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Technical standard for the production machinery pneumatic systems of newly acquired pneumatic systems, repairs of pneumatic systems of the current production machinery and purchase of separate pneumatic components.

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Note: In case of any differences between the Czech, English or German language mutation of this ITS, the Czech version takes precedence.

The Czech version is available at <http://cts.skoda-auto.com/>.

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1 Dimensions

1.1 Working pressure

Pneumatic machinery should be dimensioned in a way so that the required speed of shifts, quick shifts, required clamping pressures, etc. on the separate working units are reached with a sufficient safety and in the set pressure range.

Pressure is given in bars. The figure states overpressure, whereas underpressure, as a negation of the overpressure, is given with the minus sign.

Range of working pressures

a/ General use (common pressure): 5 - 6 bar

b/ Welding machines (high pressure): 10 - 12 bar

1.1.1 Normal pressure (N)

Pressure range $P_e = 5$ to 6 bar. In all parts of the N-pressure distribution network minimum pressure of 5 bar must be ensured. Therefore, when calculating power components (pistons, engines, etc.) working pressure of 5 bar must be considered.

1.1.2 High pressure (H)

Pressure range $P_e = 10$ to 12 bar. In all parts of the H-pressure distribution network minimum pressure of 10 bar must be ensured. Therefore, when calculating power components (pistons, engines, etc.) it is necessary to consider a working pressure of 10 bar.

1.2 Air compression power supply

The point of air compression between the production device and distribution network is a screwed fitting as given by ISO, ČSN, DIN.

1.3 Air modification units

Units for air modification must be assembled into the wiring in the shortest possible distance from the appliances and must ensure quality of the pressure medium.

Requirements on the quality of compressed air is defined by the ISO 8573-1 guideline which describes the classes of compressed air.

The unit for air modification must be assembled from a manual safety valve, contact valve with an electromagnetic 24 V DC coil, reduction valve with a filter, condensate separator with a manometer, pressure switch. For pneumatic moves a vent with a slow pressure start is necessary. The use of flowmeter must be approved by ŠkodaAuto above all.

Units for air modification with a connection size of G ¼ to G 1 should be used primarily in the block version.

2 Arrangement construction

2.1 Pneumatic system to be realized: - in line with VW standards:

39 D 1260	- drives incl. supply
39 D 1063	- for function graphs
39 V 16130	- active section
39 V 16135	- cooling

- in line with ČSN EN ISO 4414: safety requirements on pneumatic machinery and their pneumatic components

2.2 Primarily components should be used that can operate without additional lubrication of the pressure medium.

2.3 Every separate component of the pneumatic machinery must be easily accessible for maintenance purposes and replaceable if necessary.

2.4 Pipe diameter dimensions must not allow the maximum flow rate to be exceeded.

2.5 Nominal clearance of the pneumatic components is set according to the nominal clearance.

2.6 The pipe must be easily accessible in such distances so that each screw fitting can be disassembled with a common set of tools.

2.7 All pipe is always installed and fixed so that no unwanted vibrations occur and it is not welded to pipe holders. The end of the pipe before the hose connection must be attached.

2.8 No glued joints must be inside the machine.

2.9 If possible, the supplier is obligated to use components in line with the EN, ISO, ČSN and DIN standards.

2.10 In order to facilitate the maintenance it is recommended to use integrated systems (module, tower) in line with EN, ISO, ČSN, DIN. Basically a maximum of ten pneumatic components may be grouped into one tower.

2.11 Pneumatic construction components such as valves, distributors should be grouped into a case or in a panel. In simple cases these pneumatic elements may be placed on the outer side of the machine's body.

2.12 Control and regulation components must be easily accessible and close to the power components.

2.13 Pneumatic components must be protected against vibrations and impacts.

2.14 All components, blocks the weight of which is more than 15 kilos must be realized so that a lifting device may be used.

2.15 The use of materials disturbing the polish, including silicone, is inadmissible.

2.16 Air blow-offs from the pneumatic machinery into the atmosphere must be planted with noise dampers and arranged so that their unintentional closing is prevented and the process is not started.

