



5.40 Low current infrastructure development

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Technical requirements for projection activities and deliveries of structured cables and low current supporting and containment systems.

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The latest updated version of this ITS is available at "<http://cts.skoda-auto.com/>", the company is not obliged to notify their business partners of any ITS updates. Because of that, we appeal to everyone to review ITS on regular basis. These documents take effect on the date of their last update. When contracts are made, the applicable ITS wording shall be the one effective as at the purchase order date. Please note: Should there be any differences between the Czech, English and German language versions of this ITS, the Czech version shall take precedence. The Czech version is available at <http://cts.skoda-auto.com/>.

<i>Change -</i>	<i>Date:</i>	<i>Note:</i>
	1. 4. 2017	First edition
1.	1. 3. 2019	Revision no. 1



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1. Introductory Information

The internal technical standard defines basic technical requirements on the construction of the LC technical mains, LC supporting and containment systems and installation of equipment placed in the given distribution sections. It must be performed in accordance with the ČSN standards below in their current amendment and related standards, including their supplements, as well as other requirements of Škoda Auto a.s. specially ITS Škoda 5.30 distribution nodes – weak current technical rooms, ITS Škoda 1.05 Information systems and technologies.

1.1 Basic Terms and Abbreviations

ACS	Access control systems
AV	Audiovisual technologies
eDoch	Electronic attendance system
EMC	Electromagnetic compatibility
ePark	Electronic parking lot
EPS	Electronic fire alarm system
eVstup	Electronic entry system
F/Z/W 30 - 90	Fire resistance class (fire resistance in minutes)
HTM	Main SLP technical room
IP CCTV	Internet protocol closed circuit television
JČ	Uniform time system
KV	Entry control
MM	Multimode
OTDR	Optical time division reflectometer
PBR	On-site fire solution (for the structure/building concerned)
PD	Project documentation
PTM	Subsidiary SLP technical room
PZTS	Alarm, safety and emergency systems
SCS	Structured cabling system
SLP	Low-voltage systems
SM	Singlemode
SV	List of deliverables
TDI	Investor's technical supervisor
TM	SLP technical room
UPS	Uninterruptible power supply

1.2 Related European Directives and Standards

European directives:	
2014/35/EU	Low voltage electrical equipment
2014/30/EU	Electro-magnetic compatibility
2017/53/EU	Radio and telecommunication end devices
Standards:	
ČSN 34 2300 ed.2	Directives for internal distribution of communication lines
ČSN 33 2130 ed.3	Low voltage electrical installations – Internal electrical systems
ČSN EN 50173-1 ed.4	Information technology – Universal cable systems – Part 1: General requirements
ČSN EN 50173-2 ed.2	Information technology – Universal cable systems – Part 2: Office spaces
ČSN EN 50173-3 ed.3	Information technology – Universal cable systems – Part 3: Industrial spaces
ČSN EN 50173-5 ed.2	Information technology – Universal cable systems – Part 5: Data Centres
ČSN EN 50173-6 ed.2	Information Technologies - Universal Cabling Systems - Part 6: Distributed Services in Buildings



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ČSN EN 50131-x	ASES alarm systems
ČSN CLC TS 50131-x	ASES alarm systems
ČSN EN 62676-x	CCTV alarm systems
ČSN EN 60839-11-1 a 2	IC alarm systems
ČSN EN 50174-1 ed.2	Information Technologies - Cabling Installations - Part 1: Specifications and Quality Management
ČSN EN 50174-2 ed.2	Information technology – Cable system installation – Part 2: Project preparation and construction in buildings
ČSN EN 62676-4	Alarm systems – Security alarm and emergency systems – Part 1: System requirements
ČSN EN 50310 ed.4	Usage of joint connection systems and grounding in buildings equipped with information technology equipment
ČSN 33 2000-1 ed.3	Low voltage electrical installations - Part 1: Basic standpoints, definition of basic characteristics, definitions
ČSN 33-2000-4-41 ed.2	Low voltage electrical installations - Part 4-41: Protective measures to ensure safety – Electrical shock protection
ČSN 332000-4-43 ed.2	Low voltage electrical installations - Part 4-43: Safety – Overcurrent protection
ČSN 332000-5-54 ed.3	Low voltage electrical installations - Part 5-54: Selection and construction of electrical devices – Grounding and protective wires
ČSN 332000-5-52 ed.2	Low voltage electrical installations - Part 5-52: Selection and construction of electrical devices – Electrical lines
ČSN 332000-5-51 ed.3	Low voltage electrical installations - Part 5-51: Selection and construction of electrical devices – General regulations
ČSN 33 61439-1 ed.2	Low voltage distribution boards – Part 1: General Specifications
ČSN 73 0821 ed. 2	Fire safety of buildings
ISO/IEC 11801-3:2017	Information Technologies – Generic Cabling for Customer Premises - Part 3: Industrial Premises
ČSN EN 60794-2 ed.2	Optical-Fibre Cables – Part 2: Indoor Cables – Special Sections

