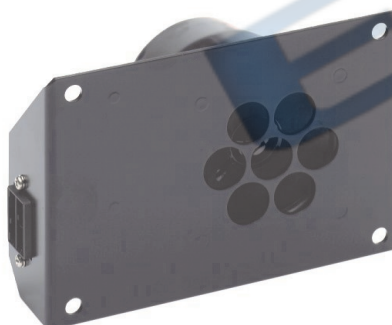
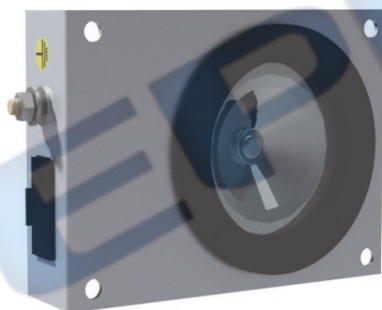


The image is only illustrative.



- Compact size
- Specially developed housing protects the speaker against dust and provides excellent percussion effect
- Easy mounting
- Can optionally be delivered with different impedances

Internal Loudspeaker/Cab Loudspeaker

Focon item no. 030373 and no. 030262

Internal Loudspeaker:

The internal loudspeaker is a specially designed loudspeaker ideal for interior mounting in train applications, where it is used for providing audio information to the passengers in saloons, vestibules and restaurants.

PA announcements and global entertainment are transmitted to the passengers via internal loudspeakers and each power amplifier placed in the system is connected to a set of identical loudspeakers.

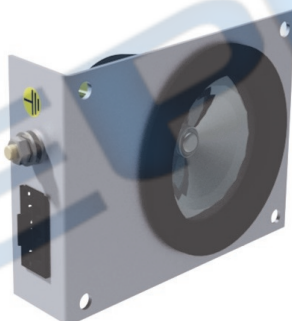
The internal loudspeaker is equipped with a housing to protect the loudspeaker and to secure the best loudspeaker sound performance.

Cab Loudspeaker:

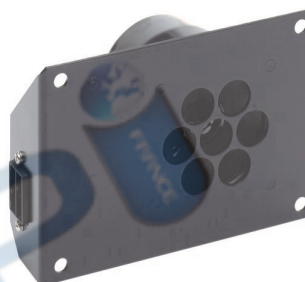
The purpose of the cab loudspeaker is to let the train driver monitor the following:

- Cab-to-cab intercommunication
- Emergency speech intercommunication
- Passenger announcements
- Broadcast audio
- Door chime

The cab loudspeaker is equipped with a housing to protect the loudspeaker and to secure the best loudspeaker sound performance. The sound level in the cab can be controlled via the cab control head, the service interface or the train computer interface (depending on the system).



Internal Loudspeaker



Cab Loudspeaker

Technical information

Weight:	Approx. 0.5 kg / 1.1 lb incl. mounting arrangement
Temperature range:	-25 °C to +70 °C -13 °F to 158 °F
Storage temperature:	-40 °C to +85 °C -40 °F to 185 °F
Sealing:	IP10 incl. housing
Plug type:	WAGO WINSTA® MIDI 770 series
Mechanical dimensions (L x W x H)	148 x 105 x 95 mm 5.83 x 4.13 x 3.74 in
Cone diameter:	3"
Continuous power handling:	3 W
Impedance:	448 ohm
Frequency range:	150 – 12500 Hz, -10dB
Sound pressure:	88 dB at 1 W, 1 m distance /3.28 ft distance

Technical information

Weight:	Approx. 0.5 kg / 1.1 lb incl. mounting arrangement
Temperature range:	-25 °C to +70 °C -13 °F to 158 °F
Storage temperature:	-40 °C to +85 °C -40 °F to 185 °F
Sealing:	IP10 incl. housing
Plug type:	AMP D-3200M series
Mechanical dimensions (L x W x H)	148 x 105 x 95 mm 5.83 x 4.13 x 3.74 in
Cone diameter:	3"
Continuous power handling:	5 W
Impedance:	8 ohm
Frequency range:	150 – 12500 Hz, -10 dB
Sound pressure:	87 dB at 1 W, 1 m distance /3.28 ft distance

Approvals

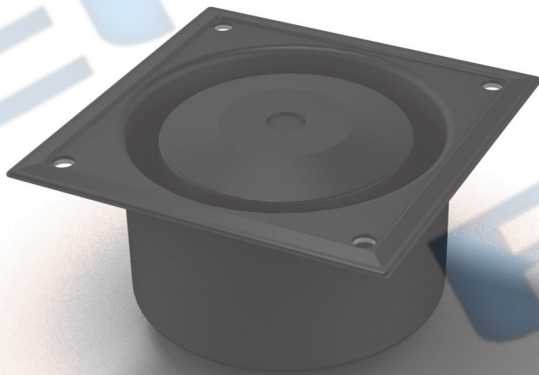


Product specifications and images are subject to change without prior notice.

030373 and 030262

Focon Electronic Systems ApS
Denmark





The image is only illustrative.

- **Compact size**
- **Rugged design**
- **IP 67**
- **Easy mounting**

External Loudspeaker - ELS

Focon item no. 030384

External Loudspeaker:

The External Loudspeaker is a compact loudspeaker to be used in Passenger Information Systems in Light Rail Vehicles, Trams and Trains.

The External Loudspeaker is ideal for outdoor mounting on e.g. the roof of Light Rail Vehicles, Trams and Trains, where it is used for providing audio information to the passengers.

PA announcements are transmitted to the passengers via external loudspeakers and each power amplifier placed in the system is connected to a set of identical loudspeakers.

External Loudspeaker



Technical information

Weight:	Approx. 0.7 kg / 1.54 lb
Temperature range:	-25 °C to +70 °C -13 °F to 158 °F
Storage temperature	-40 °C to +85 °C -40 °F to 185 °F
Sealing:	IP67
Plug type:	WAGO X-COM® -SYSTEM
Shock and vibration:	EN61373 Category 1 Class B
Mechanical dimensions (L x W x H):	121 x 121 x 70 mm 4.76 x 4.76 x 2.76 in
Continuous power handling:	10 W
Impedance:	128 Ω ± 15 %
Frequency response:	570 Hz – 4.4 kHz, -10dB
Average sound pressure level:	100 dB @ 1W, 1m / 3.28 ft distance
Materials	Housing: Lacquered aluminium (Black) Horn: Polypropylene (PP) (Black)

Approvals



Product specifications and images are subject to change without prior notice.

030384GK_7_ProdSheet

The image is only illustrative.



- High audio quality
- One-button operation
- Full duplex
- Easy installation in cabs and saloons
- Impact-proof

Handset

Focon item no. 094319

The **FOCON IMAGINE** handset is ideal for public announcements(PA) and communication inside the train. The handset has an easy press to talk (PTT) button that can be operated by both hands.

The handset connects to the Imagine Passenger Information System (PIS) via the PIS Interface Unit (PIU). This way only the handset needs to be visible after installation. The handset is typically located in the cabs of the train but can also be used in service and catering areas where the train personnel can use it for intercommunication or PA.

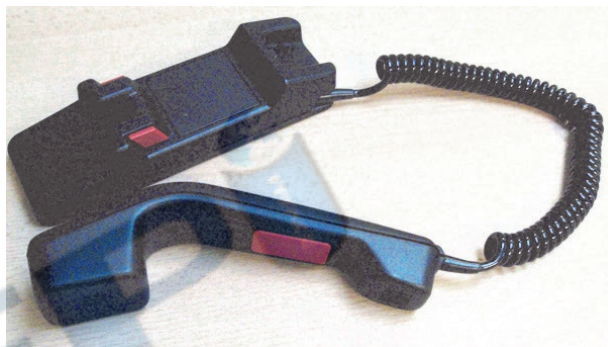
The design of the handset is easy to use and to withstand everyday use for the lifetime of the train with high audio quality. The cradle is designed with locking mechanism for the handset with a release button. The cradle is connected to the handset with a reinforced spiral cable. The handset and cradle are produced from impact proof synthetic material.

With the handset it has never been easier to make an announcement from the driver to the passengers in the vehicle.





Handset



Technical information

Weight:	Approx. 0.5 kg / 1.10 lb
Sealing:	IP20
Operating temperature:	-25 °C to +70 °C -13 °F to 158 °F
Storage temperature:	-30 °C to +80 °C -22 °F to 176 °F
Plug type:	Screw connection
Microphone type:	Dynamic, unidirectional
Frequency range, microphone:	200 – 5000 Hz
Frequency range, speaker:	200 – 5000 Hz

Options

Compatibility

- **FOCON IMAGINE** PIS system

Approvals



Product specifications and images are subject to change without prior notice.

094319



Figure 1: Digital Cube Camera

CCTV IP Forward Facing Camera

CCTV IP PoE Forward Facing Camera

Focon item no. 094548 & 094547

Our cameras are especially noted for their special design for mobile applications and their extremely high reliability. All our cameras are protected against vandalism and have an automatic backlight function, and a 'true day-and-night' function.

- Image sensor: 1/2.7" Progressive CMOS
- Illumination: 0,1 Lux F1.6
- Power source camera: 12 V/DC (+/- 10%) max. 3,8 Watt
- Extended temperature range : -25° to +70° C in accordance with 50155 T1
- Protection class according to VDE: IP31
- MTBF: 80 000 hours
- Available lenses: 4,0 mm (other lenses on demand)
- Norms and standards: CE, EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2

Technical Data

Feature	Description
Image sensor	1/2.7" Progressive CMOS,WDR
Max. pixels (h x v)	1920 x 1080
Electronic shutter	1 ~ 1/10000 sec.
Illumination	Color: 0,1 Lux / Black/white: 0,05 Lux (F1.6)
White balance	Manual Auto mode / Auto Tracking
Wide Dynamic Range	Yes
Compression	H.264, MJPEG
Video Streaming	Quad streaming: 3x h.264+ 1x MJPEG or 4x h.264
Resolution	Full HD 1080p/ HD 720p/ D1/ CIF
Frame rate	HD 25/30 fps; Full HD 15 fps
Image Setting	Brightness- Manual; Exposure- Auto/Manual; Sharpness- Manual; Contrast- Manual, Saturation- Manual; Hue- Manual
Protocol	TCP/IP, UDP, RTP, RTSP, HTTP, ICMP, FTP, SMTP, DHCP, PPPoE, UPnP & IGMP, ONVIF
Internet Browser	Internet Explorer (6.0+), Chrome, Firefox, Safari
Digital Zoom	Yes
Motion Detection & Obstruction Detection	Yes
Audio	G.711/ G.7.26
Power source camera	12 V/DC (+/- 10%) max. 3,8 Watt
Operating temperature	-20° to +50°C
Extended temperature range according to EN50155-T1	-25° to +70°C
Humidity	90% non condensing
Protection class according to IEC 60529	IP31
MTBF	Camera module: 80.000 hours, housing: 200.000 hours
Connectors	Ethernet: M12; Operating power source: WAGO-male
Weight	980 g
Dimensions / Mounting (W x H x L)	95 mm x 99x 50,5 mm / Wall- and Ceiling mounting
Available lenses	4,0 mm, (other lenses on demand)
Norms and standards	CE, EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2

Product specifications and images are subject to change without prior notice.

The image is only illustrative.

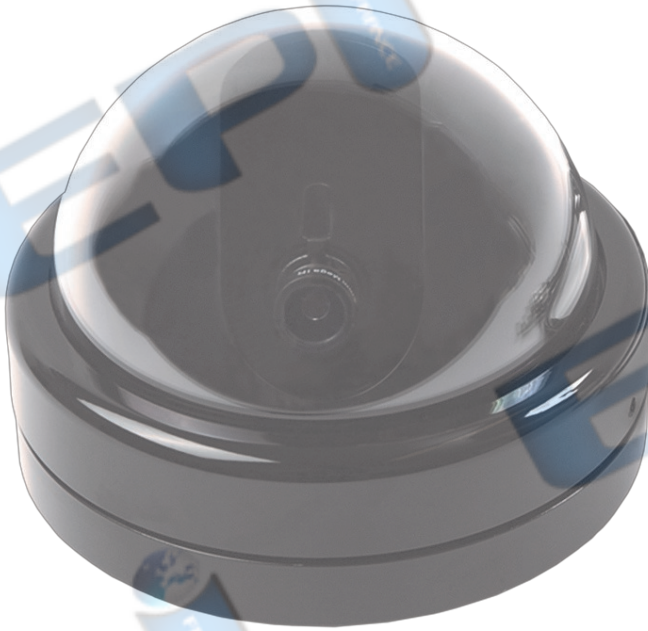


Figure 1: Dome Camera

CCTV IP Saloon Dome Camera

CCTV IP PoE Saloon Dome Camera

Focon item no. 094549 & 094519

Our cameras are especially noted for their special design for mobile applications and their extremely high reliability. All our cameras are protected against vandalism and have an automatic backlight function, and a 'true day-and-night' function.

