



动车组专业英语

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ENGLISH

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西南交通大学出版社

· 成都 ·

内容简介//OBSTRACT

本书系统地介绍了高速动车组的结构组成及工作原理,包括概论、车顶高压设备、空调系统、车体及车内设备、车端连接装置、转向架及列车控制和乘客信息系统。全书共8章,各章均配有词汇及短语、重点句注释及本章习题。

本书内容丰富、条理清晰、重点突出。全书针对高等职业院校动车组检修技术专业学生编写,也可供中职学生和在职人员使用。

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前言//PREFACE

“动车组专业英语”是动车组检修技术相关专业的一门重要选修课程。随着我国高速铁路的快速发展，与国外的技术交流日趋频繁，对于动车组相关专业的学生以及从业的相关工程技术人员来说，熟练掌握专业英语对与国外同行进行技术交流、促进国际合作都有重要作用。

本书根据铁路相关技术文件，针对动车组司机及动车组机械师等相关岗位，结合动车组乘务、检修部门的生产实际以及高等职业技术教育、中等职业技术教育教学和铁路职工培训的特点，对车顶高压设备、空调系统、车体及车内设备、车端连接装置、转向架及列车控制和乘客信息系统等方面的内容进行了介绍。

本书由天津铁道职业技术学院李飞担任主编，天津铁道职业技术学院李元元、梁炜昭、湖南铁道职业技术学院徐磊担任副主编。全书共分八章，第一章由李泽杰、马来苹编写，第二章由李笑、罗利锦编写，第三章由李元元、晋永荣编写，第四章由梁炜昭编写，第五章由吕娜玺、李飞编写，第六章由李元元编写，第七章由李飞、徐磊编写，第八章由马来苹编写。

我国动车事业发展快速，编者水平有限，不妥之处在所难免，希望读者批评指正。

编 者

2018年3月

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Chapter 1 Overview of Electrical Multiple Unit

Through bringing in high speed Electrical Multiple Unit (EMU) from the High-speed rail technology developed countries in the world, after digestion, absorption and re-innovation by CRRRC, independent brand CRH series EMU are developed in China. Under the guidance of advanced, mature, economical, applicable and reliable policy, China's high-speed railway has reached the international advanced level in system integration, lightweight, high-speed bogie, AC drive in high speed flow, speed, braking, network control, man-machine engineering, energy saving and environmental protection. Presently in China, we have CRH1, CRH2, CRH3, CRH5, CRH380A, CRH380B, CRH380C, etc.

CRH3 will be introduced as an example in this chapter.

1.1 Technical Data

Train configuration is shown in Figure 1.1.1.

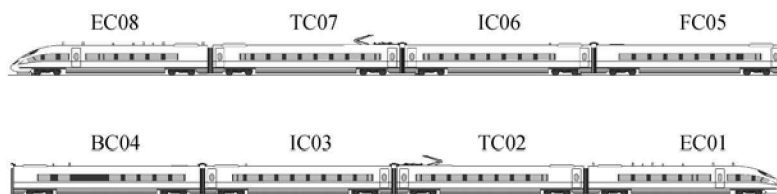


Figure 1.1.1 Train Configuration

The CRH3 vehicles are designed for existing tracks as well as for passenger transport on the newly built sections of the Chinese Railway (CR). They are able to operate at a speed of 300 km/h on the parts of the CR railway that have been newly built for passenger transport and on specially identified sections.

The trainset of the CRH3 trains consists of 8 cars:

- ① End cars EC01 / EC08,
- ② Transformer cars TC02 / TC07,
- ③ Intermediate cars IC03 / IC06,
- ④ Bistro car BC04,
- ⑤ First class car FC05.

Cars EC01 / TC02 / IC03 / BC04 and EC08 / TC07 / IC06 / FC05 form a traction unit. It is possible to couple up to two electrical multiple units of the CRH3 to make a trainset.

The vehicles are designed as single system vehicles for operation with a nominal voltage of AC 25 kV / 50 Hz. 50 % of the axles are driven due to the CRH3 being conceived as an electrical multiple unit with distributed drive equipment. Table 1.1.1 shows the technical data of CRH3.