1.3 Requirements on the Author of the Project Documentation

The project documentation will be created in selected and approved technologies of ŠA (according to the assignment of individual projects):

- Metallic data cabling (cat.6a - F/UTP): Legrand, Reichle de Massari
- Optical cabling (OS2, OM3, OM4, OM5): Huber-Suhner, Reichle de Massari

1.3.1 Basic requirements on project works and the submitted PD.

The contents and extent of the project documentation must include all the prerequisites according to applicable legal regulations and normative requirements (Act No. 499/2006 Coll. on building documentation and the Act no. Č. 183/2006 Coll. on territorial planning and construction on town and country planning and building code – the building act). Requirements listed below in this ITS also need to be taken into account.

The final version of the project documentation is subject to the final approval of the FIO/3x department and must account for all conditions from the project lead process and FIO/3x approval.

All documentation accepted by FIO must be in both printed and electronic form. The electronic form is to be submitted on a data media (CD, DVD etc. or sent via eBOX after a prior discussion with FIO/3x) properly marked with regards to its content

- Text part as *.doc(x) and/or *.pdf
- Calculations, PL etc. as *.xls(x) and/or *.pdf
- Drawing documentation as *.dwg and/or *.pdf

PD in all phases of the project planning, all correspondence and communication between the ordering party (ŠA) and the supplier is to be conducted in Czech.

Drawing part in the *.dwg format is to be written up in layers (individual professions/systems are to be distinguished via colours and layers).

Not complying with the above poses a reason for not accepting the work and related sanctions



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1.3.2 Performance List

The submitted project PL in the *.xls format is to be submitted in two issues:

- Assessed by unit process of the project designer (for informative project costs values)
- "Blank" list (with no unit prices) prepared for the project supplier tender

The "blank" PL is to include an appraised item "documentation of actual implementation", which is to be included in the provider's delivery.

The performance list is to be conceived using formulas so that it is complete and automatically calculated after entering unit prices into corresponding fields.

In case of a construction project for a new, independent building (according to a project assignment by FIO/3x), the PL is to be created for the tender in both of the technologies mentioned above.

1.3.3 Documentation for construction

It is to be created according to the Act No 499/2006 Coll. – according to the annex no. 6 this annex.

The documentation is to be provided in 3 versions of printed form (drawings and drawing attachments in colour) and electronic form as *.pdf according to 1.3.1. Shall contain all floor plans and block diagrams, including a technical report.

1.3.4 Documentation of the actual implementation

It is to be created according to the Act No 499/2006 Coll. – according to the annex no. 7 this annex.

The documentation is to be provided in 6 versions of printed form (drawings and drawing attachments in colour) and electronic form as *.pdf and/or *.dwg according to 1.3.1.

In case the cables pass through fire-barrier frames, the presented PD is to include a "documentation of fire safety seals" (directed by the supplier). Shall contain all floor plans and block diagrams, including a technical report.

1.4 Requirements on the Provider

The provider must possess applicable manufacturer certifications for the required cable systems (all of the below):

Metallic cabling (standard cat.6a - F/UTP):

- Certified Installer HD Legrand cabling system
- Certified Business Partner HD Legrand cabling system
- R&Mfreenet DC Automotive Installation Manager
- R&Mautomotive Solution Specialist

Optical cabling (OS2, OM3, OM4, OM5):

- Huber + Suhner - Automotive Environment Structured Cabling
- R&Mfreenet DC Automotive Installation Manager
- R&Mautomotive Solution Specialist

The provider of the installation works must meet the qualification, expertise and other requirements of the legal regulations, normative requirements and the accompanying documentation of the manufacturer or system distributor and meet the requirements for training of the manufacturer of the specific system. When installing the delivered products and equipment, the provider is obliged to uphold the technological assembly procedures and adhere to the assembly procedures of individual manufacturers. The personnel carrying out the installation must meet the occupational health and safety requirements and present an authorization for working in heights or mountaineering works (in case of installation on top of already installed production technology, the lines may be located at heights of up to 20 m). Workers that work on lifting platforms must be eligible for this type of work.

The provider company that is to carry out the installation, is responsible for the conformity of the installed system according to related ČSN. In case changes are necessary during the installation, these changes must be demonstrably approved by a project designer of the provided work and FIO/3x, as well as added into the documentation of the actual implementation.