- Image sensor: 1/2.7" Progressive CMOS
- Extended temperature range : -25° to +70° C in accordance with 50155 T1
- Protection class according to IEC 60529: IP 41
- MTBF: 80 000 hours
- Available lenses: 4,0 mm (other lenses on demand)
- Norms and standards: CE, EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2

Technical Data

Feature	Description
Image sensor	1/2.7" Progressive CMOS , WDR
Max. pixels (h x v)	1920 x 1080
Electronic shutter	1 ~ 1/10000 sec.
Illumination	Color: 0,1 Lux / Black/White: 0,05 Lux (F1.6)
White balance	Manual Auto mode / Auto Tracking
Wide Dynamic Range	Yes
Compression	H.264, MJPEG
Video Streaming	Quad streaming: 3x h.264+ 1x MJPEG or 4x h.264
Resolution	Full HD 1080p/ HD 720p/ D1/ CIF
Frame rate	HD 25/30 fps : Full HD 15 fps
Image Setting	Brightness- Manual; Exposure- Auto/Manual; Sharpness- Manual; Contrast- Manual, Saturation- Manual; Hue- Manual
Protocol	TCP/IP, UDP, RTP, RTSP, HTTP, ICMP, FTP, SMTP, DHCP, PPPoE, UPnP & IGMP, ONVIF
Internet Browser	Internet Explorer (6.0+), Chrome, Firefox, Safari
Digital Zoom	Yes
Motion Detection	Yes
Audio	G.711/ G.7.26
Power source camera	12V DC max. 3.8 Watts, optionally PoE 48 V DC
Operating temperature	-20° to +50°C
Extended temperature range according to EN50155-T1	-25° to +70°C
Humidity	90% non condensing
Protection class according to IEC 60529	IP41
MTBF	Camera module: 80.000 hours, housing: 200.000 hours
Connectors	Ethernet: M12- male d-coded (optional M12- female); Operating power source: WAGO-male (PoE via M12)
Weight	710 g
Dimensions / Mounting (Ø x H)	118 mm x 76,5 mm / Wall- and Ceiling mounting
Available lenses	4,0 mm (other lenses on demand)
Norms and standards	CE, EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2

Product specifications and images are subject to change without prior notice.



Figure 1: Rear View Camera

CCTV IP Rear View Camera Right CCTV IP Rear View Camera Left

Focon item no. 094551 & 094550

Our cameras are especially noted for their special design for mobile applications and their extremely high reliability. All our cameras are protected against vandalism and have an automatic backlight function, and a 'true day-and-night' function.

- Image sensor: 1/3" Color
- Power source camera: 12V/DC (+/- 10%) max. 3 Watt / Heater 24V/DC (+/- 30%), max. 20 Watt
- Extended temperature range: -25° to +70° C in accordance with EN50155 T1
- Protection class according to VDE: IP68
- MTBF: Camera module: 80 000 hours, housing: 200 000 hours
- Housing design: *Exterior housing left/right*
- Available lenses: 2,5 mm, 8 mm (other lenses on demand)
- Norms and standards: CE, EN 50155, EN 50121-3-2, EN 61373

Technical Data

Feature	Description
Image sensor	1/3 " Color
Max. pixels (h x v)	1920 x 1080
Electronic shutter	1 ~ 1/10000 sec.
Illumination	Color: 0,1 Lux / Black/white: 0,05 Lux (F1.6)
White balance	Manual Auto mode / Auto Tracking
Wide Dynamic Range	Yes
Compression	H.264, MJPEG
Video Streaming	Quad streaming: 3x h.264+ 1x MJPEG or 4x h.264
Resolution	Full HD 1080p/ HD 720p/ D1/ CIF
Frame rate	HD 25/30 fps: Full HD 15 fps
Image Setting	Brightness- Manual; Exposure- Auto/Manual; Sharpness- Manual; Contrast- Manual, Saturation- Manual; Hue- Manual
Protocol	TCP/IP, UDP, RTP, RTSP, HTTP, ICMP, FTP, SMTP, DHCP, PPPoE, UPnP & IGMP, ONVIF
Internet Browser	Internet Explorer (6.0+), Chrome, Firefox, Safari
Digital Zoom	Yes
Motion Detection & Obstruction Detection	Yes
Audio	G.711/ G.7.26
Extended temperature range according to EN50155-T1	-25° to +70°C
Humidity	95% non condensing
Protection class according to IEC 60529	IP68
MTBF	Camera module: 80.000 hours, housing: 200.000 hours
Housing design	Exterior housing left/right
Connectors	Video: BNC-female Operating- and heating power source: WAGO connector
Weight	860 g
Dimensions / Mounting (W x H x L)	147,5 x 78 x 207,25 mm
Available lenses	2,5 mm, 8 mm (other lenses on demand)
Norms and standards	CE, EN 50155, EN 50121-3-2, EN 61373

Product specifications and images are subject to change without prior notice.

The image is only illustrative.



Figure 1: Passenger Communication Unit

FOCON

Your solution with our knowledge

- Compliant with EN 50155 and EN 50121-3-2
- Compliant with TSI PRM
- Rugged aluminium design with IP54 protection from the front
- Modular design with rear part (electronics) and front plate
- Ethernet interface (IP backbone)
- Integrated microphone and loudspeaker with high audio quality
- In-front push button (Push to activate)
- Three in-front LED indicators (Ready, Wait/Listen and Talk)
- Three switch inputs for external potential free contacts

Passenger Communication Unit - PCU

Focon item no. 899014

The Passenger Communication Unit is a call unit/alarm unit in the Passenger Information System with a human-machine interface (HMI), which enables passengers to communicate with the Driver.

The Passenger Communication Unit is connected to the train IP backbone (Ethernet switch) via the Ethernet connector.

The Passenger Communication Unit design is modular, and it consists of an indispensable rear part (with all the electronics) and a front plate. Optionally, the front plate can fulfil special customer requests concerning size, colour, gloss and text language.

During normal operation the general status of the Passenger Communication Unit is health-monitored by the **FOCON IMAGINE** PIS System Controller, which is the main controlling unit on the IP backbone.

The Passenger Communication Unit has the following passenger HMI:

- One built-in microphone
- One built-in loudspeaker
- One in-front push button (Push to activate)
- Three in-front LED indicators (Ready, Wait/Listen and Talk)

There is also a possibility of connecting up to three external potential free contacts to the switch inputs of the Passenger Communication Unit (e.g. an external alarm push button or an external alarm handle).

The "Ready" LED indicator tells the passenger that the Passenger Communication Unit is operating and ready for use.

The following audio functions are supported:

Passenger Communication

In case of an emergency situation, a passenger pushes the "Push to activate" push button, and the Driver will receive an alarm in the active cab. To initiate the Passenger Communication function the alarm must be acknowledged by the Driver, and a Driver-controlled full-duplex communication link can then be established between the passenger and the Driver. The Passenger Communication Unit visually tells the passenger via the LED indicators when to listen ("Wait/Listen") and when to talk ("Talk"). The speech direction is controlled by the Driver, so when the communication link once has been established it is not necessary for the passenger to push the in-front push button repeatedly. The communication is done via the built-in microphone and the built-in loudspeaker.

Background noise measuring (optional)

The built-in microphone can be used for measuring the background noise level in the coach. The background noise level can be used for automatically adjusting the volume settings of the Public Address (PA) system.

The Passenger Communication Unit complies with all requirements for passenger alarm devices in the TSI PRM set up by the European Commission. Persons with reduced mobility are able to operate the push button of the unit, and the unit has visual and audible indication that it has been operated.

Interfaces

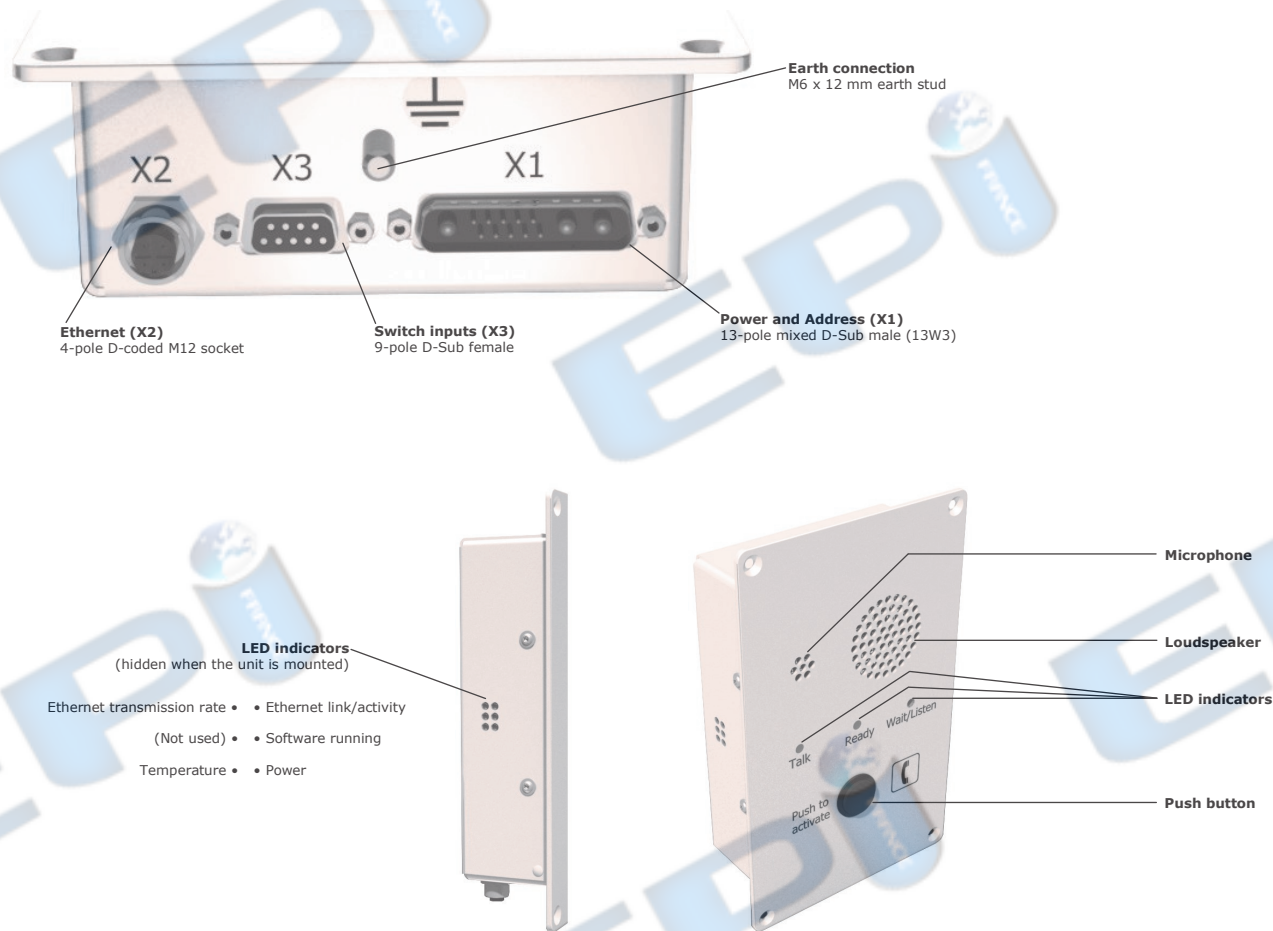


Figure 2: Interfaces of the Passenger Communication Unit

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2
Passenger alarm system	prEN 16334
Disability regulation	2008/164/EC (European Commission): Technical Specification for Interoperability relating to Persons with Reduced Mobility (TSI PRM)

General specifications	
Cabinet material	Aluminium
Cabinet surface coating	Surface treatment: SurTec® 650 chromitAL® TCP
	Paint (front): RAL 7004 (Signal Grey) Note 1
	Gloss: 60% – 80% @ 60° Note 1
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement)
	Flush mounted in a wall or similar
Cooling	Convection
Preventive maintenance	None

Note 1: Painted front plate in customer colour (according to RAL colour codes) and gloss on request.