Table 1.1.1 Technical data of CRH3

Length (over coupler head)	Approx. 200 m	Operating speed	300 km/h
Configuration	8-car unit (two traction units)	Max power at the wheel rim when driving	8,800 kW
Axle labeling	$B'_0B'_0 + 2'2' + B'_0B'_0 + 2'2' + 2'2' + B'_0B'_0 + 2'2' + B'_0B'_0$	Theoretically achievable final speed (residual acceleration = 0 m/s ²)	350 km/h
Max. axle load	170 kN ± 4 %	Starting tractive effort	300 kN
Track gauge	1,435 mm	Number of axles	32
Max. incline when starting to tow an EMU at 100 % traction	20‰	Acceleration from 0 to maximum operating speed with 15 km/h headwind	after a distance of 22.5 km
Wheel base	17,375 mm	Nominal line voltage UN	AC 25 kV
Bogie pitch	2,500 mm	Switch-off limit value	AC 31 kV
Total height (top of roof)	3,890 mm	Nominal line frequency fN	50 Hz
Height (top of floor)	1,260 mm	Max. mass	563 t
Width	approx. 3,260 mm	Driven axles	16
Car body length	approx. 24,825 mm (intermediate cars) approx. 25,860 mm (end cars)		
Car sequence: ✓ End car (EC01): 1st / 2nd class with traction converter / cooling system, traction motors and gears; ✓ Transformer car (TC02): 2nd class with transformer / cooling system; ✓ Intermediate car (IC03): 2nd class with traction converter / cooling system, traction motors and gears; ✓ Bistro car (BC04): 2nd class with battery equipment and service facilities; ✓ First class car (FC05): 1st class with battery equipment; ✓ Intermediate car (IC06): 2nd class with traction converter / cooling system, traction motors and gears; ✓ Transformer car (TC07): 2nd class with transformer / cooling system; ✓ End car (EC08): 1st / 2nd class class with traction converter / cooling system, traction motors and gears.			

1.2 Traction Units

Overview of first traction unit is shown in Table 1.2.1 and 1.2.2.

Table 1.2.1 Overview of First Traction Unit

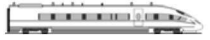
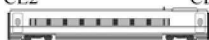
	CE1 BC04 CE2 	CE1 IC03 CE2 	CE2 TC02 CE1 	CE2 EC01 CE1 
Interior equipment	✓ 2nd class non smoker ✓ Passenger compartment with 50 seats ✓ Standing room bistro ✓ Galley ✓ Room for customer service and staff	✓ 2nd class non smoker ✓ Passenger compartment with 87 seats ✓ Two standard sanitary facilities	✓ 2nd class non smoker ✓ Passenger compartment with 87 seats ✓ Two standard sanitary facilities	✓ 1st class non smoker lounge with 8 seats ✓ 2nd class non smoker ✓ Passenger compartment with 65 seats
Main underfloor equipment	✓ Double auxiliary converter unit ✓ Battery and battery charger ✓ E-container for on-board power supply	✓ Traction motors ✓ Traction converter and cooling unit ✓ E-container for on-board power supply ✓ Air compressor unit	✓ Auxiliary converter container ✓ Transformer and cooling unit ✓ E-container for on-board power supply	✓ Traction motors ✓ Traction converter and cooling unit ✓ E-container for on-board power supply

Table 1.2.2 Overview of First Traction Unit

	CE1 EC08 CE2 	CE1 TC07 CE2 	CE2 IC06 CE1 	CE2 FC05 CE1 
Interior equipment	✓ 1st class non smoker lounge with 8 seats ✓ 2nd class non smoker ✓ Passenger compartment with 65 seats	✓ 2nd class smoker ✓ Passenger compartment with 87 seats ✓ Two standard sanitary facilities	✓ 2nd class non smoker ✓ Passenger compartment with 87 seats ✓ Two standard sanitary facilities	✓ 1st class non smoker ✓ Passenger compartment with 56 seats ✓ Handicapped area ✓ One standard sanitary facility ✓ One universal sanitary facility (applicable for handicapped passengers)
Main underfloor equipment	✓ Traction motors ✓ Traction converter and cooling unit ✓ E-container for on-board power supply	✓ Auxiliary converter container ✓ Transformer and cooling unit ✓ E-container for on-board power supply	✓ Traction motors ✓ Traction converter and cooling unit ✓ E-container for on-board power supply ✓ Air compressor unit	✓ Emergency coupler with UIC cable ✓ Double auxiliary converter unit ✓ Battery and battery charger ✓ E-container for on-board power supply

1.3 Car Layouts

The colors shown in the interior view graphics identify the following main groups / facilities:

① red: Cabinet for electrical equipment; ② green: Galley / drinking water; ③ yellow: Sanitary facilities; ④ blue: Passenger compartment; ⑤ purple: Conductor cabin; ⑥ orange: Driver's cab.

