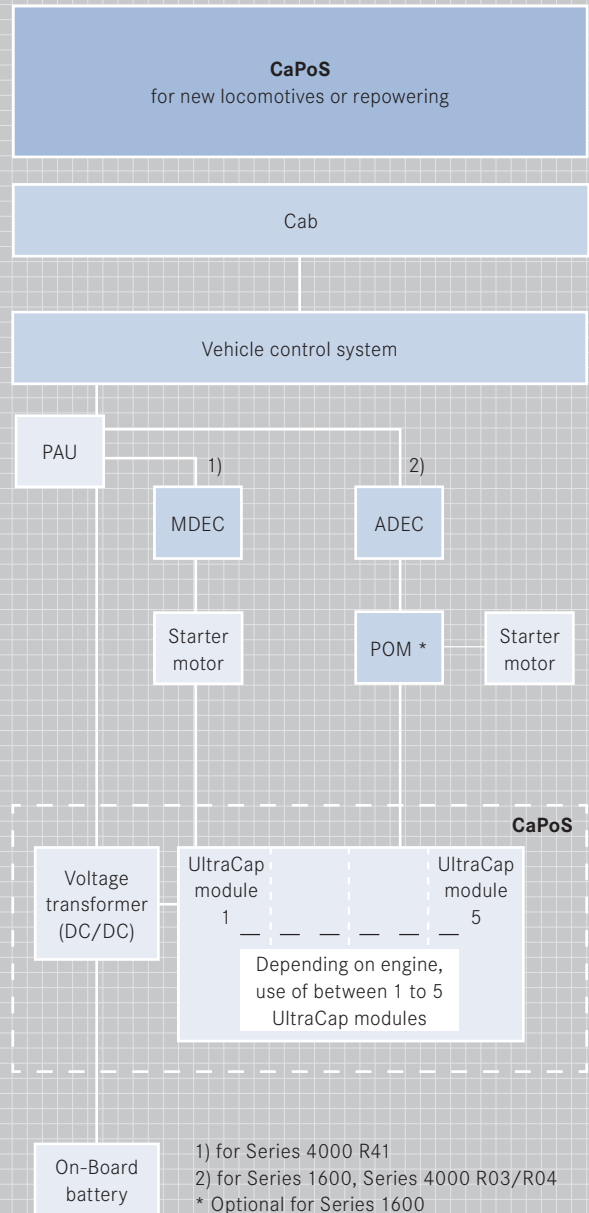
The most important features at a glance:

- Autonomous and modular construction
- Maintenance-free system
- Significant reductions in weight and volume compared with conventional starter batteries
- Optimized cold-starting properties
- Low life-cycle costs
- No voltage interruption during start-up
- On-board voltage of 16V – 154V possible
- Wired-up complete system
- CAN interface with **powerline**