2.17 All pneumatic components are assembled in the original version. No change is admissible.

2.18 Materials for the sealing components are given by the operation conditions.

3 Component versions

Regulation components of the flow rate and pressure to be used in a lockable BKS – E 11 version at the setting of system and process values. They must be approved separately for each project.

3.1 Linear pneumatic motors

Preferably, cylinders in line with DIN ISO 15552, ISO 6432, ISO 21287 and VDMA 24562-2 with liftin devices as given by DIN ISO 4393 should be used. Other versions must be approved in advance by SkodaAuto.

All cylinders must be equipped with an adjustable powerful damping in end positions. The piston-rod must be corrosion-resistant with a surface hardness of C54 Rockwell.

3.2 Control and regulation components

Integration of the components in line with 39 D 1260.

3.2.1 ISO ISO Distributors

Distributors with perforation as given by ISO 5599, size 1 and 3 or ISO 15407-1 (VDMA 24663) size 01 should be used.

Slide valve distributors are assembled exclusively along horizontal slide axis so that resistance against a spontaneous rearrangement is enhanced.

3.2.2 Pressure switches

Placement behind the pressure regulator of the air modification unit. The switch spot is generally placed 0.5 bar under the set working pressure.

3.2.3 Electric magnets

24V direct current electric connections with connectors M12x1 as per IEC 61076-2-101, with a PIN setup as given by ISO 23570-1, with a LED and a switching diode or as given by EN 175301-803 and EN 175201-804.

The connectors must always be approved separately for every project.

3.2.4 Air valves

If the inner volume of an air valve exceeds one liter or the product of the nominal volume in litres and the maximum pressure of the air valve in MPa exceeds the value of 10, then the working overpressure is higher than 0.07MPa, the air valve is considered a stable pressure container ČSN 690010-x.

ČSN 690012 must be adhered to for the operation purposes which stipulates that documentation in line with ITS 6.21 Stable pressure tanks must be supplied.

3.3 Fittings and connective components

3.3.1 Fixed air pipage

Only steel, exact, „Chrom VI – freie“ pipes may in line with EN 10305-4-E 235 only may be used.

Considering the maximum air pressure, air pipage must be operationally safe.

3.3.2 Hoses pipe

Hose channelin is allowed only from the valve. Correct hose type (PUN, PEN, PAN, PLN, PFAN) must be selected according to application environment.

It must not go through the device frame. In a dry environment, it is possible to use the PA 11W polyamide pipes with a socket connector as given by DIN 73378.

3.3.3 Screw fitting

Only steel, exact, „Chrom VI – freie“ screws with elastic seals, neck and screw cap may be used in line with DIN EN ISO 8434-1.

3.4 Additional machinery

3.4.1 Pressure meter

Maximum operation pressure must be highlighted red on the pressuremeter scale.

Snalling scale must be divided into bars even if the scale is used for reading derived quantities. The scale range must equal roughly a double of the operation pressure.

4 Control

4.1 General regulation

When sectioning production machinery into stations and units all functions must be ensured without unwanted mutual influence and in a fixed time sequence of all working moves including control signals.

Controlling must be conducted in a way so that all moves are blocked and the clamping pressure is maintained if the electricity shuts down or the control pressure is lost.

No dangerous moves may occur upon renewal of the electricity supply or the control pressure.

4.2 Manual control

safety switch must be in the reach of the operator which ensures blocking of all moves as well as the clamping pressure if the need arises.

If an effective protection of hands is missing at working and operating tasks a two-hand safety device must be used. For a programme-controlled machinery, step-by-step setting must be possible without an undue overlap of the steps.

4.3 Controlling moves

It is necessary to adjust the control of the pneumatic moves to the path.

If such control cannot be installed or is found unurposeless, it is necessary to agree another type of control.

4.4 Control elements layout

Pneumatic components must be easily accessible and as close to the appliance as possible.

The distance between the controlling valve and the pneumatic motor must not be more than three metres. If longer pipe is needed in some cases the nominal clearance must be one degree higher.