The colors shown in the underfloor view graphics identify the following main systems / facilities / equipment:

① blue: High voltage / Traction system; ② purple: Auxiliary Supply system; ③ yellow: Sanitary facilities; ④ green: Pneumatic Brake Equipment (the numbering in the brackets corresponds to the KNORR parts number).

Figure 1.3.1, Figure 1.3.2, Figure 1.3.3, Figure 1.3.4 and Figure 1.3.5 show the interior and underfloor layout of EC01/EC08, TC02/TC07, IC03/IC06, BC04 and FC05 cars respectively.

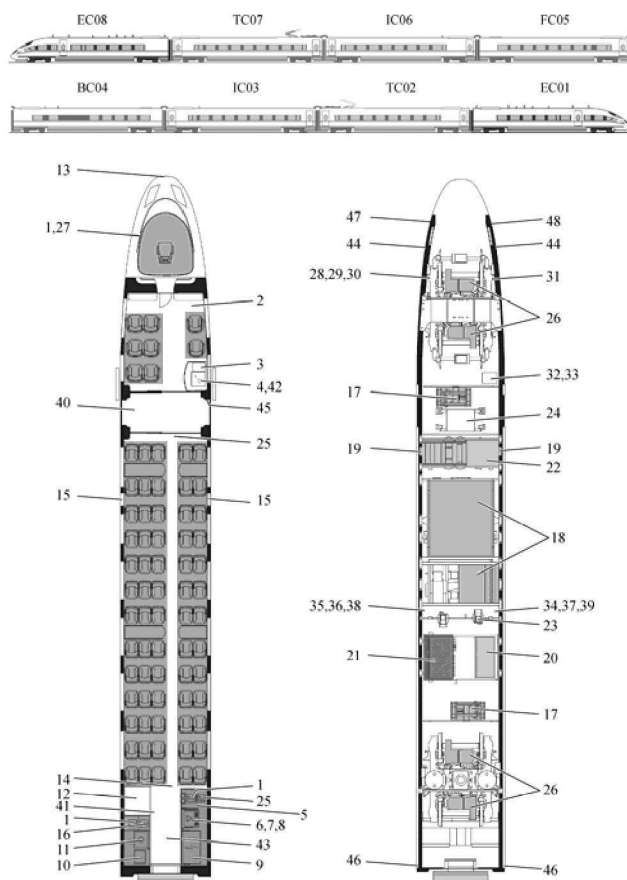


Figure 1.3.1 Interior and Underfloor Layout EC01 / EC08 Cars

- | | |
|---|---|
| 1—Fire extinguisher; | 27—Fixed intercom station; |
| 2—Lounge; | 28—Isolating cock MRP (Z17); |
| 3—Tank of windscreen washer system; | 29—Isolating cock front hatches control / decoupler (Z07/2); |
| 4—Wardrobe for driver; | 30—Isolating cock coupler (Z07/1); |
| 5—Car control panel 149.30; | 31—Isolating cock BP (Z13); |
| 6—E-cabinet PIS 149.20; | 32—Isolating cock flange lubrication (V01); |
| 7—Train radio (CR-center) 149.40; | 33—Flange lubrication unit; |
| 8—Train control GFX-3A 149.50; | 34—Isolating cock BP (for entire car, (B16)); |
| 9—E-Cabinet, car switchgear 149.10; | 35—Isolating cock sanding equipment (B20); |
| 10—OCS cabinet 159.20; | 36—Isolating cock BP (for rescue purposes, (Z30)); |
| 11—HVAC cabinet 159.10; | 37—Isolating cock bogie brake equipment (C-pressure) (B15); |
| 12—E-Cabinet train guard 159.40; | 38—Isolating cock braking system, various consumers (B27); |
| 13—Automatic coupler; | 39—Isolating cock air suspension equipment (L02); |
| 14—Train destination display inside; | 40—Isolating cock interior door (Z21/1); |
| 15—Train destination display outside; | 41—Isolating cock air conditioning (Z21/2); |
| 16—Drinking water heater; | 42—Special handle bar (for disconnecting the articulated bridge at the intercar gangway); |
| 17—Traction motor ventilator; | 43—Isolating cock water supply drinking water heater; |
| 18—Traction converter / cooling unit; | 44—Filling sand; |
| 19—Braking displays (Z22 / Z24); | 45—Indicator filling level tank of windscreen washer system; |
| 20—Brake control module (B02); | 46—Filling fresh water; |
| 21—E-Container on-board power supply; | 47—Pushbutton “Signal light Ready for Coupling” (–51–S04); |
| 22—Air reservoir / exhaust unit; | 48—Pushbutton “Test Wheel Flange Lubrication Unit” (–73–S01) |
| 23—Doubler radar; | |
| 24—Condenser unit air conditioning cab; | |
| 25—Dustbin; | |
| 26—Traction motor and gear; | |