The provider is to provide the ordering party with a written EC declaration of conformity, test protocols, measurement protocols and subject product certificates on products used to carry out the work if the product are government appointed as requiring conformity assessment regarding their properties meeting the requirements of technical regulations according to the Government Decree no. 163/2002



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Coll. as amended by further regulations, as a followup to the Act no. 22/1997 Coll. on Technical Requirements for Products and on Amendments to Some Acts.

For proper finalization and handover of the work, it is necessary to prevent valid, up-to-date and FIO/3x-approved documentation of the actual implementation according to 1.3.3.

The minimum warranty period required for the system is 25 years after delivery of the complete project. The system warranty shall be confirmed by means of a certificate to be issued by the manufacturer of the technology relevant to the installation concerned plus completed measurement reports for the individual routes / lines. In the event of extending the existing certified installation, the Parties shall make an additional form to be paired with the main certificate. In the event of degradation of the transmission parameters within 25 years the technology owner is entitled to free replacement of the defective component(s). The said replacement shall be paid for by the manufacturer of the system concerned.

Minimum required system warranty of 25 years since the handover of the completed work.

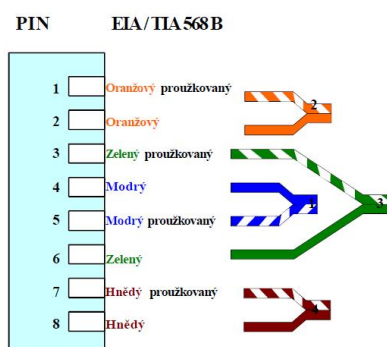
The supplier of ASES and CCTV systems must meet legislative conditions according to the Act no. 455/1991 Coll. "on Trades". It is a "concessioned" trade, meaning that the trade subject is tied to a special expert eligibility. The act includes this activity in the annex no. 3 as: "Providing technical services for protection of property and personnel".

All meetings and inspection days, all correspondence and communication between the ordering party (ŠA) and the supplier is to be conducted in Czech.

1.4.1 Cabling termination requirements

1.4.1.1 Metallic cabling

The maximum admissible standard length is 90 m for the Permanent Link topology and 100 m for the Channel topology. Patch panels in the data distribution case (LAN) will be marked alphabetically, with no additional signs. Patch panel ports alone shall not be identified; markings shall only be made on the data socket side and shall consist of the patch panel letter, patch panel port No. and data distribution panel identification. Cable conductor connections shall be done in compliance with the TIA/EIA 568B standard: both data socket and patch panel endpoints.



1.4.1.2 Optical cabling

Exclusively OS2, OM3, OM4 and OM5 fibres are allowed for new optical installations. All fibres shall be terminated within the respective optical tub, in a case, and the weld shall be protected using a weld protector in the case ridge. Fibres and welds must not be laid loose. The only permissible fibre termination technology is welding. Direct connectors or gel fibre lock splices can only be used as a temporary solution pre-approved by FIO3/x. All terminations of all new optical connections shall be done with Huber-Suhner or Reichle de Massari components. The arrangement of individual fibres in the optical case shall be done in compliance with the IEC 60794-2, TIA 586-B, DIN VDE 0888 standards.



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Fiber Nr	Color Code IEC 60794-2	Color Code TIA 598-B	Color Code DIN VDE 0888
1	Blue	Blue	Red
2	Yellow	Orange	Green
3	Red	Green	Blue
4	White	Brown	Yellow
5	Green	Slate	White
6	Violet	White	Slate
7	Orange	Red	Brown
8	Slate	Black	Violet
9	Aqua	Yellow	Aqua
10	Black	Violet	Black
11	Brown	Rose	Orange
12	Rose	Aqua	Rose

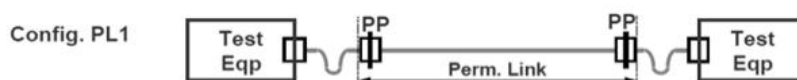
1.4.2 Cabling measurement requirements

Any measurements shall be performed exclusively using a certification measurement device with properly calibrated main unit and properly calibrated remote unit. The measurement device calibration frequency is determined by the manufacturer; the calibration is usually done once a year. If the measurement device does not have a valid calibration certificate, the installation concerned cannot be taken over from the Contractor. The maximum permissible date of the latest measurement within a single installation is 6 months after the first measurement (first measured data). The above does not apply to additional cabling installations. The identification (marking) of measurement reports and individual ports / lines shall be in line with the project documentation. The Contractor shall provide the measurement data in flw or sor and also in pdf (in electronic form) on a data carrier (CD, DVD etc.; if necessary and subject to agreement with FIO/3x, the data can also be sent via the eBOX application) properly marked to identify the file contents.