Technical Data (continued)

Power port	
Nominal supply voltage	110 VDC Note 2
Power consumption	Idle: 5.0 W
	Typ.: 5.2 W
	Max.: 8.0 W
Inrush current @ 77 VDC	$\int I^2 dt = 0.014 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 8 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 0.3 ms)}$
Inrush current @ 110 VDC	$\int I^2 dt = 0.031 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 12 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 0.3 ms)}$
Inrush current @ 137.5 VDC	$\int I^2 dt = 0.049 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 15 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 0.3 ms)}$
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Note 2: Other supply voltages on request.

Ethernet port	
Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

Microphone	
Frequency response	200 to 8000 Hz, ± 3 dB (rel. 1 kHz)
Sensitivity	74 dB _{SPL} (1 kHz) Note 3
Recommended talk distance	Approx. 20 cm / 7.9 in

Note 3: This is equivalent to a talk distance of approx. 20 cm / 7.9 in.

Loudspeaker	
Frequency response	200 to 8000 Hz, ± 3 dB (rel. 1 kHz)
Max. sound pressure level	93 dB _{SPL} @ 50 cm / 19.7 in listen distance (1 kHz)

Push button specifications	
Colour	Bezel: Black
	Push button: Red
Activation force	4.0 N ± 0.2 N
Size	Bezel: Ø 25 mm / 1.0 in
	Push button: Ø 20 mm / 0.8 in
Switching	Push to make, momentary action

Switch input specifications	
Switch inputs	Normally open (approx. 5 VDC), activated when short circuited (approx. 10 mA)

Technical Data (continued)

Text specifications Note 4

Text type	Printed silk screen
Colour	Black
Font	Helvetica Medium
Text height	5.0 mm / 0.20 in

Note 4: Text in customer language and colour (according to RAL colour codes) on request.

LED indicator specifications (front)

"Ready"

Colour and size	Green Ø 5.0 mm / 0.20 in
Function	Indicates that the unit is operating and ready for use

"Wait/Listen"

Colour and size	Red Ø 5.0 mm / 0.20 in
Function	Indicates that the passenger should wait/listen to the Driver

"Talk"

Colour and size	Green Ø 5.0 mm / 0.20 in
Function	Indicates that the passenger may talk to the Driver

LED indicator specifications (side)

Power

Colour and size	Green Ø 4.0 mm / 0.16 in
Function	Off: No power on the unit
	On: Power on the unit

Temperature

Colour and size	Multi Ø 4.0 mm / 0.16 in
Function	Red: Ambient temperature outside specifications
	Green: Ambient temperature within specifications

Software running

Colour and size	Multi Ø 4.0 mm / 0.16 in
Function	Red: No software
	Flashing yellow: Boot sequence started
	Flashing green: Application running

Ethernet transmission rate

Colour and size	Green Ø 4.0 mm / 0.16 in
Function	Off: 10 Mbit/sec.
	On: 100 Mbit/sec.

Ethernet link/activity

Colour and size	Yellow Ø 4.0 mm / 0.16 in
Function	Off: No link
	On: Link established
	Flashing: Link established and activity

Type Test and Environmental Conditions

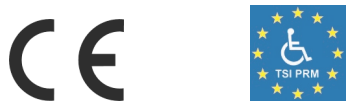
Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	77 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	66 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S1) EN/IEC 61000-4-29	No malfunction	No interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	66 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T3) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	-25°C to +70°C / -13°F to +158°F
		Power-on *	-40°C to +70°C / -40°F to +158°F
		Storage	-40°C to +85°C / -40°F to +185°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	500 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			210 x 130 x 57 mm 8.3 x 5.1 x 2.2 in
Weight			Approx. 0.8 kg / 1.8 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP54 (front)
			IP20 (rest)

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



Product specifications and images are subject to change without prior notice.

Focon Electronic Systems ApS

Denmark



- Compliant with EN 50155 and EN 50121-3-2
- Rugged aluminium design with IP55 protection from the front
- Ethernet interface (IP backbone)
- Powerful/high performance low power 64-bit embedded processor
- Windows XP embedded operating system
- Graphical user interface for the Driver
- 10.4" TFT-LCD with touch screen panel
- 640 x 480 pixels (VGA)
- 262 144 colours
- Brightness control (manual or automatic)

Figure 1: Cab Control Head

Cab Control Head - CCH

Focon item no. 899015

The Cab Control Head is a multifunction touch screen, which acts as the graphical user interface (GUI) between the Driver and the Passenger Information System.

Via the GUI of the Cab Control Head the Driver can carry out e.g. the following functions:

- Initialize a route (or change a route)
- Trigger predefined announcements
- Trigger predefined texts
- Receive/acknowledge visual alarms from activated **FOCON IMAGINE** Passenger Communication Units
- Adjust the volume of the Cab Loudspeaker
- Set the Passenger Information System in test mode
- Make a diagnosis of the Passenger Information System (i.e. get general status of the sub-units, or manage download of system logs)
- Provide maintenance of the Passenger Information System (i.e. manage upload of software updates to the sub-units)
- Optionally select addressable PA (coach, zone, internal, external left or external right)
- Optionally monitor real-time video from CCTV surveillance cameras

The Cab Control Head is connected to the train IP backbone (Ethernet switch) via the Ethernet connector.

During normal operation the general status of the Cab Control Head is health-monitored by the **FOCON IMAGINE** PIS System Controller, which is the main controlling unit on the IP backbone.

In addition to the Driver, authorized service personnel can also use the Cab Control Head to make diagnoses or provide maintenance of the Passenger Information System, i.e. manage download of system logs or manage upload of software updates.

Depending on the ambient light in the cab, the brightness of the Cab Control Head can be adjusted (manually or automatic) to a suitable level.

Interfaces

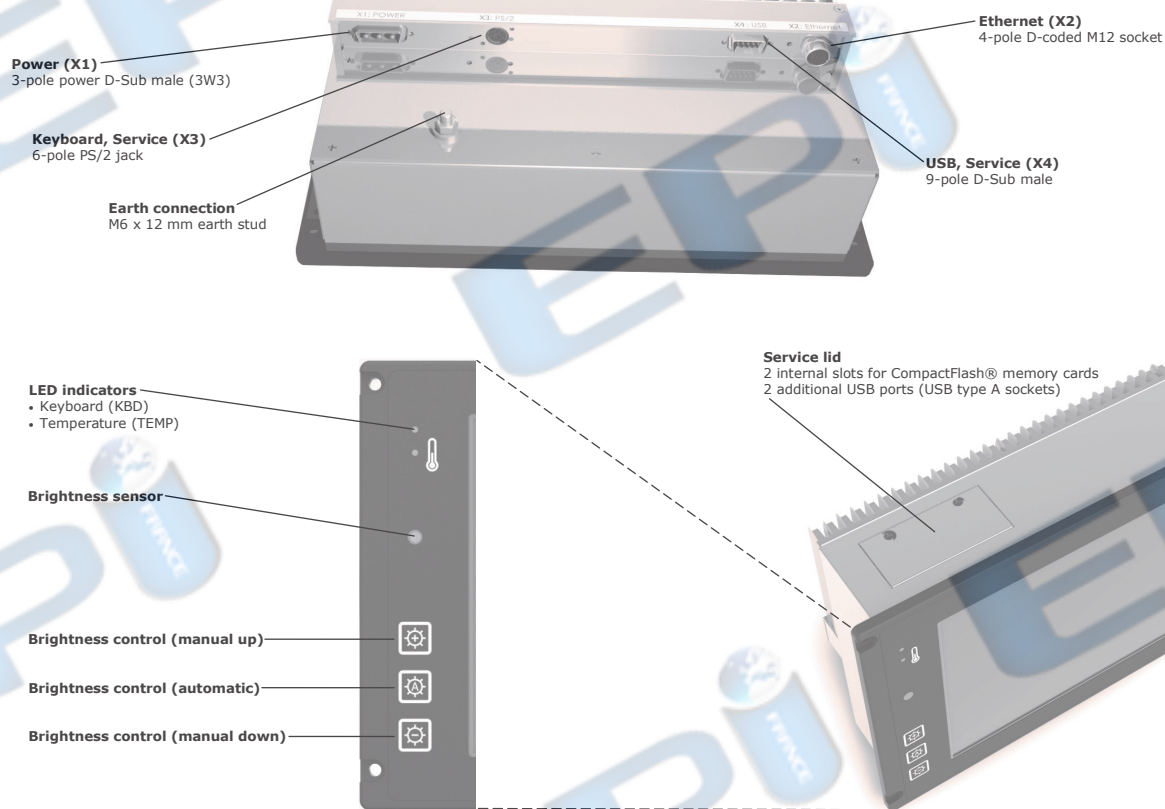


Figure 2: Interfaces of the Cab Control Head

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2

General specifications	
Cabinet material	Aluminium (front plate and heat sink), High-grade steel (rest of cabinet)
Cabinet surface coating	Surface treatment: Black anodised (front plate), Aludyne (heat sink), Matt pickled (rest of cabinet)
	No paint
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement)
	Flush mounted in a Driver's desk or similar
Cooling	Convection
Preventive maintenance	LED backlight: Replace after approx. 70 000 operating hours @ +25°C / +77°F Replace after approx. 60 000 operating hours @ +70°C / +158°F

Technical Data (continued)

Power port

Nominal supply voltage	24 to 110 VDC
Power consumption	Idle: 17.0 W
	Typ.: 19.0 W
	Max.: 45.0 W (heating mode)
Inrush current @ 24 VDC	Max. 27.0 A (relaxed to nominal current in 14 µs)
Inrush current @ 110 VDC	Max. 75.0 A (relaxed to nominal current in 2 µs)
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Ethernet port

Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

Processor and memory specifications

Processor	VIA Eden™ @ 500 MHz
Video controller	MPEG-2 hardware accelerator
Working memory	512 MB DDR2 SDRAM
Mass storage	2 internal slots for CompactFlash® memory cards (≥ 1 GB each)

USB connection

Electrical specification	USB 2.0 (Universal Serial Bus Specification Revision 2.0)
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Display specifications

Display type	Active matrix TFT-LCD (Thin Film Transistor Liquid Crystal Display), low-reflective
Viewable image size (Horizontal x Vertical)	213.2 x 160.4 mm / 8.39 x 6.31 in (10.4" diagonal)
Resolution (Horizontal x Vertical)	640 x 480 pixels (VGA)
Colours	262 144 (18 bit)
Viewing angle	Horizontal: Typ. ± 80°
	Vertical: Typ. ± 80°
Luminance	Typ. 300 cd/m ² (digital brightness control 1% to 100%)
Contrast ratio	Typ. 900:1
Backlight type	LED backlight

Technical Data (continued)

Touch screen specifications

Touch screen panel type	Analogue resistive
Touch screen material	Laminated by glass to ITO (Indium Tin Oxide) film and ITO glass
	1.1 mm / 0.043 in chemically strengthened glass
	0.2 mm / 0.008 in top glass with hard coat surface GFG (Glass-Film-Glass)

Front foil specifications

Front foil	Colour: RAL 9005 (black)
	3 hard keys for brightness control (up, down, automatic)
	2 LED indicators (keyboard, temperature)
	1 brightness sensor situated behind glass

LED indicator specifications

Keyboard (KBD)

Colour and size	Green Ø 3.0 mm / 0.12 in
Function	Flashing green:
	Each time a hard key is pressed
	During power-up of the unit
	When the backlight of the display is switched off

Temperature (TEMP)

Colour and size	Yellow Ø 3.0 mm / 0.12 in
Function	Flashing yellow:
	The unit is being operated outside of the allowed operating temperature range (Decisive for this is the temperature inside the unit)

Type Test and Environmental Conditions

Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	16.8 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	14.4 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S2) EN/IEC 61000-4-29	No malfunction	10 ms interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	14.4 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T2) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	–40°C to +60°C / –40°F to +140°F
		Power-on *	–40°C to +70°C / –40°F to +158°F
		Storage	–40°C to +80°C / –40°F to +176°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	100 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			214 x 310 x 99 mm (incl. front) 8.4 x 12.2 x 3.9 in (incl. front)
Weight			Approx. 4.3 kg / 9.5 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP55 (front)
			IP40 (rest)

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



Product specifications and images are subject to change without prior notice.