CaPoS with **powerline** - Sample for the 12V 4000

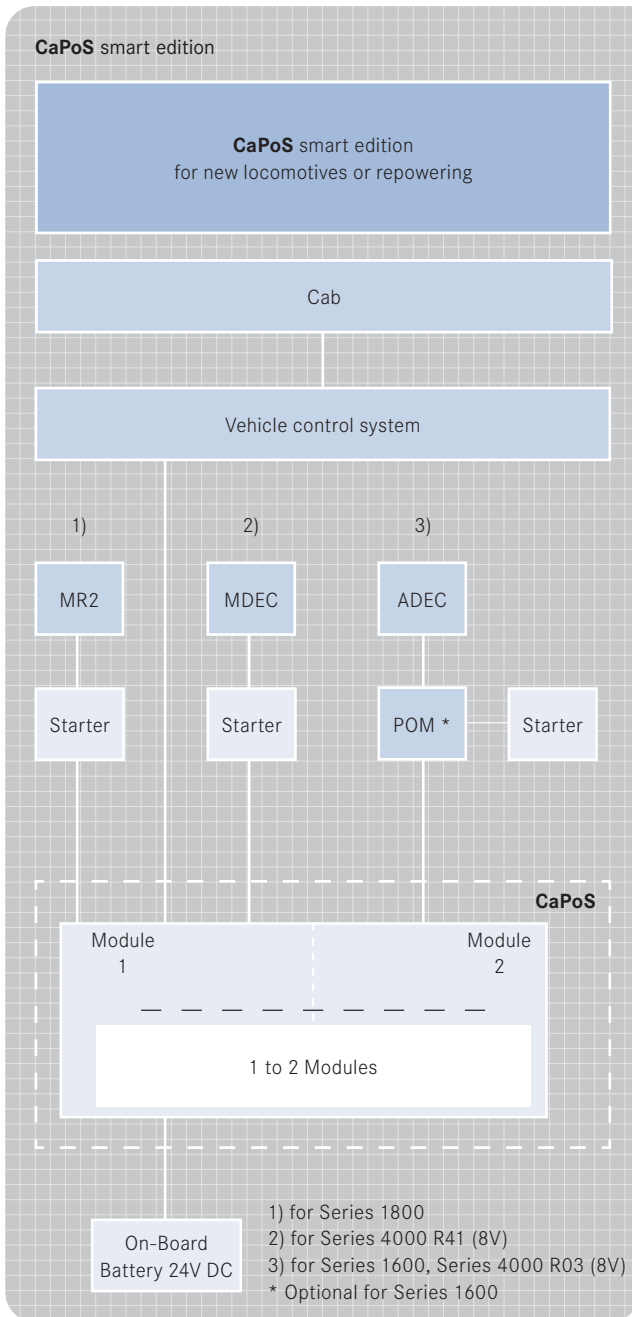


CaPoS with **powerline**



Automation

CaPoS smart edition – Capacitor Power System for Series 1600, 1800 and 4000



Reliable power right from the start.

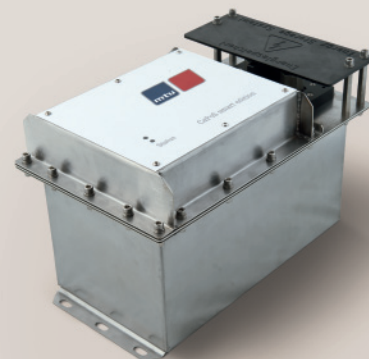
CaPoS smart edition was especially developed for heavy and duty applications and provides the high energy required by the 24V DC starters during the starting sequence.

CaPoS smart edition uses capacitor technology to optimize startup behavior. The number of modules to be used depends on the type of engine involved and its breakaway torque.

The most important features at a glance:

- Autonomous and modular construction
- Maintenance-free system
- Significant reductions in weight and volume compared with conventional starter batteries
- Optimized cold-starting capabilities
- Low life-cycle costs
- No voltage interruption during start-up
- On-board voltage of 24V DC
- Integrated self-monitoring system with interface to vehicle control system
- Integrated DC-/DC converter for automatical recharging
- IP66 protection

CaPoS smart edition – Sample for the 12V 1600



MTU ValueCare

A valuable portfolio of products and services



Getting the most out of your MTU engines and systems is of paramount importance. That's why we offer MTU **ValueCare**, a complete portfolio of products and services designed to help maximize both performance and uptime.

The MTU **ValueCare** portfolio includes global support and service products through **ValueService**; genuine spare parts and top quality consumables through **ValueSpares**; and remanufactured engines and service parts through **ValueExchange**. No matter where you are or what you need, we're always ready to provide valuable support through our worldwide MTU service network.

ValueService Products:

Remote Services

Identifying faults early, before they turn into unwanted complications, saves valuable service time and helps you make quick operational decisions. As a part of **ValueService**, Remote Services is a powerful diagnostic solution that links you directly to a record of the activity of your MTU engines and systems through a secure Internet connection. A telemetric device within Remote Services stores selected information and transmits it in real time or at predetermined intervals. Important engine data such as oil temperature, current location and operating hours can be conveniently retrieved for analysis, even remotely from a far-away work site. All you need is a computer with an Internet connection.

Remote Services can be ordered as an option on an MTU engine. If you already have an MTU engine, Remote Services is also available as a retrofit. The minimum duration for a Remote Services User Agreement is 2 years, after which time it's automatically extended for 6 months.

Maintenance Solutions:

- > Customized Care: professional, planned maintenance solutions from MTU
- > Extended Coverage: providing coverage beyond your standard warranty on your MTU engines and systems
- > Annual Check: a yearly professional inspection of your MTU engines and systems by MTU experts

In addition, we can provide further value-added services:

- > Technical documentation
- > Training
- > RAMS - LCC-Analysis

ValueSpares:

- > Genuine parts
- > Top quality consumables (lubricants, coolants, filters)