For electric circuits of the control elements the ITS 1.11 – Electricity is binding.

5 Labelling components on production devices

All pneumatic parts must be labelled unambiguously. The labels should be placed on irreplaceable parts.

Labelling in the pneumatic scheme and in the list of pneumatic components must adhere to the labelling on the component itself, including the description of function and the electric magnets.

5.1 The following data must be given on the label:

- Type
- symbol ČSN ISO 14617-x, ISO 1219
- Manufacturer
- Maximum pressure

5.2 All connective pipes must be labelled as given in the pneumatic scheme.

Labels must be marked indelibly, adhesive tapes are inadmissible.

6 Noisiness according to ITS 1.19

For machines and devices with pneumatic control the noisiness of **75dB** must not be exceeded (applies to the whole machine). Deviations must be approved individually.

7 Safety

7.1 Every pneumatic device must be secured with regard to operational pressure, temperature and the influence of outside factors.

7.2 If the electric device breaks down or it is shut down the operating staff must not be in danger.

7.3 The ITS 1.11- Electricity is binding for electric circuits.

7.4 The supplier has the obligation to use the pneumatic components only within their technical parametres given by the manufacturer.

7.5 ITS 1.18 Working safety is binding for pneumatic devices.

8 Technical documentation

8.1 General conditions

Two copies of the pneumatics scheme, pneumatic components list, functional graph and the pneumatic component layout must be delivered for testing and authorization to ŠkodaAuto before production at the supplier is launched.

Testing and authorization of the documentation delivered does not apply to functional correctness of the devices nor to the dimensions of the construction parts.

If any changes need to be made to the pneumatic system for construction or operational reasons, revised documentation must be sent to ŠkodaAuto (in two copies) to be authorized.

The pneumatics scheme must adhere to ČSN ISO 14617-x, ISO 1219.

The pneumatics scheme drawings must be done as per ITS 1.01. Apart from the data carriers the data should be submitted in hardcopy on A3/A4 sheets.

8.2 Pneumatics scheme

8.2.1 Generally

All pneumatic components as well as all electric signalling elements must be included in the pneumatics scheme.

The components must be represented in a zero position, or in the initial position of steering. Deviations must be recorded.

8.2.2 Labelling pneumatic components

Every component must be labelled with gradual numbers and indexes. With distributors the manner of control and the switching positions must be labelled.

8.2.3 Labelling pipe connections

Pipe connections are labelled on the pneumatic component or the connection desk. All plumbing (pipage, hoses) must have identical labels at their ends.

8.2.4 Technical data of a component

With individual components in the pneumatics scheme it is necessary to give the following data:

- Pressure or allowed pressure in bars on pressure valves and switches
- Inner diameter of the valve, maximum lift in mm, its function, e.g. clamping, lifting, etc. on direct pneumatic motors
- Nominal clearance and the connection parameters of the screw on pipage and hoses
- Volume in litres and operational pressure in bars on air tanks
- Voltage, type of voltage, power output in on electrically controlled components

8.3 List of pneumatic components

All components are listed separately including the following data:

- component designation
- full type labelling of the component
- manufacturer
- number of pieces
- ordering number of the component

8.4 Functional graph

In the functional graph time sequence of all working moves including the control signals must be given. Manner of submitting the graphs must be agreed.

8.5 Pneumatic component layout

Pneumatic component layout on the machine must provide a clear overview of the factual location of the pneumatic components on the production machinery.

8.6 Pneumatic machinery operation and maintenance manual

The pneumatic machinery operation and maintenance manual must contain the following:

- Data on starting/shutting-down and putting into operation of the pneumatic system
- Values for the adjustment of the individual regulation components and manner of their adjustment
- Exact maintenance manual for special pneumatic machines
- Layout of the pneumatic components, filters, diagnostic connectors, etc. on which a regular maintenance must be conducted

9 List of recommended spare parts Release list of manufacturers of pneumatic components

List of manufacturers of pneumatic components applies to deliveries of new machinery, repairs of pneumatic systems at existing machinery and deliveries of pneumatic components.