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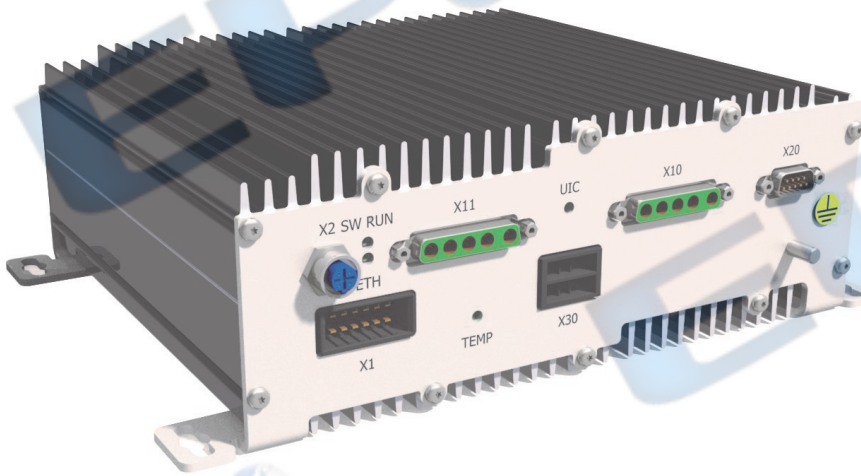


Figure 1: IP PA Amplifier

- Compliant with EN 50155 and EN 50121-3-2
- Rugged aluminium profile
- Ethernet interface (IP backbone)
- Class D amplifier
- Four individual loudspeaker channels of up to 25 W per channel
- 28 V_{RMS} loudspeaker system
- Up to 14 internal loudspeakers or up to 8 external loudspeakers per channel
- Fall-back PA over UIC 568

IP PA Amplifier - IPA

Focon item no. 899018

The IP PA Amplifier is a remote Class D loudspeaker amplifier unit with a connection to the 28 V_{RMS} loudspeaker system which is part of the Passenger Information System.

The IP PA Amplifier is connected to the train IP backbone (Ethernet switch) via the Ethernet connector.

During normal operation the general status of the IP PA Amplifier is health-monitored by the **FOCON IMAGINE** PIS System Controller, which is the main controlling unit on the IP backbone.

To handle fall-back public address (PA) in case of breakdown of the IP backbone, software malfunction etc., the IP PA Amplifier has an interface to the UIC 568 PA backbone (analogue train lines).

In addition, two digital hardware inputs and one digital hardware output are reserved and can be used for general purpose I/O.

The IP PA Amplifier features four loudspeaker channels and supports e.g. one of the following loudspeaker configurations:

- Four channels of internal loudspeakers crossing between coaches, i.e. two channels wired in the local coach and two channels wired in the adjacent coach.
- Alternatively, two channels of external loudspeakers, i.e. one channel wired in the left side of the train and one channel wired in the right side of the train, and two channels of internal loudspeakers crossing between coaches, i.e. one channel wired in the local coach and one channel wired in the adjacent coach.

Attention: Crossing of internal loudspeaker wires ensures that at least 50% of the loudspeakers in a coach will still work in case of a failure in one IP PA Amplifier, and public address (PA) announcements can still be heard.

Each loudspeaker channel can be individually controlled (e.g. enabled/disabled, muted or volume adjusted) and different audio can be put on each channel.

Depending on which loudspeaker configuration is requested in the train, one or more IP PA Amplifiers can be placed in each coach to fulfil the loudspeaker wiring.

Interfaces

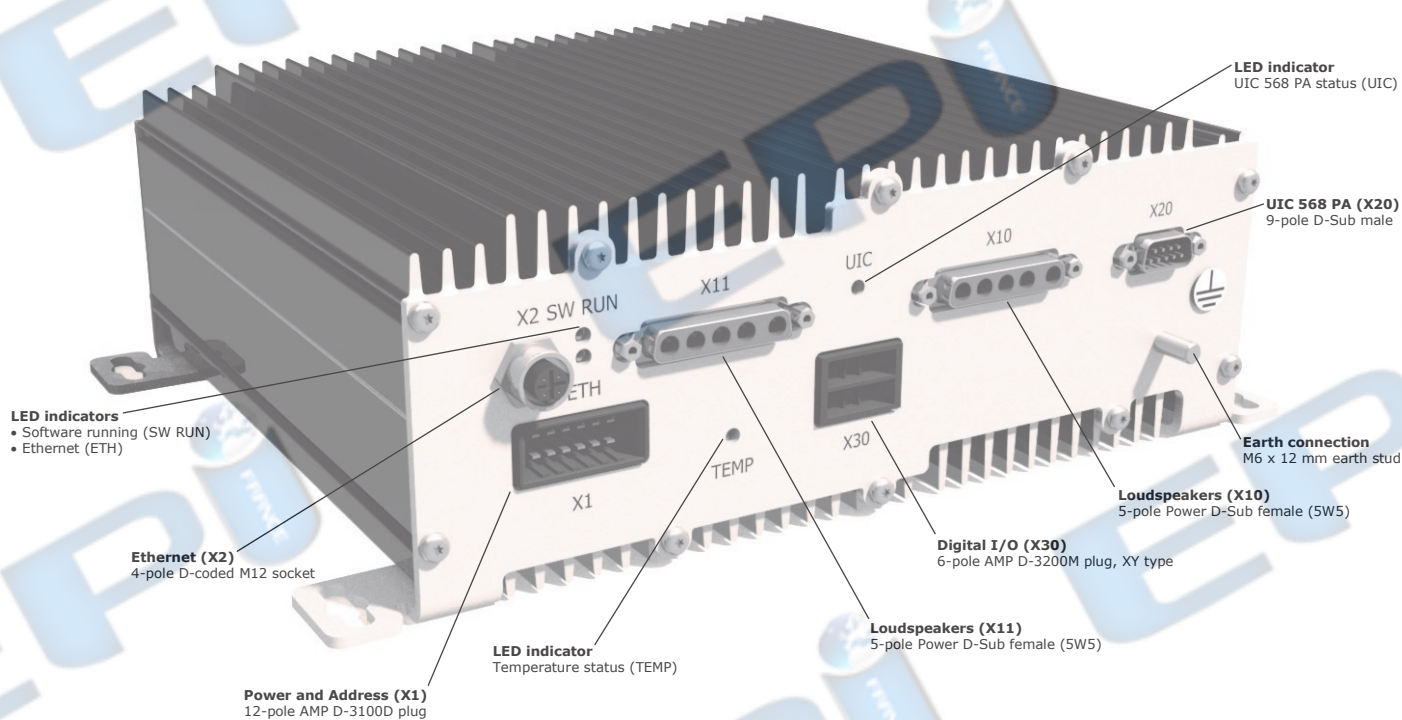


Figure 2: Interfaces of the IP PA Amplifier

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2

General specifications	
Cabinet material	Aluminium
Cabinet surface coating	Surface treatment: SurTec® 650 chromitAL® TCP Paint (profile): Black anodized No paint on front and back cover
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement) Wall mounted or flat surface mounted
Cooling	Convection
Preventive maintenance	None

Technical Data (continued)

Power port	
Nominal supply voltage	110 VDC Note 1
Power consumption	Idle: 15 W
	Typ.: 78 W
	Max.: 140 W
Inrush current @ 77 VDC	$\int I^2 dt = 0.370 \text{ A}^2\text{s}$
	$I_{\text{peak}} = \text{approx. } 20 \text{ A (current > 50\% of } I_{\text{peak}} \text{ for 1.3 ms)}$
Inrush current @ 110 VDC	$\int I^2 dt = 0.730 \text{ A}^2\text{s}$
	$I_{\text{peak}} = \text{approx. } 28 \text{ A (current > 50\% of } I_{\text{peak}} \text{ for 1.3 ms)}$
Inrush current @ 137.5 VDC	$\int I^2 dt = 1.140 \text{ A}^2\text{s}$
	$I_{\text{peak}} = \text{approx. } 35 \text{ A (current > 50\% of } I_{\text{peak}} \text{ for 1.3 ms)}$
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Note 1: Other supply voltages on request.

Ethernet port	
Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

UIC 568 PA interface	
Standard technical characteristics	UIC Code 568 OR
Cable specifications	UIC Code 558 OR
	Conductor pairs: 1/2 (PA audio) + 5/6 (PA enable) + 7/8 (PA priority)

Loudspeaker amplifier output	
Amplifier type	Class D technology
Frequency response	200 to 8000 Hz, ± 3 dB (rel. 1 kHz)
Max. signal level (per channel)	28 V _{RMS} @ 1 kHz
Impedance (per channel)	≥ 32 Ω load
Max. power (per channel)	25 W @ 32 Ω load
Number of internal loudspeakers (per channel) Note 2	Max. 14 pcs. of 448 Ω type (Focon item no. 030373) Note 3 Max. 3 pcs. of 112 Ω type (Focon item no. 030383)
Number of external loudspeakers (per channel) Note 2	Max. 8 pcs. of 256 Ω type (Focon item no. 030418) Max. 4 pcs. of 128 Ω type (Focon item no. 030384)
Short circuit protection	Between positive and negative terminal
	Between positive/negative terminal and chassis earth

Note 2: In order to calculate the number of loudspeakers the following design guide must be used:

- Max. 25 W per channel
- Min. 2 W per loudspeaker @ 28 V_{RMS} output
- Impedance range (for the complete loudspeaker channel): 32 Ω to 448 Ω

Note 3: The 448 Ω type of loudspeaker only supports 1.75 W per loudspeaker @ 28 V_{RMS} output.

Technical Data (continued)

Digital input/output specifications	
Digital inputs	Opto-coupler isolated, activated when 110 VDC (77 to 137.5 VDC) is applied
Digital output	Normally open relay (external applied voltage will be switched via relay)
	Max. switching voltage/current: 110 VDC/100 mA

LED indicator specifications

"SW RUN" (Software running)

Colour and size	Multi Ø 3.0 mm / 0.12 in	
Function	Red:	No software
	Flashing yellow:	Boot sequence started
	Flashing green:	Application running

"ETH" (Ethernet)

Colour and size	Multi Ø 3.0 mm / 0.12 in	
Function	Off:	No link
	Yellow:	Link established at 10 Mbit/sec.
	Flashing yellow:	Traffic at 10 Mbit/sec.
	Green:	Link established at 100 Mbit/sec.
	Flashing green:	Traffic at 100 Mbit/sec.

"UIC" (UIC 568 PA)

Colour and size	Multi Ø 3.0 mm / 0.12 in	
Function	Off:	Normal mode
	Red:	Fall-back mode
	Yellow:	Fall-back mode and active PA_EN (PA enable) or PA_PR (PA priority)
	Green:	Active PA_EN (PA enable) or PA_PR (PA priority)

"TEMP" (Temperature)

Colour and size	Multi Ø 3.0 mm / 0.12 in	
Function	Red:	Ambient temperature outside specifications
	Green:	Ambient temperature within specifications

Type Test and Environmental Conditions

Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	77 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	66 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S1) EN/IEC 61000-4-29	No malfunction	No interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	66 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T3) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	-25°C to +70°C / -13°F to +158°F
		Power-on *	-40°C to +70°C / -40°F to +158°F
		Storage	-40°C to +85°C / -40°F to +185°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	200 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			92 x 290 x 231 mm 3.6 x 11.4 x 9.1 in
Weight			Approx. 3.7 kg / 8.2 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP20

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



Product specifications and images are subject to change without prior notice.