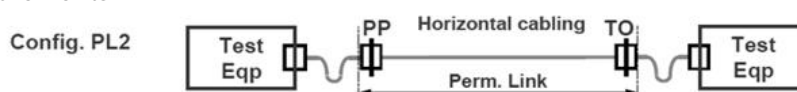
The structure of the final-measurement directory shall be logically arranged to reflect the actual status and the project documentation (for example, it is not allowed to integrate everything into a single directory with general sequential numbering). Each measured port shall be easy-to-find in terms of the physical installation.

1.4.2.1 Metallic cabling measurement – instructions

- Recommended measurement devices: Fluke DSX5000, DSX8000 or other devices approved by FIO3/x prior to the measurement.
- Cat.6a cabling measurement standard: ISO/IEC 11801 PL1 Class Ea for permanent link patch panel – patch panel measurements



- Cat.6a cabling measurement standard: ISO/IEC 11801 PL2 Class Ea for permanent link patch panel – socket measurements



- Correctly set NVP parameter; in line with instructions by the manufacturer of the respective horizontal cable for measuring its electrical length
- All measurement reports shall contain the following info:
 - Cable ID
 - Measurement date and time
 - Clear height (NEXT)
 - Test limit (standard under which the measurement is performed)
 - Cable type



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- NVP
- Operator
- Calibration date (main unit)
- Calibration date (remote unit)
- Integrated components, such as cat.5e cables and cat.6 patch panels, shall be measured twice, for the lowest category and the highest one
- If the measurement repeatedly fails to meet the respective standard or "passes with an asterisk", the handover report shall state the reason why such outcome has been reached and thus warn FIO3/x of possible complications in terms of connecting the terminal system. FIO3/x will then decide on the way this port is going to be used

1.4.2.2 Optical cabling measurement – instructions

- Data review and measurement using OTDR measurement devices
- Recommended measurement devices: Fluke DSX5000, DSX8000 with the OTDR module, EXFO, AFL or other devices approved by FIO3/x prior to the measurement.
- The optical cable measurement methods shall comply with ČSN EN 61280-4-2 Optical Fibre Attenuation Measurement
- This is a two-way measurement using a 500m lead fibre and including a final report to check:
 - Fibre non-homogeneity
 - Attenuation on all splices and the specific attenuation on all fibres of the individual cable stretches, with splice location specifications
 - Measurement of the total insertion loss on the optical line
- Unless otherwise required, the measurement shall be performed on the following wavelengths:
 - Multimode lines 850nm and 1,300nm
 - Singlemode lines 1,310nm and 1,550nm
- All measurement reports shall contain the following info:
 - Cable ID
 - Measurement date and time
 - Clear height (NEXT)
 - Test limit (standard under which the measurement is performed)
 - Cable type
 - Operator
- As a back-up alternative, it is allowed to use direct measurement where the outcome takes the form of an automatic source-data report. Using this method is subject to approval by FIO3/x prior to the start of the measurement session.

2. Structured Cable Lines

SCS is a unified structured cable system for buildings and surfaces that connects the following technologies of communication services to the data network of ŠA:

- Weak current IT – DATA, TELEPHONES
- Access systems – KV
- Unified time lines – JČ
- Alarm, security and emergency system – ASES
- Electrical fire signalization – EFS
- Closed camera systems– CCTV
- eAtt, eInput, ePark – ACS
- Internal System for Indication and Emergency Information – VSVTI

2.1 Basic subdivision of SCS

SCS is subdivided by its impact and function

2.1.1 LSCS (local SCS)

- Usually an area or object connected to one TR
- Cable lines are made using cat.6a F/UTP metallic lines
- Maximum cable line length of 90 m, measured from the patch panel to the socket. (IEEE 802.3 standards for Ethernet)
- standard Škoda Auto a.s. = 2 data ports / workstation
- For distances greater than 90 m with no option to construct further TR, it is allowed to install an optical line from the closest TR to the socket.



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- For optical lines, use SM 9/125um, or MM 50/125um cables.

Example:

1 SCS double socket, distance: 120 m

The following shall be used:

- 2 x, meaning 4 fibres will be occupied
- The required cable is SM 9/125um, 8 fibres.
- At the remote spot, the optical cable is to lead into an optical data socket (LAN BOX distributor) according to connected technology)
- FIO is to make the decision on whether to use an optical data socket or a LAN BOX

Lockable SCS distribution point – LAN BOX contains the following:

- Metallic patch panel (s)
- Optical patch panel (s) including a case, tub, weld protection and pigtails
- Shelf (shelves) for converters and other active elements
- Further requirements defined by ITS 5.30 Technical rooms LC chapter 2.5 LAN BOX

2.1.2 BSCS (core SCS)

Distribution of optical cable lines between individual TR and HTR used for operation of telecommunication equipment.