If, for technical reasons, a manufacturer must be selected that is not on the supplier's list, a written authorization from ŠkodaAuto is necessary, for the pneumatic components listed particularly on this list.

For pneumatic components stated below the selection is free against a written authorization from ŠkodaAuto.

9.1 Linear pneumatic motors

Types according to the manufacturer's catalogue.

Use of special pneumatic motors must be agreed.

9.1.1 Pneumatic valves

Realization and manners of attachment in line with DIN ISO 15552, ISO 6432 and VDMA 24562-1, -2 with a recommended lift as given by ISO 4393.

Festo	Poličské strojírný
Hoerbiger	Norgren Herion
Parker Hannifin	SMC
Numatics	Stránský Petržák
Aventics	

9.1.2 Short-lift valves

Realization in line with Provedení dle ISO 21287.

Hoerbiger	Festo
Aventics	

9.1.3 Non-piston valves

Festo	Hoerbiger
Norgren Herion	Stránský Petržák
SMC	Aventics

9.2 Oscillating pneumatic motors

Types according to the manufacturers catalogue

Festo	Desoutter
Norgren Herion	Specken Drumag
Aventics	

9.3 Multipliers

Use must be agreed.

9.4 Distributors

9.4.1 2/2 distributors

Types according to the manufacturer's catalogue

9.4.1.1 Electromagnetically controlled

Connection : G 3/8, G 1/2, G 1, G 1 1/2, G 2

SMC	Festo
Hoerbiger	Norgren Herion
Aventics	

9.4.1.2 Pneumatically controlled sealing ball distributors.

Connection: G 1/2, G 1, G 1 1/2, G 2

SMC	Festo
Norgren Herion	Aventics



9.4.2 3/2 Distributors

Types according to the manufacturer's catalogue

9.4.2.1 Electromagnetically controlled

Used as pilot valves for 5-way distributors.

Nominal clearance: Js 1.3/1.5 mm, connection parametres as given by CNOMO.

Connection : G 1/4, G 1/2, G 1

Hoerbiger	ITV
Poličské strojírny	SMC
Festo	Norgren Herion
Aventics	Parker Hannifin

9.4.2.2 Pneumatically controlled

Connection : G 1/8, G 1/4, G 1/2, G 1

Poličské strojírny	SMC
Norgren Herion	ITV
Hoerbiger	Parker ORIGA
Festo	Parker Hannifin
Aventics	

9.4.2.3 Mechanically controlled

Nominal clearance, connection: NG 2,5 , G1/8, G1/4

Poličské strojírny	Crouzet
Festo	SMC
Norgren Herion	Aventics
Parker Hannifin	

9.4.2.4 Manually controlled

Connection : G 1/4, G 1/2, G 1

ZTR	Legris
Poličské strojírny	Festo
SMC	ITV
Aventics	

9.4.2.5 4/2. Distributors

Types according to the catalogue

Conection : G 1/4

Festo	SMC
Poličské strojírny	Norgren Herion
Aventics	

9.4.2.6 5/2, 5/3 Distributors

Perforation as given by ISO 5599-1 size 1,3.

Types according to the manufacturer's catalogue.

Poličské strojírny	Hoerbiger
Festo	SMC
Norgren Herion	Numatics
Aventics	Parker Hannifin

9.5 Safety valves for presses

Types according to the manufacturer's catalogue

Nominal clearance: Js 20, 32, 50

Norgren Herion	
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9.6 Control and regulation components

Backvalves, controlled one-way valves, controlled two-way valves, pressure valves, choke valves

Connection : G 1/8, G 1/4, G 1/2, G 3/4, G 1

Types according to the manufacturer's catalogue.

Poličské strojírny	Norgren Herion
Baumgartner	Hoerbiger
Festo	Legris
SMC	ITV
Parker Hannifin	Aventics

9.7 Units for air modification

For G 1/4 to G1 block version is preferred.

Types according to the manufacturer's catalogue.