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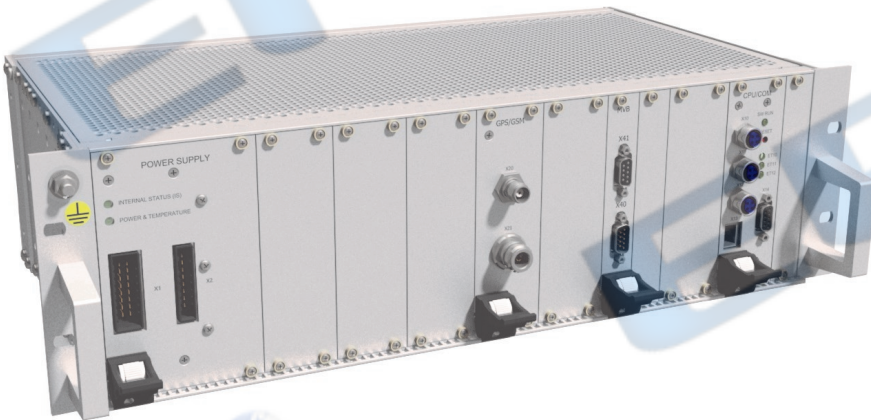


Figure 1: PIS System Controller

- Compliant with EN 50155 and EN 50121-3-2
- Standard 19 inch aluminium rack
- Ethernet interface (IP backbone)
- Powerful/high performance low power 32-bit embedded processor
- Royalty free embedded Linux operating system
- No forced cooling
- Two digital inputs and two digital outputs
- RS-485/RS-422 serial interface
- Single point service interface for the complete Passenger Information System
- Reserved slots for expansion modules

PIS System Controller - PSC

Focon item no. 899021

The PIS System Controller is the central unit of the Passenger Information System. It monitors and controls all peripheral units in the system connected to the train IP backbone.

The PIS System Controller is connected to the train IP backbone (Ethernet switch) via the Ethernet connectors.

The PIS System Controller design is modular, and it consists of a standard 19 inch rack (3U height) with two indispensable insert modules, a **power supply module** and a **processor module**.

The power supply module and the processor module are placed vertically to allow a good natural air flow, and each module consists of an EMC compliant front plate and a handle for easy replacement of the module. Both modules are connected to a CompactPCI backplane, and between these two modules a number of slots are reserved for CompactPCI expansion modules (e.g. future digital I/O, GPS, MVB etc.).

The PIS System Controller is designed for mounting in a 19 inch rack cabinet in the train and has two handles for easy mounting or dismounting and four holes for fastening to the rack cabinet.

All external connectors and the earth stud are accessible from the front of the PIS System Controller.

In addition to the main function of monitoring and controlling peripheral units the PIS System Controller can also support e.g. the following functions:

- Storing and playing back pre-recorded Digital Voice Announcement (DVA) messages.
- Receiving digital hardware inputs from the train, interpreting and acting on the basis of these signals.
- Sending digital hardware outputs to the train.
- Uploading of software updates for the PIS System Controller and peripheral units, and system files (e.g. DVA files) from a service PC via the service interface.
- Downloading of system logs from the PIS System Controller and peripheral units to a service PC via the service interface.

The PIS System Controller is built on many years of experience in the railway industry. It has processor capacity sufficient for the next generations of passenger information systems. The modular design of the PIS System Controller makes it very easy to configure to fit customer requests.

Interfaces

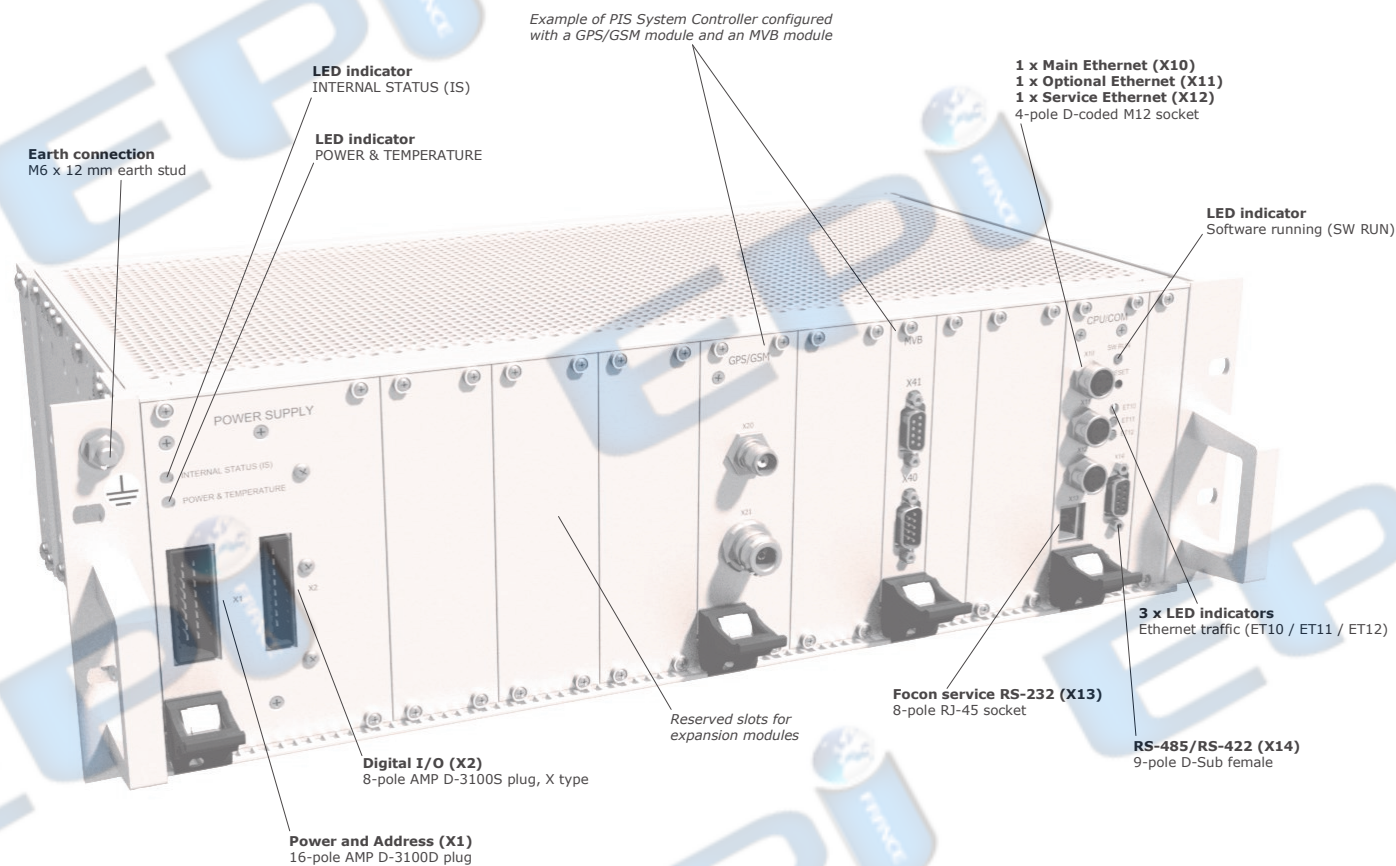


Figure 2: Interfaces of the PIS System Controller

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2 Note 1
Note 1: This is fulfilled when the PIS System Controller is mounted in a fire resistant rack cabinet.	
General specifications	
Cabinet material	Aluminium
Cabinet surface coating	Surface treatment: Anodised (front), Clear chromated (rear)
	No paint
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement)
	Mounted in a 19 inch rack cabinet
Cooling	Convection
Preventive maintenance	None

Technical Data (continued)

Power port	
Nominal supply voltage	110 VDC Note 2
Power consumption	Idle: 15.5 W
	Typ.: 15.5 W
	Max.: 35.5 W
Inrush current @ 77 VDC	$\int I^2 dt = 2.150 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 55 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 1.0 ms)}$
Inrush current @ 110 VDC	$\int I^2 dt = 4.110 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 76 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 1.0 ms)}$
Inrush current @ 137.5 VDC	$\int I^2 dt = 6.710 \text{ A}^2\text{s}$
	$I_{\text{Peak}} = \text{approx. } 93 \text{ A (current > 50\% of } I_{\text{Peak}} \text{ for 1.1 ms)}$
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Note 2: Other supply voltages on request.

Ethernet port	
Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

Processor and memory specifications	
Processor	PowerQUICC™ II Pro @ 400 MHz
Working memory	128 MB DDR2 SDRAM
Additional memory	32 MB Flash memory (for Linux kernel)
	256 kB NVRAM (for system log etc.)
Mass storage	Internal slot for CompactFlash® memory card (≥ 1 GB)

Digital input/output specifications	
Digital inputs	Opto-coupler isolated, activated when 110 VDC (77 to 137.5 VDC) is applied
Digital outputs	Normally open relay (external applied voltage will be switched via relay)
	Max. switching voltage/current: 110 VDC/100 mA

RS-485/RS-422 port	
Electrical specification	TIA/EIA-485 and TIA/EIA-422
Transmission format	RS-485 or RS-422
Transmission rate	Configurable (max. 115 200 baud)
Serial format	Half-duplex (RS-485) or Full-duplex (RS-422)
Cable	Shielded twisted-pair
Characteristic cable impedance	80 to 120 Ω (120 Ω preferred)

Technical Data (continued)

LED indicator specifications		
"INTERNAL STATUS (IS)"		
Colour and size		Multi Ø 3.5 mm / 0.14 in
Function	Red (Power up or Error):	Power supply module un-initialized or internal voltages outside specifications
	Green (Ok):	Power supply module initialized and internal voltages within specifications
"POWER & TEMPERATURE"		
Colour and size		Multi Ø 3.5 mm / 0.14 in
Function	Red (Power up or Error):	Input voltage too low or ambient temperature outside specifications
	Green (Ok):	Input voltage and ambient temperature within specifications
"SW RUN" (Software running)		
Colour and size		Multi Ø 3.5 mm / 0.14 in
Function	Red (Power up or Error):	Processor module un-initialized or internal hardware error
	Flashing yellow:	Boot sequence started
	Flashing green (Ok):	Application running
"ET10" / "ET11" / "ET12" (Ethernet Traffic X10 / X11 / X12)		
Colour and size		Multi Ø 3.5 mm / 0.14 in
Function	Off:	No link
	Yellow:	Link established at 10 Mbit/sec.
	Flashing yellow:	Traffic at 10 Mbit/sec.
	Green:	Link established at 100 Mbit/sec.
	Flashing green:	Traffic at 100 Mbit/sec.

Examples of optional modules

GPS aerial connection	
Antenna connector	50 Ω TNC female
GSM aerial connection	
Antenna connector	50 Ω N female
MVB interface	
Electrical specification	Depending on customer specifications

Type Test and Environmental Conditions

Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	77 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	66 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S2) EN/IEC 61000-4-29	No malfunction	10 ms interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	66 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T1) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	-25°C to +55°C / -13°F to +131°F
		Power-on *	-40°C to +70°C / -40°F to +158°F
		Storage	-40°C to +85°C / -40°F to +185°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	150 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			133 x 483 x 285 mm 5.2 x 19.0 x 11.2 in
Weight			Approx. 5.2 kg / 11.5 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP20

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



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The image is only illustrative.



Figure 1a: External Front Display

- Compliant with EN 50155 and EN 50121-3-2
- Rugged aluminium profile
- Ethernet interface (IP backbone)
- Graphic LED display
- 32 x 264 dots
- Yellow text on dark background
- Unicode fonts in any language
- 4 mm dark front polycarbonate
- Stationary, flashing or scrolling text

External Front Display (32 x 264 @ 5.7 x 4.7)

Focon item no. 899057

The External Front Display is a graphic LED display in the Passenger Information System, which provides visual information to passengers outside the train (e.g. final destination and routing of the train).

The External Front Display consists of a graphic matrix of 32 x 264 dots with yellow LED's, which provides 1 line of approx. 15 characters (depending on font) or 2 lines of approx. 29 characters (depending on font). The display text appears as yellow on a dark background giving the optimal contrast.

The graphic matrix of the External Front Display can be divided into separate fields, and command sequences can be executed for each field.

The External Front Display is connected to the train IP backbone (Ethernet switch) via the Ethernet connector.

During normal operation the general status of the External Front Display is health-monitored by the **FOCON IMAGINE** PIS System Controller, which is the main controlling unit on the IP backbone.