Requirements:

- SM 9/125um optical cables
- Cables are always ended in the optical patch panel

2.1.3 CSSCS (core site SCS)

Distribution of optical cable lines between individual buildings used for operation of telecommunication equipment.

Requirements:

- Installed inside sufficiently dimensioned cable trays, collectors or cable chutes installed within the ground in the exterior or within cable trays (LC section) in buildings.
- SM 9/125um optical cables with increased resistance to rodents in cable chutes
- In cable ducts and fibre collectors in "blow-in" chutes
- Cables are always ended in the HTR optical patch panel

2.2 Labelling of Cables and Lines

Labelling rules for all LC cables and lines for all new and underway projects

2.2.1 Cable label types

Normal environment (no moisture, no aggressive environment etc.):

- Plastic cable labels PE –T30, T40, T60 according to the cable size and description (halogen-free/folded)

Humid environment:

- Engraved plates (according to ITS 1.11 ElektriKa), or description die-stamped on an Al plate at least 1 mm thick

The labels must be fixed using straps of appropriate dimensions and length

2.2.2 LC cable marking

Cable labels shall contain the following information:

- Cable function – e.g. UTS, DATA, EFS etc.
- Cable type – e.g. TCEPKPFLE 10XN0,6; UKFY..., CYKY 5x1,5; 16MM; 24SM; etc.
- Cable path (from... , to...) – e.g. LAN2 – LAN4, etc.

Label placement:

- At tap joints, including a cable rail
- At access points – e.g. bridge ladder etc.
- Collector entrance – stairs etc.

Installation of other cable lines (other than LC) must be discussed and approved by FIO/3 in advance.



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2.2.3 Path marking

Adhesive foil with indelible lettering

Label placement:

- All LC lines maintained by FIO are to be marked with a red label "LC - EFS + phone no." visibly along the entire length, i.e. at high heights at the duct bottom, at low height on the side, always readable from communication etc.
- All EZS and CCTV lines are to be labelled with a red label "LC - EFS + phone no.", visibly along all the other path, e.g. for warning system, LV lines etc., are not labelled
- The path is to be marked at the side each 3 m in complex sections and each 6 m in straight lines

2.2.4 Marking of boxes and distribution boards

According to the corresponding ČSN

- Label to identify the distribution board designation – e.g. CCTV, EZS, UTS, LAN 1, EFS, R (for warning system).
- Other distribution boards, e.g. telephone, are to be labelled with a distribution board number – e.g. RTL 2 etc. The designation is to be discussed with FIO in advance.

2.3 Cable Lines, SCS Cable Harnesses

The SCS cable lines may contain cables of other LC systems of up to 50V, except for the 100V lines of internal systems for ISIEI. The cable paths may not contain cables not related to the LC operation. The cables must be installed according to the rules defined in paragraph 3 of this ITS

3. Supporting and Containment Cable Systems

These ancillary frames are used to contain larger numbers of cables. They are used to contain both power and weak current or optical cables. According to the recommendation for EMC assurance, no weak-current and heavy-current cables are to be installed together.

3.1 Basic Requirements for LC Lines

- The cable paths may not contain cables not related to the operation of the given cable line. The cables must be installed according to the rules defined in this ITS.
- Space reserve in a cable line is to be assessed by the project designer along with the technology engineer and FIO/3x as a followup to the future requirements of data lines. The project designer is to design the path dimensioning. The new line is to be installed with at least 50 % reserve.
- Cable line load – according to the cable manufacturer specification
- Line protection via position – leading the line under a ceiling outside of the handling space of forklifts, assembly lines or other devices
- Covering of LC cable lines is to be defined by the LC project designer in cooperation with the HV (LV) project designer, SA technology representative and FIO/3x representative
- Mechanical cable protection – in case the cables are in danger of being damaged by falling object due to work activities taking place above
- Electromagnetic cable protection – LC lines must be always covered by lids at points of crossing HV lines. In case of long sections of HV and LV going alongside with technological expectancy of high current input (such as welding shops) the ducts always need to be covered with lids.
- Cable routes (ducts) need to be continually interconnected and grounded.
- Protrusions of cable ducts or rails through partition frames are to lead through construction openings with that purpose (non-dilation or work seams).
- Protrusions through fire barriers are to be sealed using certified fire sealing with labelling from both sides

3.2 Basic subdivision of Paths

The paths are subdivided by its impact and function:

3.2.1 By purpose

3.2.1.1 Local (ancillary) Paths

Usually LC lines leading from core paths to individual weak-current sockets or other connection points in room or workplaces.