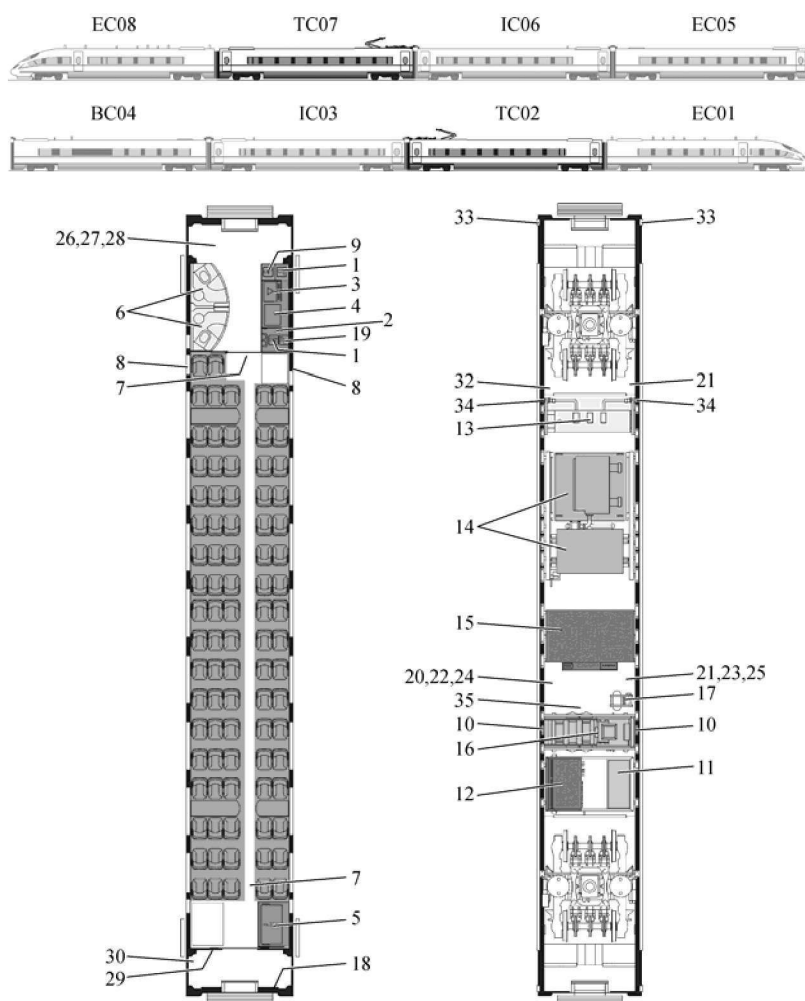


Figure 1.3.2 Interior and Underfloor Layout TC02 / TC07 Cars

- | | |
|---------------------------------------|---|
| 1—Fire extinguisher; | 20—Isolating cock parking brake (H29); |
| 2—Car control panel 242.40; | 21—Isolating cock BP (B16); |
| 3—E-cabinet PIS 242.20; | 22—Isolating cock braking system, toilet equipment (B27); |
| 4—HVAC cabinet 242.30; | 23—Isolating cock bogie brake equipment (C-pressure) (B15); |
| 5—E-Cabinet, car switchgear 248.10; | 24—Isolating cock pantograph equipment (B20); |
| 6—Standard sanitary facility; | 25—Isolating cock air suspension equipment (L02); |
| 7—Train destination display inside; | 26—Isolating cock water supply toilets; |
| 8—Train destination display outside; | 27—Isolating cock water supply drinking water heater; |
| 9—Drinking water heater; | 28—Isolating cock interior door / air conditioning (Z21/1); |
| 10—Braking displays (Z24 / Z26); | 29—Isolating cock interior door (Z21/2); |
| 11—Brake control module (B02); | 30—Earth switch; |
| 12—E-Container on-board power supply; | 32—Isolating cock BP (Z17/2); |
| 13—Sewage container; | 33—Filler fresh water; |
| 14—Transformer / Cooling unit; | 34—Waste water suction / venting connections; |
| 15—Auxiliary converter container; | 35—Isolating cock air supply toilets (Z18) |
| 16—Air reservoir / Exhaust unit; | |
| 17—Auxiliary compressor (U01); | |
| 18—Internal communication unit; | |
| 19—Dustbin; | |