The External Front Display has a built-in LED diagnostics function that reports if an LED has failed (open or short).

An ambient light sensor monitors and gradually adjusts the External Front Display light intensity accordingly for optimal reading.

A temperature sensor monitors the internal temperature of the External Front Display. To ensure a long lifetime of the External Front Display and to prevent it from overheating, the light intensity is gradually lowered before the internal temperature reaches the operating temperature limits of the components.

The following text example of the External Front Display shows a Focon developed standard font for LED displays:



Figure 1b: Text example of the External Front Display

Interfaces

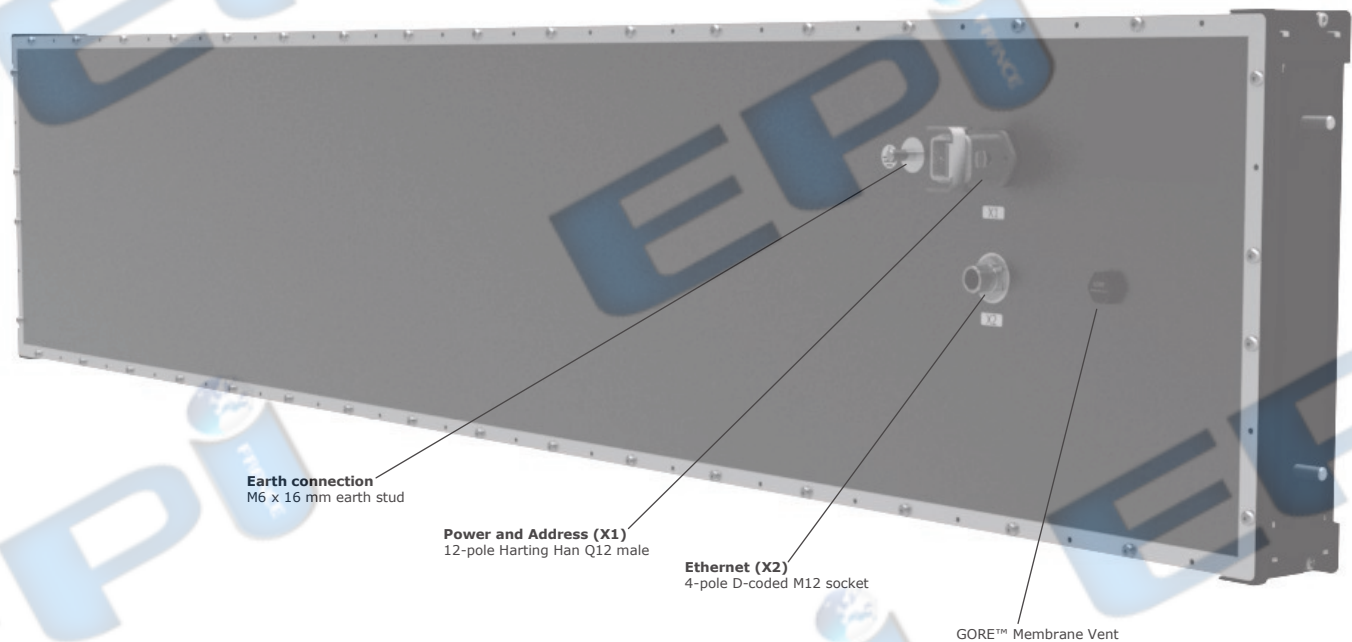


Figure 2: Interfaces of the External Front Display

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2

General specifications	
Cabinet material	Aluminium
Cabinet surface coating	Surface treatment: SurTec® 650 chromitAL® TCP
	Paint: Black anodized
	Gloss: None
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement)
	Mounted in exterior coach wall, ceiling/roof or similar
Cooling	Convection
Preventive maintenance	None

Technical Data (continued)

Power port	
Nominal supply voltage	110 VDC Note
Power consumption	Idle: 8 W @ 0% LED's on
	Typ.: 40 W @ 33% LED's on
	Max.: 55 W @ 50% LED's on
Inrush current @ 77 VDC	$\int I^2 dt = 0.14 A^2s$
	$I_{peak} = \text{approx. } 16 A \text{ (current } > 50\% \text{ of } I_{peak} \text{ for } 750 \mu s)$
Inrush current @ 110 VDC	$\int I^2 dt = 0.28 A^2s$
	$I_{peak} = \text{approx. } 23 A \text{ (current } > 50\% \text{ of } I_{peak} \text{ for } 750 \mu s)$
Inrush current @ 137.5 VDC	$\int I^2 dt = 0.45 A^2s$
	$I_{peak} = \text{approx. } 29 A \text{ (current } > 50\% \text{ of } I_{peak} \text{ for } 750 \mu s)$
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Note: Other supply voltages on request.

Ethernet port	
Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

Additional specifications	
Front polycarbonate	Material: PSC Lexan® F2000 (dark)
	Thickness: 4 mm / 0.16 in
	Obscuration band: Black silk screen

Technical Data (continued)

Display specifications	
Display type	Graphic LED display
Resolution/graphic matrix (H x L)	32 x 264 dots
Pixel size (visible dot area diameter)	2.4 mm / 0.09 in
Pixel pitch (H x L)	5.7 x 4.7 mm / 0.22 x 0.19 in
Active viewing area	179.1 x 1238.5 mm / 7.05 x 48.76 in (incl. pixel)
Number of characters	Two lines of 29 characters with FOCON DOT16 font One line of 15 characters with FOCON DOT32 font Otherwise depending on font (ask Focon for further advice)
Character height	70.8 mm / 2.79 in with FOCON DOT16 font 144.9 mm / 5.70 in with FOCON DOT32 font Otherwise depending on font (ask Focon for further advice)
Text format (font)	Unicode (in any language)
Text colour	LED: Yellow/amber (wavelength ~590 nm)
	Background: Dark
Viewing angle	Horizontal: ± 60°
	Vertical: ± 60°
Readable distance (directly from front)	1 to 30 m with two lines of display text 3.3 to 98.4 ft with two lines of display text
	1 to 60 m with one line of display text 3.3 to 196.9 ft with one line of display text
Intensity (with dark front polycarbonate)	Dot: Typ. ~53 mcd/dot @ +25°C / +77°F
	Display: Typ. ~2000 cd/m ² @ +25°C / +77°F
Visual effects	Stationary, flashing or scrolling text
Error criteria (after use)	> 84 dots defect (1%)
	2 neighbour dots are defect

Type Test and Environmental Conditions

Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	77 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	66 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S1) EN/IEC 61000-4-29	No malfunction	No interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	66 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T3) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	-25°C to +70°C / -13°F to +158°F
		Power-on *	-40°C to +70°C / -40°F to +158°F
		Storage	-40°C to +85°C / -40°F to +185°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	500 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			263 x 1322 x 60 mm 10.4 x 52.0 x 2.4 in
Weight			Approx. 8.6 kg / 19.0 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP64

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



Product specifications and images are subject to change without prior notice.

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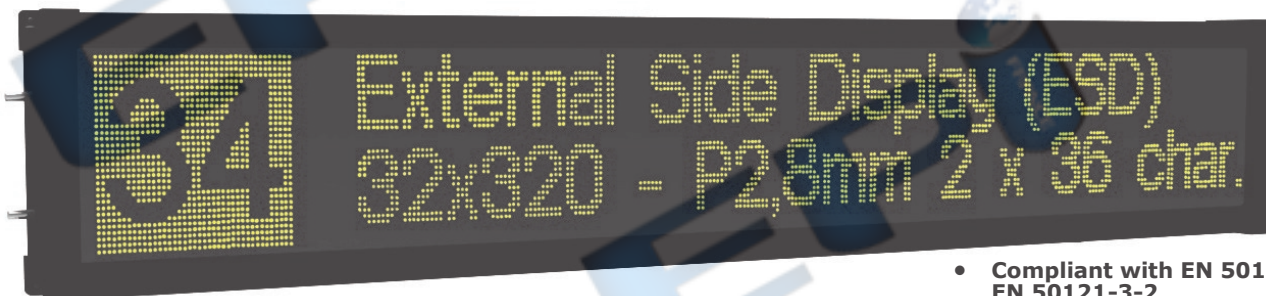


Figure 1a: LED Display

- Compliant with EN 50155 and EN 50121-3-2
- Rugged aluminium profile
- Ethernet interface (IP backbone)
- Graphic LED display
- 32 x 320 dots
- Yellow text on dark background
- Unicode fonts in any language
- 4 mm dark front polycarbonate
- Stationary, flashing or scrolling text

LED Display (32 x 320 @ 2.8)

Focon item no. 899072

The graphic LED Display is part of the Passenger Information System, and provides visual information to passengers inside or outside the train (e.g. next station, final destination and routing of the train).

The LED Display consists of a graphic matrix of 32 x 320 dots with yellow LED's, which provides 1 line of approx. 18 characters (depending on font) or 2 lines of approx. 36 characters each (depending on font). The display text appears as yellow on a dark background giving the optimal contrast.

The graphic matrix of the LED Display can be divided into separate fields, and command sequences can be executed for each field.

The LED Display is connected to the train IP backbone (Ethernet switch) via the Ethernet connector.

During normal operation the general status of the LED Display is health-monitored by the **FOCON IMAGINE** PIS System Controller, which is the main controlling unit on the IP backbone.

The LED Display has a built-in LED diagnostics function that reports if an LED has failed (open or short).

An ambient light sensor monitors and gradually adjusts the LED Display light intensity accordingly for optimal reading.

A temperature sensor monitors the internal temperature of the LED Display. To ensure a long lifetime of the LED Display and to prevent it from overheating, the light intensity is gradually lowered before the internal temperature reaches the operating temperature limits of the components.

The following text example shows a Focon developed standard font for LED displays:



Figure 1b: Text example of the LED Display

Interfaces

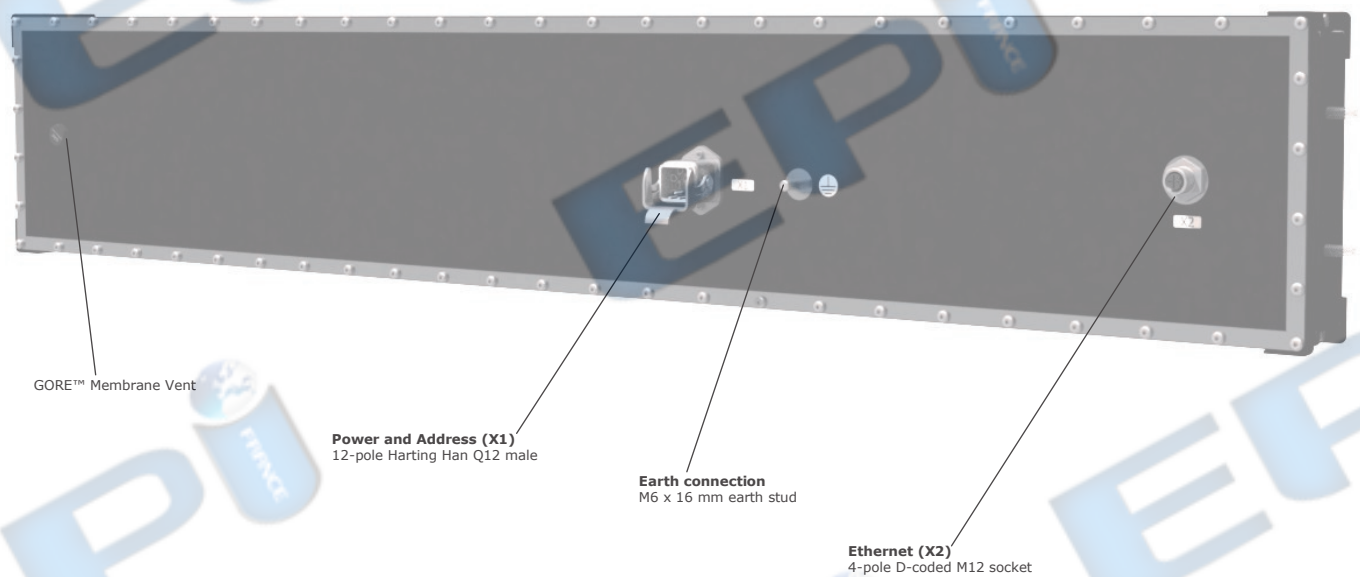


Figure 2: Interfaces of the LED Display

Technical Data

Standards and norms	
Overall railway standard	EN 50155
Railway EMC standard	EN 50121-3-2
Fire safety	EN 45545, Hazard Level 2
General specifications	
Cabinet material	Aluminium
Cabinet surface coating	Surface treatment: SurTec® 650 chromitAL® TCP
	Paint: Black anodized
	Gloss: None
PCB protective coating	Yes
Mounting	Cubicle placed (ambient type of placement)
	Mounted in interior coach wall, exterior coach wall, ceiling/roof or similar
Cooling	Convection
Preventive maintenance	None

Technical Data (continued)

Power port	
Nominal supply voltage	110 VDC Note
Power consumption	Idle: 10 W @ 0% LED's on
	Typ.: 36 W @ 33% LED's on
	Max.: 53 W @ 50% LED's on
Inrush current @ 77 VDC	$\int I^2 dt = 0.14 A^2s$
	$I_{Peak} = \text{approx. } 16 A \text{ (current > 50\% of } I_{Peak} \text{ for } 750 \mu s)$
Inrush current @ 110 VDC	$\int I^2 dt = 0.28 A^2s$
	$I_{Peak} = \text{approx. } 23 A \text{ (current > 50\% of } I_{Peak} \text{ for } 750 \mu s)$
Inrush current @ 137.5 VDC	$\int I^2 dt = 0.45 A^2s$
	$I_{Peak} = \text{approx. } 29 A \text{ (current > 50\% of } I_{Peak} \text{ for } 750 \mu s)$
Polarity	Reverse polarity protected
Dielectric strength (to chassis earth)	1414 VDC
Insulation resistance (to chassis earth)	> 50 MΩ

Note: Other supply voltages on request.