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They usually include two types of paths. Wire or sheet metal duct concealed above the soffit or in a double floor, from the core path to the point of transition from the concealed line to visible line. Visible line consist of installation rails, e.g. Legrand. In case heavy current lines are installed within the same rail, it needs to be fitted with a grounded metal shielding barrier to separate the heavy current lines from the LC ones.

3.2.1.2 Core Paths

Used to lead the LC lines from the TR to individual extensions (connections) of local lines. Usually, they are installed in pathways or communication paths. They are concealed within the soffit or a double floor in office spaces and visible in production spaces. They consists of wire or steel sheet metal ducts suspended at the ceiling, walls or fixed frames of a building or technology. Installing heavy current lines into LC ducts is not permitted. Separate ducts must be assigned to heavy current lines. UPS backup is an exception. LV lines to power LC technical rooms may be installed in the LC path, as long as provided with a metal shielding barrier.

3.2.1.3 Core Site Paths

Usually installed in ground in a separate multi-channel (e.g. SiteI) or collectors at the side intended for LC lines on the containment frame of the collector. Heavy current path installed alongside in a multi-channel is only acceptable in exceptional cases (for very short distances, ČSN 33 2000-4-444) and is to be decided upon by FIO/3x. Heavy current line installed alongside in the same collector section is not acceptable

3.2.2 By function

3.2.2.1 Fire-resistant paths (paths with functions against fire)

In the sense of applicable technical regulations, "cable path with retained function" or "with functional integrity" refers to an entire combination consisting of a containment system (cable ladder, duct etc.) and cables or integrated function lines.

Basic requirements on cable lines with time-limited functionality in case fire are defined in applicable national legislation and generally legally obligatory.

Czech Republic:

- Act no. 183/2006 Coll. on territorial planning and construction in its current amendment
- Act no. 133/1985 Coll. on fire safety in its current amendment
- Act no. 22/1997 Coll. on technical requirements for products in its current amendment
- Decree no. 246/2001 on defining conditions of fire safety and performance of state fire safety supervision, in its current amendment
- Decree no. 23/2008 on technical conditions of fire safety of buildings
- Government decree no. 163/2002 Coll. used to define technical requirements on selected construction products in its current amendment
- Government decree no. 100/2013 Coll., used to define technical requirements on construction products marked as CE in its current amendment (European parliament and council decree no. 305/2011)
- Government decree no. 118/2016 Coll. used to define technical requirements on low voltage electrical devices in its current amendment (2014/35/EU)
- Standard line ČSN 73 08 XX for fire safety of buildings in its current amendment
- Testing regulation ZP 27/2008 PAVUS

Cable, line and standard-based containment system:

It is firmly defined that the cables or the lines may never be tested from the standpoint of function separately; the testing shall be conducted in an appropriate way on a containment frame. Three standard installation systems have been defined for this purpose:

- Cable ladder installation
- Cable duct installation
- Individual cable installation under the ceiling on the lugs

In addition to these standard systems, it is also accepted to conduct the functionality retaining test on any other, individually defined containment system. In these cases, however, it is necessary to present the specification of such system to an expert department of Škoda Auto for approval.



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Cable lines with functional integrity:

All standard and non-standard containment systems for cable lines with functional integrity mentioned below in this document must meet the requirements of ZP 27/2008 PAVUS, STN 920205 or. DIN 4102, part 12.

What is not functional integrity:

Functionality of cable lines in the sense of ZP 27/2008 or STN 92 0205 presents a compilation of very specific requirements. For that reason, functionality according these regulations cannot be related to the following marking of cables or cable containment frames:

- V180 or FE180
- Fire-resistant cable
- Fire-safe
- Fire-resistant installation
- Retention of insulation capability
- Low or no smoke production

The main criteria when selecting an optimal containment system is the type and number of contained cables. Conditions at the point of installation cannot be omitted either.

Fixation system:

The fixation system must meet the same criteria from the standpoint of fire resistance or functionality in case of fire as the containment system itself.

Space with obstacles:

In case of numerous changes of direction or level of cable pathing, it is necessary to provide an effective support for the cables. That is why no cables, regardless of their cross-sections, may remain in the turns without a support of a support system.