9.7.1 Filters

The following versions are allowed:

G 1/4 connection, G 1/2, G1 connection – preferred version as per 39 D 1436 for block version.

G 1 1/2, G2 – preferred version as per 39 D 1437

Filtration quality of 5 microns

Poličské strojírny	SMC
Festo	Norgren Herion
ITV	Aventics
Parker Hannifin	

9.7.2 Pressure regulator

9.7.2.1 Manual setting

Preferred versions as per 39 D 1383 for block versions

Connection : G 1/4, G 1/2, G 1

Poličské strojírny	SMC
Festo	Norgren Herion
ITV	Aventics
Parker Hannifin	

9.7.2.2 Pneumatic setting

Preferred versions as per 39 V 16352 for air installations.

Connection : G 1, G 1 1/2, G 2

Norgren Herion	SMC
ITV	Parker Hannifin
Aventics	

9.7.2.3 Electronically controlled

Preferred versions as per 39 D 1381.

Connection : G 1/2, G1

SMC	Norgren Herion
Festo	Aventics
Parker Hannifin	

9.7.3 Lubricators

Preferred versions as per 39 D 1439 for block versions.

Connection : G 1/4, G 1/2, G 1

Poličské strojírny	SMC
Festo	Norgren Herion
ITV	Aventics
Parker Hannifin	

9.7.4 Sound dampers

Preferred versions as per 39 D 1466

Přípoj : G 1/8, G 1/4, G 3/8, G 1/2, G 3/4, G 1

Connection: G 1/8, G 1/4, G 3/8, G 1/2, G 3/4, G 1

Festo	Wienäber
Norgren Herion	SMC
Poličské strojírny	Legris
Aventics	

9.8 Logical components with accessories:

YES, NO, OR, AND, delay valves, bistable components, monostable components, signal components, tact components, counters, visualizing components, gears, amplifying components

Types according to the manufacturer's catalogue.

Air Com	Legris
Crouzet	Festo
Norgren Herion	SMC
Aventics	

9.9 Pressure switches

Scale of the overpressure setting: 0.5 up to 6 bar and 1 up to 12 bar

Preferably, electronic pressure switches are required.

Types according to the manufacturer's catalogue.



9.9.1.1 Electromechanical

Norgren Herion	SMC
Hoerbiger	Festo
Aventics	Parker Hannifin

9.9.1.2 LCD/LED Electronical with an LCD/LED monitor

We require direct data on pressure value in bar.

IFM	SMC
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9.10 Vacuum components : Venturio pipes, sucker

Crouzet	Sapelem
Festo	Unimatic
Norgren Herion	SMC
Aventics	Schmalz

9.11 Valve terminal

The version must be authorized in advance by ŠkodaAuto

Festo	SMC
Norgren Herion	Aventics

9.12 Accessories

Types according to the manufacturer's catalogue

9.12.1 Plumbing, hoses, screw fitting

9.12.1.1 Fixed plumbing

Only steel, exact, „Chrom VI – freie“ pipes as per EN 10305-4-E 235 should be used.

based on selection	
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9.12.1.2 Hose pipes, PUN, PEN, PAN, PLN, PFAN.

Legris	ITV
Norgren Herion	SMC
Festo	Aventics
Parker Hannifin	

9.12.1.3 Hoses with a textile lining

Inner and outer diameters as per 39 V 1256.

Semperflex Odry	Hildendorf
Aeroquip	Parker Hannifin

9.12.1.4 Screw fitting

Use only steel, exact, „Chrom VI – freie screw fitting with elastic sealing, neck and a cap nut as given by DIN EN ISO 8434-1.

Eaton Walterscheid	Woss
Parker Hannifin	

9.12.2 Connectors :- Safety connectors

Connection : G 1/4, G 3/8, G 1/2, G 3/4

- Fast connectors

Connection : G 1/4, G 3/8

Realization allowed : for air in line with ISO 6150, for water in line with ISO 7241.

Festo	Stäubli
SMC	Walter
Rectus	Legris
Norgren Herion	Cejn
Parker Hannifin	