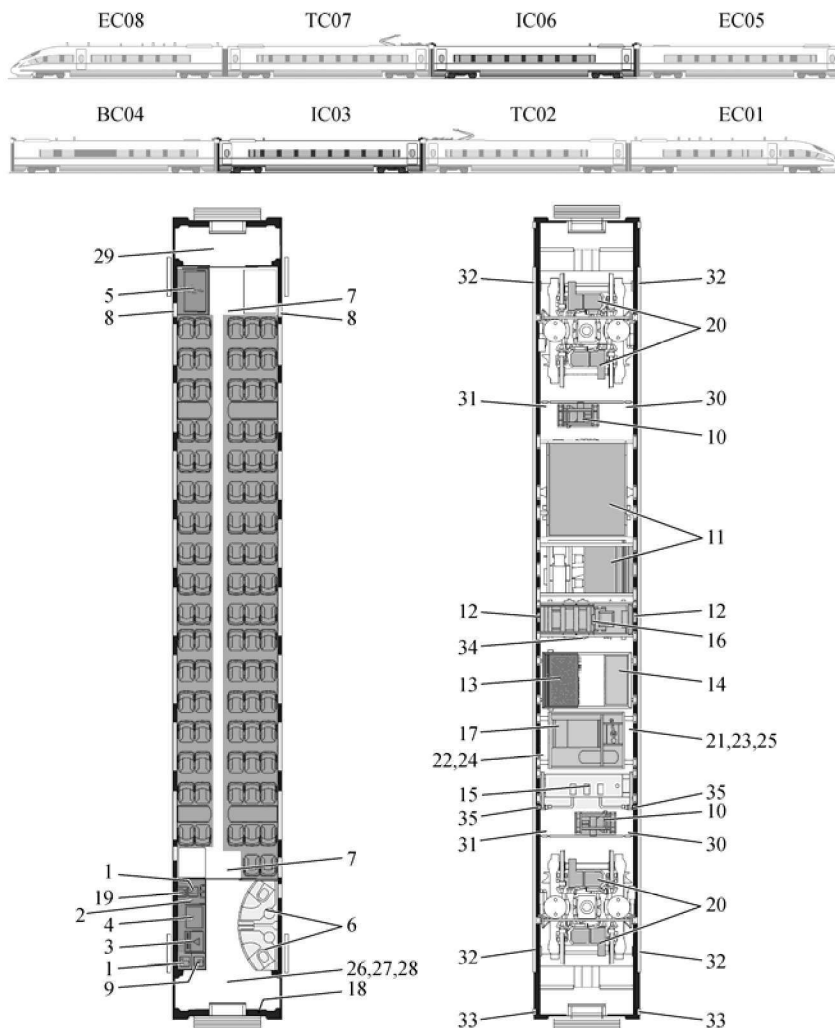


Figure 1.3.3 Interior and Underfloor Layout IC03 / IC06 Cars

- | | |
|---------------------------------------|---|
| 1—Fire extinguisher; | 20—Traction motor and gear; |
| 2—Car control panel 342.40; | 21—Isolating cock BP (B16); |
| 3—E-cabinet PIS 342.20; | 22—Isolating cock braking system, toilet equipment (B27); |
| 4—HVAC cabinet 342.30; | 23—Isolating cock bogie brake equipment (C-pressure) (B15); |
| 5—E-Cabinet, car switchgear 348.10; | 24—Isolating cock MRP (B20); |
| 6—Standard sanitary facility; | 25—Isolating cock air suspension equipment (L02); |
| 7—Train destination display inside; | 26—Isolating cock water supply toilets; |
| 8—Train destination display outside; | 27—Isolating cock water supply drinking water heater; |
| 9—Drinking water heater; | 28—Isolating cock interior door / air conditioning (Z21/1); |
| 10—Traction motor ventilator; | 29—Isolating cock interior door (Z21/2); |
| 11—Traction converter / Cooling unit; | 30—Isolating cock MRP (Z17/1); |
| 12—Braking displays (Z22 / Z24); | 31—Isolating cock BP (Z17/2); |
| 13—Brake control module (B02); | 32—Filling sand; |
| 14—E-Container on-board power supply; | 33—Filling fresh water; |
| 15—Sewage container; | 34—Isolating cock air supply toilets (Z18); |
| 16—Air reservoir / Exhaust unit; | 35—Waste water suction / venting connections |
| 17—Air supply unit (A01); | |
| 18—Internal communication unit; | |
| 19—Dustbin; | |