Combinations with other technologies:

Air conditioning equipment, pipelines, common electrical distribution lines or construction parts may not negatively influence the cable lines with functional integrity according to the applicable legal alteration in the defined time. Solution comes in form of a direct wall or ceiling installation of such lines using group holders, cable sleeves or fasteners directly under the ceiling.

Limited space:

In a limited space, cable installation is carried out using sleeve pieces or cable fasteners directly under the ceiling, or installation of multiple narrow cable paths on top of each other instead of one wide path.

Problematic bearing capacity:

For older ceiling designs, bearing capacity cannot be surely determined during reconstructions. In such cases, it is allowed to use wall installation.

Marking of equipment by its provider:

Each cable line with functional integrity must be labelled, analogically e.g. like fire cable padding. In the Czech Republic, this obligation is not yet implied from the applicable regulations; Škoda Auto requires such marking.

The description label must include:

- Name of the author of the cable line
- Function class according to the corresponding regulation
- Number marking of the approval document
- Name of the approval document owner
- Date (month, year) of provision
- Project support



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3.2.2.2 Standard and non-standard frames

Standard and non-standard cable support systems may be used for maintaining the function of cable lines.

Standard frames:

For standard cable support frames, transfer of test results is generally acceptable, extending the options when selecting an appropriate cable. Thanks to that, the standard frame can accept any cable approved by the standard frame manufacturer according to a corresponding regulation. This is to be used for smaller projects where it would not be lucrative to conduct tests with non-standard support frames.

Non-standard frames:

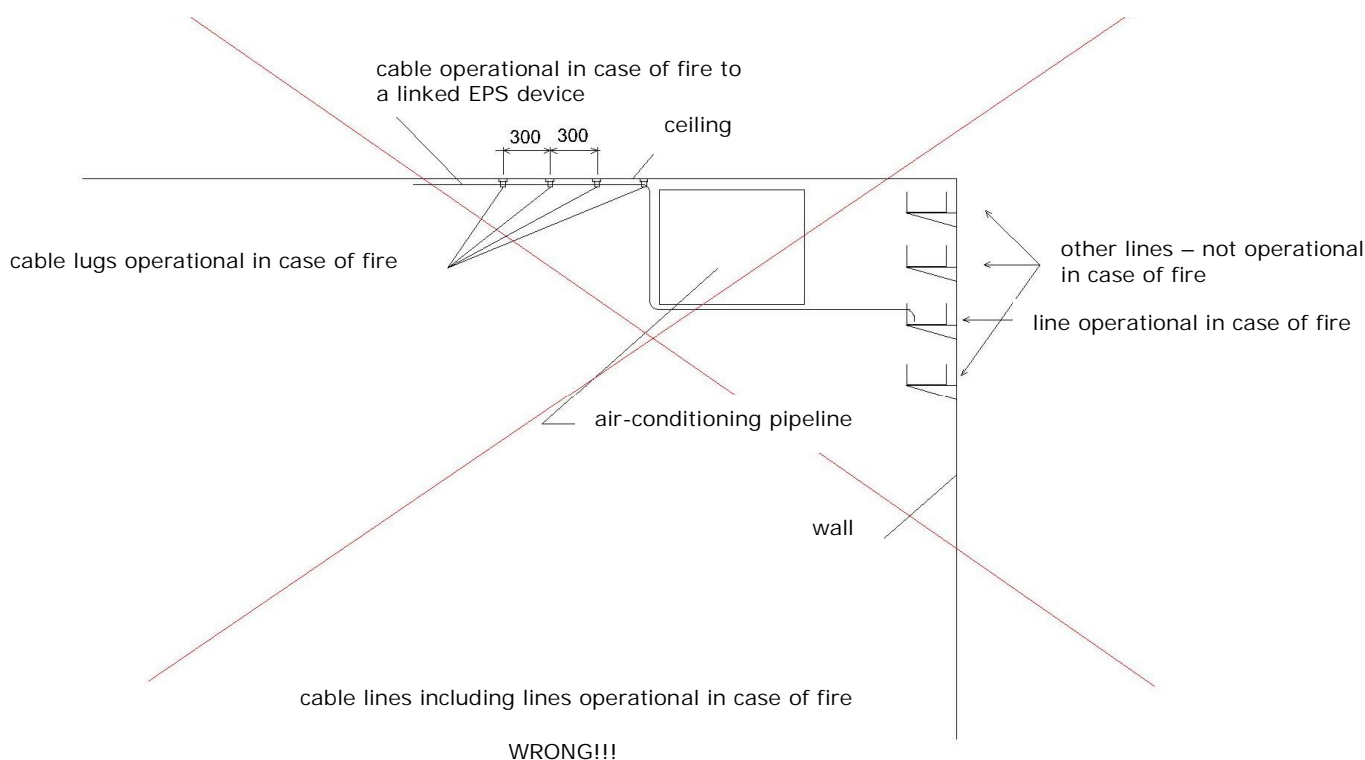
In case of non-standard cable support frames, regulations exclude the option of test transfer. Because of that, such connection may only be made using cables fire-tested on the used type of non-standard frame and also released in the corresponding approval. This is to be used for large project where using non-standard containment frames can mean significant financial savings.