Ethernet port	
Electrical specification	IEEE Std 802.3
Transmission format	Ethernet 100BASE-TX
Transmission rate	10 Mbit/s or 100 Mbit/s
Cable	Shielded twisted-pair (Category 5e or better)
Characteristic cable impedance	100 Ω
Dielectric strength (to chassis earth)	707 VDC
Insulation resistance (to chassis earth)	> 20 MΩ

Additional specifications	
Front polycarbonate	Material: PSC Lexan® F2000 (dark)
	Thickness: 4 mm / 0.16 in
	Obscuration band: Black silk screen

Technical Data (continued)

Display specifications	
Display type	Graphic LED display
Resolution/graphic matrix (H x L)	32 x 320 dots
Pixel size (visible dot area, H x W)	1.6 x 0.8 mm / 0.06 x 0.03 in
Pixel pitch (H x L)	2.8 x 2.8 mm / 0.11 x 0.11 in
Active viewing area	88.4 x 894.0 mm / 3.48 x 35.20 in (incl. pixel)
Number of characters	Two lines of 36 characters each with FOCON DOT16 font One line of 18 characters with FOCON DOT32 font Otherwise depending on font (ask Focon for further advice)
Character height	35.2 mm / 1.39 in with FOCON DOT16 font 71.6 mm / 2.82 in with FOCON DOT32 font Otherwise depending on font (ask Focon for further advice)
Text format (font)	Unicode (in any language)
Text colour	LED: Yellow/amber (wavelength ~590 nm)
	Background: Dark
Viewing angle	Horizontal: ± 60°
	Vertical: ± 60°
Readable distance (directly from front)	1 to 15 m with two lines of display text 3.3 to 49.2 ft with two lines of display text
	1 to 30 m with one line of display text 3.3 to 98.4 ft with one line of display text
Intensity (with dark front polycarbonate)	Dot: Typ. ~6.0 mcd/dot @ +25°C / +77°F
	Display: Typ. ~800 cd/m² @ +25°C / +77°F
Visual effects	Stationary, flashing or scrolling text
Error criteria (after use)	> 102 dots defect (1%)
	2 neighbour dots are defect

Type Test and Environmental Conditions

Phenomena	Test	Description	Test levels
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2	Enclosure contact	± 6 kV (criteria B)
		Enclosure air	± 8 kV (criteria B)
RF field	EN/IEC 61000-4-3	Enclosure	20 V/m 80% AM (1 kHz) 80 - 1000 MHz (criteria A)
			10 V/m 80% AM (1 kHz) 1400 - 2100 MHz (criteria A)
			5 V/m 80% AM (1 kHz) 2100 - 2500 MHz (criteria A)
Fast transient (burst)	EN/IEC 61000-4-4	Power port	± 2 kV (criteria A)
		Signal ports	± 2 kV (criteria A)
Surge	EN/IEC 61000-4-5	Power port	± 2 kV line to earth (criteria B)
			± 1 kV line to line (criteria B)
RF conducted	EN/IEC 61000-4-6	Power port	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
		Signal ports	10 V _{RMS} 80% AM (1 kHz) 0.15 - 80 MHz (criteria A)
Radiated emission	EN 55011	Enclosure	40 dBμV/m QP (10 m / 32.8 ft) 50 dBμV/m QP (3 m / 9.8 ft) 30 - 230 MHz
			47 dBμV/m QP (10 m / 32.8 ft) 57 dBμV/m QP (3 m / 9.8 ft) 230 - 1000 MHz
Conducted emission	EN 55011	Power port	99 dBμV QP 0.15 - 0.50 MHz
			93 dBμV QP 0.50 - 30 MHz
Dielectric strength (to chassis earth)	EN 50155	Power port	1414 VDC (1 min)
		Ethernet port and other galvanic isolated ports	707 VDC (1 min)
Supply voltage range	EN 50155	Full function	77 to 137.5 VDC
Supply voltage variation	EN 50155 EN/IEC 61000-4-29	No malfunction	66 to 154 VDC (100 ms)
Supply overvoltage	EN 50155 EN/IEC 61000-4-29	No malfunction	137.5 to 154 VDC (1 s)
Supply voltage interruption	EN 50155 (Class S1) EN/IEC 61000-4-29	No malfunction	No interruption
Supply voltage change over	EN 50155 (Class C1) EN/IEC 61000-4-29	No malfunction	66 VDC (100 ms)

Type Test and Environmental Conditions (continued)

Phenomena	Test	Description	Test levels
Temperature	EN 50155 (Class T3) EN/IEC 60068-2-1 EN/IEC 60068-2-2	Operating	-25°C to +70°C / -13°F to +158°F
		Power-on *	-40°C to +70°C / -40°F to +158°F
		Storage	-40°C to +85°C / -40°F to +185°F
Humidity		Operating or storage	Yearly average ≤ 75% RH 30 consecutive days/year 95% RH
Altitude		Operating	2000 m / 6562 ft
Reliability prediction (MTBF)		Operating	500 000 hours
Vibration, random simulated long life	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 5.72 m/s ² / 18.77 ft/s ² Transverse: 5.72 m/s ² / 18.77 ft/s ² Longitudinal: 5.72 m/s ² / 18.77 ft/s ² 3 x 5 hours
Vibration, random functional	EN/IEC 61373 Category 1 Class B	Operating	Vertical: 1.0 m/s ² / 3.28 ft/s ² Transverse: 1.0 m/s ² / 3.28 ft/s ² Longitudinal: 1.0 m/s ² / 3.28 ft/s ² 3 x 10 minutes
Shock, half sine pulses	EN/IEC 61373 Category 1 Class B	Not operating	Vertical: 50 m/s ² / 164 ft/s ² Transverse: 50 m/s ² / 164 ft/s ² Longitudinal: 50 m/s ² / 164 ft/s ² 30 ms, 3 x 6 shocks
Dimension (H x W x D)			173 x 977 x 60 mm 6.8 x 38.5 x 2.4 in
Weight			Approx. 5.0 kg / 11.0 lbs
Degree of protection	EN/IEC 60529	Enclosure	IP64

* Temperature range where supply voltage may be applied without causing irreversible damage.

Certifications



Product specifications and images are subject to change without prior notice.

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Figure 1: Unmanaged EN 50155 Switch

Compact basic rail-approved Ethernet solution

- Fully EN50155 compliant
- Single model 24 – 110 VDC power range
- 12 100 Mbit/s Ethernet ports

Externally tested and verified to EN50155

- Surge resistance and isolation
- Magnetic field immunity & conducted emission
- Shock and vibration

Designed for long life and extreme operational environments

- IP65 anti-condensation Gore-Tex® membrane
- Ambient temperature -40°C (-40°F) to $+70^{\circ}\text{C}$ ($+158^{\circ}\text{F}$)
- Integrated M12 threading & high MTBF

Design and production testing to match requirements for train control

- Post production testing exceeding EN 50155 mandatory requirement
- Burn in and isolation test on all units
- Manufactured according to IPC-A-610D class2

Unmanaged Ethernet switch, 12 port

Focon item no. 094489

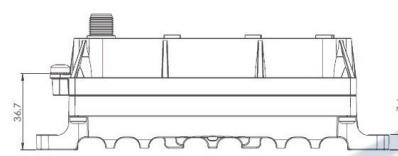
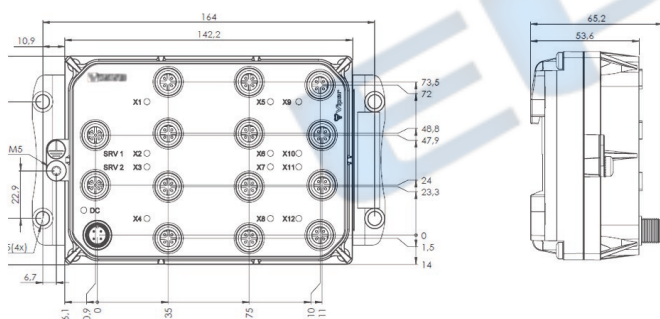
The switch is a basic unmanaged 12 port switch designed to meet the full requirements of the rail vehicle market. The incredibly compact and robust housing ensures the unit can be built into tight and environmentally hostile spaces.

As is critical for all equipment to be installed in rail vehicles, the Viper has been externally tested across the complete spectrum of standards required by EN50155.

FOCON understand that systems on railcars are required by the EN50155 standard to have a useful life of 20 years, so as well as using the highest quality components to deliver extended MTBF figures, we also implement features like the

Gore-Tex® membrane in the IP65 enclosure to prevent water build up in the units. Due to the high vibration environment of the rail industry, we have also developed the Viper case with integral threading for the M12 connectors to ensure the IP65 seal is maintained for the life of the product.

The EN50155 standard requires mandatory performance and isolation testing. Not only does our switches meet these, we exceed them in order to meet the additional manufacturer requirements for train control. Our supplier has been building Ethernet switches for the railcar market for many years now and understands the measures that are required to provide the highest quality manufactured solutions.



Weight 1.4 kg
Degree of protection IP 65

Figure 2: Dimentional drawings

Texhnical Description

Power	
Operating voltage	Rated: 24 to 110 VDC
	Operating: 24 to 110 VDC ±30%
	Operating for 100 ms: 24 to 110 VDC ±40%
Rated current	350 mA @ 24 V and 150 mA @ 110 V

Interfaces	
X1-X12, Ethernet ports	12 x 10 Mbit/s, 100 Mbit/s
SRV1 and SRV2	1 x Service ports that must not be used

Temperature	
Operating	-40 to +70°C (-40 to + 158°F)
Storage & Transport	-50 to +85°C (+58 to +185°F)

Agency approvals and standards compliance	
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-3, Emission standard for redidential, commercial and lightpindustrial environments
	EN 61000-6-4, Emission industrial environments
	EN 55022 +A1, Emission IT equipment
	EN 55024, Immunity IT equipment
	FCC part 15 Class B
	EN 50121-4, Railway signaling and telecommunications apparatus
	EN 50121-3-2:2006 Railway applications - Rolling stock - apparatus
	EN 50155:2007 Railway applications - Electronic equipment used on rolling stock
	IE C 62236-4, Railway signaling and telecommunications apparatus
Safety	EN 60950-1, IT equipment
Environmental	EN 61373:1999 - Railway applications - Rolling stock equipment. Shock and vibration test
	IEE 1478:2001 - Environmental conditions for transit rail car electronic equipment
	EN 50124-1:2001+A1:2003+A2:2005 - Railway applications - Insulation coordination
	Fire safety standards CEN 45545-2

Certifications



Product specifications and images are subject to change without prior notice.