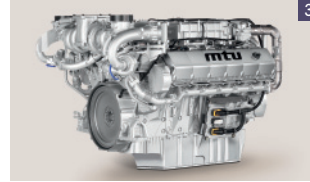
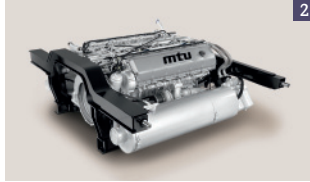
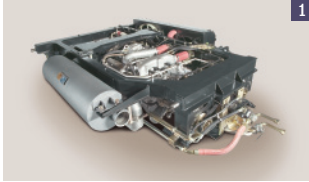
ValueExchange:

- > Remanufactured Parts
- > Remanufactured Engines
- > Remanufactured PowerPacks
- > Engine Overhaul



Series and emissions qualification

Overview of MTU engines



| Engine model | UIC II | UIC IIIA | EU Stage IIIA compliant | EU Stage IIIB certified | US EPA Tier3 (line haul loco) compliant | US EPA Tier3 (line haul loco) Carb ULEL compl. | US EPA Tier 4i (NRMM) compliant |
|--|--------|----------|-------------------------|-------------------------|---|--|---------------------------------|
| MTU PowerPacks® for Railcars | | | | | | | |
| 1 Series 1800 | | | ■ | ■ | ■ | | ■ |
| 2 Series 1600 | | | | ■ | | | |
| MTU Engines for Railcar Trainsets, Push-Pull Trains and Locomotives | | | | | | | |
| 3 Series 1600 | | | | ■ | | | |
| 4 Series 4000 | | | | | | | |
| 8V/12V/16V 4000 R41 | ■ | | | | | | |
| 8V/12V/16V/20V 4000 R43 ¹⁾ | | ■ | ■ | | | | |
| 20V 4000 R53 | | ■ | ■ | | | | |
| 20V 4000 R63 | | ■ | ■ | | | | |
| 12V/16V 4000 R54 | | | | | | ■ | |
| 12V/16V 4000 R64/74/84 | | | | | | ■ | |

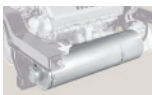
¹⁾ EU IIIA type approved, EU IIIA certificate available

Key technologies for emission reduction

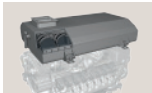
MTU engine technology

| Engine model | Exhaust Gas Aftertreatment | | | Internal Emission Technology | | |
|--|----------------------------|-----|-----|------------------------------|--------------------|-------------|
| | SCR | DPF | DOC | EGR | 2st Turbo-charging | Advanced CR |
| Railcar | | | | | | |
|  Series 1800 | ■ | | | | | |
|  Series 1600 | ■ | | | | | ■ |
| Locomotive | | | | | | |
|  Series 1600 | | | ■ | ■ | ■ | ■ |
|  Series 4000 | | ■ | ■ | ■ | ■ | ■ |

Exhaust Gas Aftertreatment



Selective Catalytic Reduction (SCR)

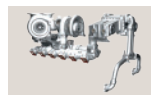


Diesel Particulate Filter (DPF)



Diesel Oxidation Catalyst (DOC)

Internal Emission Technology



Exhaust Gas Recirculation (EGR)



Two-Stage Turbocharging



Advanced Common Rail Fuel Injection

Exhaust emissions

UIC (International Railway Association)

In its codex 624 the UIC has established emission limits for rail traction engines, which are binding for all its members.

| Stage | Power P _n Speed n _n | NO _x g/kWh | HC g/kWh | CO g/kWh | Partic. g/kWh | Date |
|--------|--|--------------------------|-------------|-------------|------------------|------|
| UIC II | P _n ≤ 560 kW | 6.0 | 0.6 | 2.5 | 0.25 | 2003 |
| | P _n ≤ 560 kW n _n ≥ 1000 rpm | 9.5 | 0.8 | 3.0 | 0.25 | 2003 |
| | P _n ≤ 560 kW n _n ≥ 1000 rpm | 9.9 | 0.8 | 3.0 | 0.25 | 2003 |
| | P _n ≤ 560 kW n _n ≥ 1000 rpm | | | | | |

EU - Rail 97/68/EC

Locomotive propulsion engines

| Stage | Power P _n Cylinder displacem. | NO _x g/kWh HC+NO _x (g/kWh) | HC g/kWh | CO g/kWh | Partic. g/kWh | Date* |
|-------|--|--|-------------|-------------|------------------|-------|
| IIIA | 130 - 560 kW | 4.0 | | 3.5 | 0.2 | 2007 |
| | > 560 kW | 6.0 | 0.5 | 3.5 | 0.25 | 2009 |
| | > 2000 kW | 7.4 | 0.4 | 3.5 | 0.2 | 2009 |
| | V _{hiz} > 5 l | | | | | |
| IIIB | > 130 kW | 4.0 | | 3.5 | 0.025 | 2012 |