3.2.2.3 Standard Lines

These are all other cable paths with no functional fire integrity requirements defined regarding the assurance of fire safety and equipment functionality in case of fire. Such lines may never cross or run alongside above a line functional in case of fire as its collapse would result in bringing the fire-functional line along with it.

The following ducts and paths may be used for these lines:

- Metal: Mars, OBO Betterman, Flexnet
- Ledge: Legrand

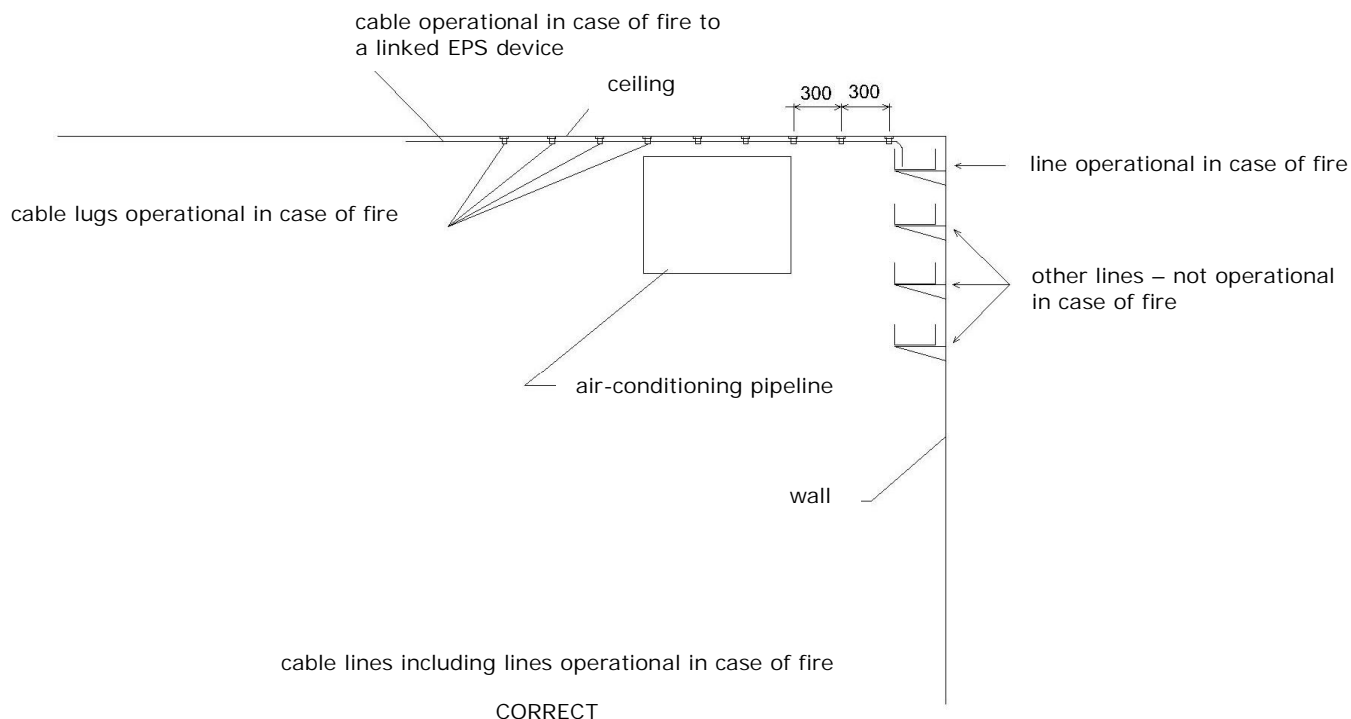




INTERNAL TECHNICAL STANDARD

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4. Materials and products released in Škoda Auto a.s.

4.1	Cable lines	
	CES	Flexnet
	Kopos	LEGRAND
	OBO Bettermann	
4.2	Distribution Boards	
	Knürr (Emerson)	Rittal
4.3	Fire Padding	
	Intumex	Hilti
	Promat	
4.4	Metallic cables	
	Telegartner	Reichle de Massari
4.5	Optical cables	
	Huber-Suhner	Reichle de Massari