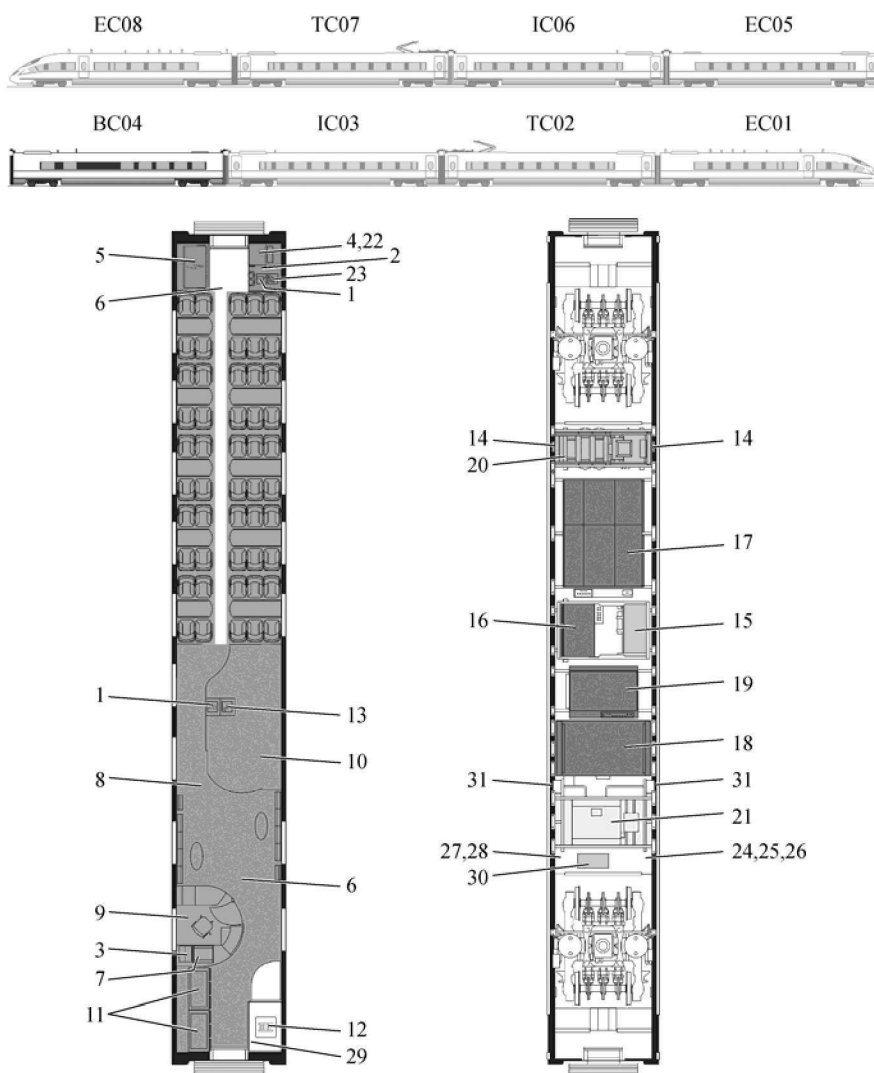


Figure 1.3.4 Interior and Underfloor Layout EC04 Car

- | | |
|---------------------------------------|---|
| 1—Fire extinguisher; | 18—Battery; |
| 2—Car control panel 459.30; | 19—Battery charger; |
| 3—E-cabinet PIS 442.10; | 20—Air reservoir / Exhaust unit; |
| 4—HVAC cabinet 459.10; | 21—Fresh water reservoir galley; |
| 5—E-Cabinet, car switchgear 449.10; | 22—Key-locking device for grounding; |
| 6—Train destination display inside; | 23—Dustbin; |
| 7—Internal communication unit; | 24—Isolating cock bogie brake equipment (C-pressure) (B15); |
| 8—Bistro; | 25—Isolating cock BP (B16); |
| 9—Conductor cabin; | 26—Isolating cock air suspension equipment (L02); |
| 10—Galley; | 27—Isolating cock braking system, toilet equipment (B27); |
| 11—Galley storage; | 28—Isolating cock parking brakes (H29); |
| 12—Evacuation gangway; | 29—Isolating cock air conditioning (Z21); |
| 13—Drinking water heater; | 30—Transformer Galley; |
| 14—Braking displays (Z24 / Z26); | 31—Filler fresh water |
| 15—Brake control module (B02); | |
| 16—E-Container on-board power supply; | |
| 17—Double auxiliary converter unit; | |