Railcar propulsion engines

| Stage | Power P _n Cylinder displacem. | NO _x g/kWh HC+NO _x (g/kWh) | HC g/kWh | CO g/kWh | Partic. g/kWh | Date* |
|-------|--|--|-------------|-------------|------------------|-------|
| IIIA | > 130 kW | 4.0 | | 3.5 | 0.2 | 2006 |
| IIIB | > 130 kW | 2.0 | 0.19 | 3.5 | 0.025 | 2012 |

* Date for placing on the market of engines, type approval one year earlier.

USA - EPA Rail Regulation 40 CFR 9, 85, et al.

On 6 May 2008 the US EPA has published the final rule „40 CFR Parts, 9, 85 et al.“ for locomotive engines less than 30 liters per cylinder. This law regulates the emission limit values for all rail diesel engines.

Line-haul Locomotives

| Engine category | Take effect in year | PM g/bhp-hr | NO _x g/bhp-hr | HC g/bhp-hr |
|---|--|----------------|-----------------------------|----------------|
| Remanufactured Tier 0 without separate loop intake air cooling | 2008, as available 2010 required | 0.22 | 8.0 | 1.00 |
| Remanufactured Tier 0 with separate loop intake air cooling | 2008, as available 2010 required | 0.22 | 7.4 | 0.55 |
| Remanufactured Tier 1 | 2008, as available 2010 required | 0.22 | 7.4 | 0.55 |
| Remanufactured Tier 2 | 2008, as available 2013 required | 0.10 | 5.5 | 0.30 |
| New Tier 3 | 2012 | 0.10 | 5.5 | 0.30 |
| New Tier 4 | 2015 | 0.03 | 1.3 | 0.14 |

Switch-haul Locomotives

| Engine category | Take effect in year | PM g/bhp-hr | NO _x g/bhp-hr | HC g/bhp-hr |
|--------------------------|----------------------------------|----------------|-----------------------------|----------------|
| Remanufactured Tier 0 | 2008, as avail. 2010 required | 0.26 | 11.8 | 2.10 |
| Remanufactured Tier 1 | 2008, as avail. 2010 required | 0.26 | 11.0 | 1.20 |
| Remanufactured Tier 2 | 2008, as avail. 2013 required | 0.13 | 8.1 | 0.60 |
| Tier 3 | 2011 | 0.10 | 5.0 | 0.60 |
| Tier 4 | 2015 | 0.03 | 1.3 | 0.14 |

USA - EPA Nonroad Regulation (40 CFR 89, 40 CFR 1039 and 40 CFR 1068)

Diesel engines

| Power Pn kW | NOx | HC | CO | Particul. | Date as of model year |
|----------------------|-------|-------|-----|------------------|-----------------------------|
| | g/kWh | g/kWh | | | |
| NOx + NMHC | | | | | |
| Tier 4 | | | | | |
| Pn < 8 | 7.5 | 7.5 | 8.0 | 0.4 ^A | 2008 |
| 8 ≤ Pn < 19 | 7.5 | 7.5 | 6.6 | 0.4 | 2008 |
| 19 ≤ Pn < 37 | 4.7 | 4.7 | 5.5 | 0.03 | 2013 |
| 37 ≤ Pn < 56 | 4.7 | 4.7 | 5.0 | 0.03 | 2013 |
| 56 ≤ Pn < 130 | 0.4 | 0.19 | 5.0 | 0.02 | 2015 ^B |
| 130 ≤ Pn < 560 | 0.4 | 0.19 | 3.5 | 0.02 | 2014 ^C |
| Pn > 560 | 3.5 | 0.19 | 3.5 | 0.04 | 2015 |
| Tier 4 Genset | | | | | |
| Pn > 560 | 0.67 | 0.19 | 3.5 | 0.03 | 2015 |

- A hand-startable, air cooled direct injection engines may be certified to Tier 2 standards through 2009 and to an optimal PM standard of 0.6 g/kWh starting in 2010
- B PM/CO: full compliance from 2012; NOx/HC: Option 1 (if banked Tier 2 credits used) – 50% engines must comply in 2012-2013; Option 2 (if no Tier 2 credits claimed) – 25% engines must comply in 2012-2014, with full compliance from 31 December 2014
- C PM/CO: full compliance from 2011; NOx/HC: 50% engines must comply in 2011-2013

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