Focon Electronic Systems ApS

Denmark





Figure 1: Managed EN 50155 PoE Switch

Compact rail-approved Ethernet switch solutions

- 4 x 100 Mbit/s + 8 PoE Ethernet port
- PoE endpoints PSE, total power 61.6W
- WeOS—Layer 2 switch functions

Externally tested and verified to EN50155

- Surge resistance and isolation
- Magnetic field immunity & conducted emission
- Shock and vibration

Designed for long life and extreme operational environments

- IP65 anti-condensation Gore-Tex® membrane
- Integrated M12 threading & high MTBF, 448,000 hours
- Galvanic isolation between power and PoE

Design and production testing to match requirements for train control

- Post production testing exceeding EN 50155 mandatory requirement
- Burn in and isolation test on all units
- Manufactured according to IPC-A-610D class2

Managed Ethernet switch, 12 port with PoE

Focon item no. 094490

The switch is a managed 12 port switch designed to meet the full requirements of the rail vehicle market. The Viper is capable of delivering up to 61.6 W of power across 8 of the ports, derived from the wide operating DC voltage of the unit. The operating system provides an extensive suite of IP networking standards allowing resilient and flexible networks to be created, meeting the needs of the rail market.

As is critical for all equipment to be installed in rail vehicles, the switch has been externally tested across the complete spectrum of standards required by EN50155. A unique feature of the switch is the galvanic isolation provided between the input DC voltage and the power delivered through PoE to the connected equipment.

Focon understand that systems on railcars are required by the EN50155 standard to have a useful life of 20 years, so as well as using the highest quality components to deliver extended MTBF figures, we also implement features like the GORE-TEX® membrane in the IP65 enclosure to prevent water build up in the units. Due to the high vibration environment of the rail industry, we have also developed the switch case with integral threading for the M12 connectors to ensure the IP65 seal is maintained for the life of the product.

The EN50155 standard requires mandatory performance and isolation testing. Not only does our switches meet these, we exceed them in order to meet the additional manufacturer

requirements for train control. Our supplier has been building Ethernet switches for the railcar market for many years now and understands the measures that are required to provide the highest quality manufactured solutions.

Meeting the requirements of the railcar environment, makes the Viper very well suited for deployment in any application with severe operating conditions and extreme environments.

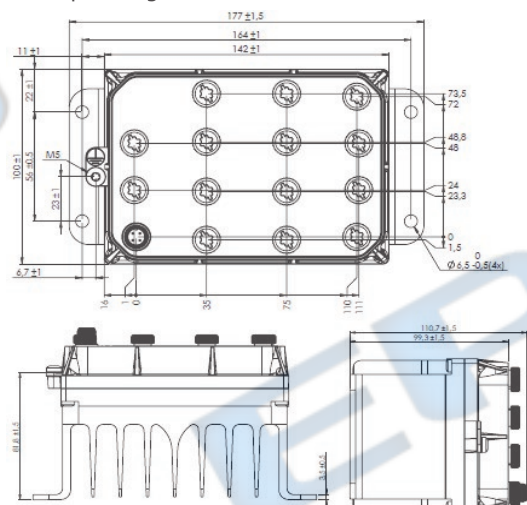


Figure 2: Dimensional drawings

Technical Description

Dimensions	
Weight	1.7 kg
Degree of protection	IP 65
Power	
Rated voltage	48 to 110 VDC
Operating voltage	33.6 to 143 VDC (28.8 to 154 VDC for 100 ms)
Rated current	Max 1.7 A @ 48 V, Max 0.8A @ 110 V @ full PoE load
Rated Output Power	Max 61.6 W ±7% distributed on all PoE ports Max 30.8 W on one single PoE port
Interfaces	
X1-X12, Ethernet ports	12 x 10/100 Mbit/s (8 with PoE capability)
USB	1 x USB 2.0, 480 Mbit/s
CON	1 x RS-232, 115.2 kbit/s
Temperature	
Operating	-40 to +70°C (-40 to + 158°F)
Storage & Transport	-50 to +85°C (+58 to +185°F)
Agency approvals and standards compliance	
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-4, Emission industrial environments
	EN 55024, Immunity IT equipment
	FCC part 15 Class A
	EN 50121-4/IEC 62236-4, Railway signaling and telecommunications apparatus
	EN 50121-3-2 Railway applications - Rolling stock - apparatus
	EN 55022, Emission IT equipment
Safety	IEC/EN 60950-1, IT equipment
Environmental	EN 50155 Railway applications—Electronic equipment used on rolling stock
	EN 61373 - Railway applications - Rolling stock equipment. Shock and vibration test
	IEE 1478 - Environmental conditions for transit rail car electronic equipment
	EN 50124-1- Railway applications - Insulation coordination
	IEC 60068-2-27. (shock 100 g. 6 ms), IEC 60068-2-64

Certifications



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Focon Electronic Systems ApS

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Figure 1: PoE Routing Switch

Compact rail-approved PoE Ethernet switch solution

- 4 x 100 Mbit/s + 8 PoE Ethernet ports
- PoE endpoint PSE, total power 61.6 W
- WeOS – Layer 3 switch and router functions

Externally tested and verified to EN50155

- Surge resistance and isolation
- Magnetic field immunity & conducted emission
- Shock and vibration

Designed for long life and extreme operational environments

- IP65 anti-condensation • GORE-TEX® membrane
- Integrated M12 threading & high MTBF, 448,000 hours
- Galvanic isolation between power and PoE

Design and production testing to match requirements for train control

- Post production testing exceeding EN 50155 mandatory requirement
- Burn in and isolation test on all units
- Manufactured according to IPC-A-610D class2

PoE Routing Switch

Focon item no. 094492

The switch is a managed 12 port routing switch designed to meet the full requirements of the rail vehicle market. The switch is capable of delivering up to 61.6 W of power across 8 of the ports, derived from the wide operating DC voltage of the unit. The operating system provides an extensive suite of IP networking standards allowing resilient and flexible networks to be created, meeting the needs of the rail market.

As is critical for all equipment to be installed in rail vehicles, the Viper has been externally tested across the complete spectrum of standards required by EN50155. A unique feature of the switch is the galvanic isolation provided between the input DC voltage and the power delivered through PoE to the connected equipment.

FOCON understand that systems on railcars are required by the EN50155 standard, to have a useful life of 20 years, so as well as using the highest quality components to deliver extended MTBF figures, we also implement features like the GORE-TEX® membrane in the IP65 enclosure to prevent water build up in the units. Due to the high vibration environment of the rail industry, we have also developed the switch case with integral threading for the M12 connectors to ensure the IP65 seal is maintained for the life of the product.

The EN50155 standard requires mandatory performance and isolation testing. Not only do our switches meet these, we exceed them in order to meet the additional manufacturer requirements for train control. Our supplier has been building Ethernet switches for the railcar market for many years and fully understands the measures that are required to provide the highest quality manufactured solutions.

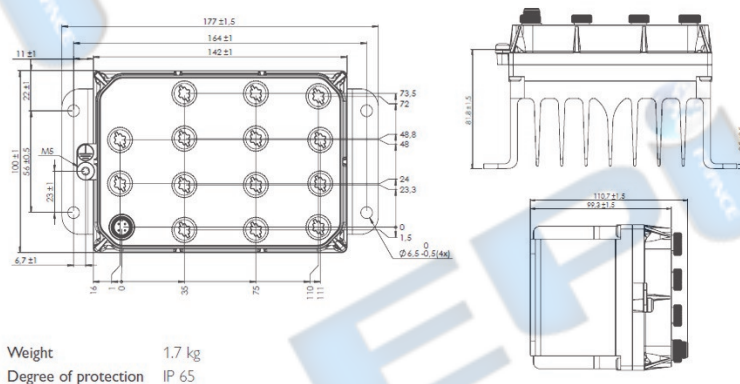


Figure 2: Dimentional drawings

Technical Description

Power	
Rated voltage	48 to 110 VDC
Operating voltage	33.6 to 143 VDC (28.8 to 154 VDC for 100 ms)
Rated current	Max 1.7 A @ 48 V, Max 0.8 A @ 110 V @ full PoE load
Rated Output Power	Max 61.6 W $\pm$ 7% distributed on all PoE ports

Interfaces	
X1-X12, Ethernet ports	12 x 10/100 Mbit/s (8 with PoE capability)
USB	1 x USB 2.0, 480 Mbit/s
CON	1 x RS-232, 115.2 kbit/st

Temperature	
Operating	-40 to +70°C (-40 to + 158°F)
Storage & Transport	-50 to +85°C (+58 to +185°F)

Agency approvals and standards compliance	
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-4, Emission industrial environments
	EN 55024, Immunity IT equipment
	FCC part 15 Class A
	EN 50121-4/IEC 62236-4, Railway signaling and telecommunications apparatus
	EN 50121-3-2 Railway applications – Rolling stock – apparatus
	EN 55022, Emission IT equipment
Safety	EN 60950-1, IT equipment
Environmental	EN 50155 Railway applications – Electronic equipment used on rolling stock
	EN 61373 – Railway applications – Rolling stock equipment. Shock and vibration tests
	IEEE 1478 – Environmental conditions for transit rail car electronic equipment
	EN 50124-1 – Railway applications – Insulation coordination
	IEC 60068-2-27, (shock 100 g. 6 ms), IEC 60068-2-64
	CEN/TS 45545-2 - Fire protection

Certifications



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Focon Electronic Systems ApS

Denmark





R16-X Mobile Hybrid Recorder

TECHNISCHE DATEN / TECHNICAL DETAILS



R16-X Mobile Hybrid Recorder

EIGENSCHAFT / FEATURE	BESCHREIBUNG / DESCRIPTION
Auflösung Resolution	CIF (352x288), 2CIF (704x288), 4CIF (704x576) CIF (352x288), 2CIF (704x288), 4CIF (704x576)
Kompression Compression	MJPEG, H.264 MJPEG, H.264
Bildrate (Bilder pro Sekunde) Frame rate (frames per second)	400 BpS 400 fps
Stromversorgung Power source	24 V/DC ± 30% gemäß EN50155; maximal 40W 24 V/DC ± 30% according EN50155; 40W max.
Nutzausgangsleistung Voltage output	12 V/DC maximal 2x18W 12 V/DC maximum 2x18W
Videoeingänge Video inputs	16x analoge Kameras und zusätzliche IP-Streams 16x analogue cameras and additional IP-streams
Videoausgänge Video outputs	2x Dual-Ausgang, programmierbar (4x BNC) 2x Dual-Output, fully programmable (4x BNC)
Audioeingänge Audio inputs	2x LineIn oder Mikrofon 2x LineIn or microphone
Speichermedien Storage media	2,5" Festplatte, Solid State 2,5" Hard disc drive, Solid State
Schnittstellen Interfaces	IBIS, RS422, RS232, Ethernet RJ45 (1Gbit), Ethernet M12 (100Mbit), 8x digitale Eingänge, 2x digitale Ausgänge, USB Device IBIS, RS422, RS232, Ethernet RJ45 (1Gbit), Ethernet M12 (100Mbit), 8x digital input, 2x digital output, USB Device
Betriebstemperatur Operating temperature	-25° bis +70°C entsprechend EN50155 T1* -25° to +70°C according to EN50155 T1*
Befestigung Mounting	Mittels 4 Schrauben M5 19" Via 4 screws M5 19"
MTBF MTBF	80.000 Stunden 80.000 Stunden
Gewicht Weight	Ca.: 6.500 g Approx.: 6.500 g
Abmessungen (B x H x T) Dimensions (B x H x D)	19", 3HE - 483 x 132,5 x 250 mm (ohne Stecker) 19" 3U - 483 x132,5 x250 mm (without connectors)
Luftfeuchtigkeit Humidity	bis 95 % nicht kondensierend up to 95% non condensing
Produktnormen Norms and standards	EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2 EN 50155, EN 50121-3-2, EN 61373, DIN 5510-2
Auswerte- und Servicesoftware Evaluation- and Servicesoftware	R2P Mobile Manager Suite R2P Mobile Manager Suite

* Aufzeichnungstemperatur ist abhängig vom Speichermedium / Recording temperature depends on storage medium

August 2013

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