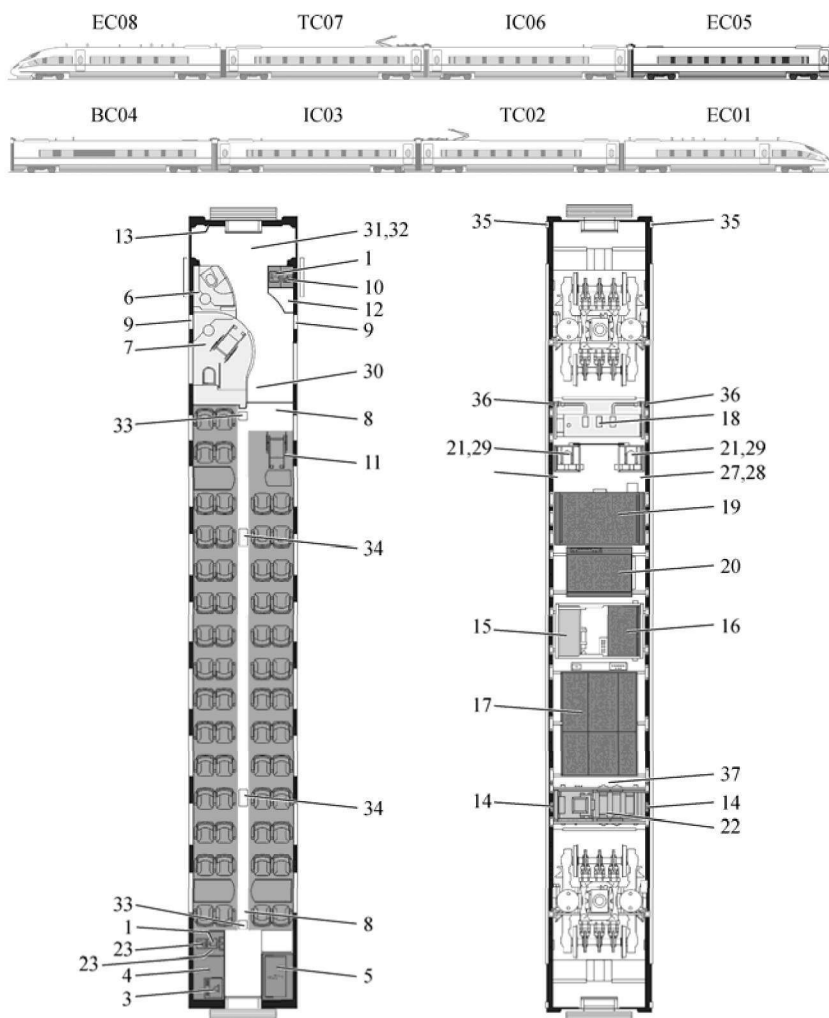


Figure 1.3.5 Interior and Underfloor Layout FC05 Car

- | | |
|---------------------------------------|--|
| 1—Fire extinguisher; | 21—Emergency adapter coupler with UIC cable; |
| 2—Car control panel 559.30; | 22—Air reservoir / Exhaust unit; |
| 3—E-cabinet PIS 559.20; | 23—Dustbin; |
| 4—HVAC cabinet 559.10; | 24—Isolating cock bogie brake equipment (C-pressure) (B15); |
| 5—E-Cabinet, car switchgear 549.10; | 25—Isolating cock BP (B16); |
| 6—Standard sanitary facility; | 26—Isolating cock air suspension equipment (L02); |
| 7—Universal sanitary facility; | 27—Isolating cock braking system, secondary consumers (B27); |
| 8—Train destination display inside; | 28—Isolating cock parking brakes (H29); |
| 9—Train destination display outside; | 29—Drag shoe; |
| 10—Drinking water heater; | 30—Isolating cock interior door / air conditioning (Z21); |
| 11—Handicapped area; | 31—Isolating cock water supply toilets; |
| 12—Wheel chair ramp; | 32—Isolating cock water supply drinking water heater; |
| 13—Internal communication unit; | 33—Video monitor (single); |
| 14—Braking displays (Z24 / Z26); | 34—Video monitor (double); |
| 15—Brake control module (B02); | 35—Filler fresh water; |
| 16—E-Container on-board power supply; | 36—Waste water suction / venting connections; |
| 17—Double auxiliary converter unit; | 37—Isolating cock air supply toilets (Z18) |
| 18—Sewage container; | |
| 19—Battery; | |
| 20—Battery charger; | |

☆ Words and Expressions

English	中文	English	中文
Technical Data	技术参数	Trainset	列车
End car	头车	Transformer car	变压器搭载车
Intermediate car	中间车	Bistro car	简餐车
First class car	头等车	Traction unit	牵引单元
Nominal voltage	标称电压/标定电压	Configuration	配置
Wheel base	轮距	Bogie pitch	转向架定距
Operating speed	运行速度	Driven axles	从动轴
Starting tractive effort	起动牵引力	Headwind	逆风
Traction converter	牵引变流器	Traction motor	牵引电机
Battery	蓄电池	Service facility	服务设施
Interior equipment	内部设备	Main underfloor equipment	主要地板下设备
Auxiliary converter container	辅助变流器箱	Double auxiliary converter unit	双辅助变流器装置
E-container	电气柜	Battery charger	蓄电池充电器
On-board power supply	车载电源	Compressor	空气压缩机
Electrical equipment	电气设备	Sanitary facility	卫生设施
Conductor cabin	乘务员室	Driver's cab	司机室
Fire extinguisher	灭火器	Switchgear	开关装置
Traction motor ventilator	牵引电动机通风机	Automatic coupler	自动车钩
Wheel flange lubrication	轮缘润滑	Signal light	信号灯
Windscreen washer system	挡风玻璃清洗系统	Isolating cock	切断阀
Interior door	内门	Articulated bridge	铰接桥
Braking system	制动系统	Bogie	转向架
Coupler	车钩	Front hatch	前车钩罩
Parking brake	停放制动	Pantograph	受电弓
Auxiliary compressor	辅助压缩机	Earth switch	接地开关
Sewage container	污水箱	Internal communication unit	内部通信单元
Video monitor (single)	视频监测器	Pneumatic foot pump	气动脚踏泵
Lounge	观光区		



☆ Notes

1. Through bringing in high speed EMU from the High-speed rail technology developed countries in the world, after digestion, absorption and re-innovation by CRRC, independent brand CRH series EMU are developed in China.

中国中车从世界高速铁路技术发达的国家引进高速电力动车组，通过引进、消化吸收、再创新，打造了中国自己的品牌 CRH 系列动车组。

2. They are able to operate at a speed of 300 km/h on the parts of the CR railway that have been newly built for passenger transport and on specially identified sections.

CRH3 动车组能够在中国铁路既有线指定区段及新建的客运专线上以 300 km/h 的速度运行。

☆ Exercises

1. Please describe the marshalling form of CRH3.

2. Please list the main interior and underfloor equipments in EC01 of CRH3.

3. What is the operating speed and the theoretically achievable final speed of CRH3?

4. Please translate the following words and phrases into Chinese:

gear; galley; lounge; intercom; distributed drive; theoretically achievable final speed; axle load; track width; pneumatic brake equipment; condenser unit; isolating cock air supply toilets ;

5. Please translate the following sentences into Chinese:

(1) Under the guidance of advanced, mature, economical, applicable and reliable policy, China's high-speed railway has reached the international advanced level in system integration: lightweight, high-speed bogie, AC drive in high speed flow, speed, braking, network control, man-machine engineering, energy saving and environmental protection.

(2) The vehicles are designed as single system vehicles for operation with a nominal voltage of 25 kV / 50 Hz AC. 50 % of the axles are driven due to the CRH3 being conceived as an electrical multiple unit with distributed drive equipment.

Chapter 2 High Voltage Equipment on the Roof of Carbody

2.1 Pantograph

1. General

The pantograph is used to supply current from a contact line for electrically operated vehicles. The collector head is adapted to the contact line system. Connection to the vehicle is via three support insulators.

The collector head and the contact strips must be, where possible, attached via a pivot or leading wheel set so that the least possible deviation from the track center is achieved, even in curves.

Depending on the design of the vehicle roof and the support insulators, the pantograph can be used up to the currently highest commercial operating voltages. It is possible to mount collector heads with appropriate profiles for use with different contact line types.

The lifting drive located between the base frame and lower arm is used to raise the pantograph and push it against the drive wire. Small changes in the height position of the drive wire are compensated for by the collector head suspension. The great height difference of the drive wire when it is lowered (e.g. under bridges, tunnels) is absorbed by the pantograph frame. The pantograph is lowered by its own weight.

In single-arm pantographs, the collector head (geometrically seen an articulated four-bar square) is guided approximately vertically by the frame. Because of this Vertical guidance, the drive direction has no influence on the contact force and the pantograph is therefore equally suitable for both drive directions. At higher speeds, additional aerodynamic forces occur and these must be compensated for with lift aides suitable for the vehicle.

2. Conditions of use / Technical data

1) Main data

- ① Overall height in lowered state: 620 mm;
- ② Maximum length in lowered state: 2,610 mm;
- ③ Maximum width at the bow: 1,950 (+5/-10) mm;
- ④ Minimum working height over lowered state: 300 mm;
- ⑤ Maximum working height above lowered state (under contact wire): 2,400 mm;