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GENERAL TECHNICAL CONDITIONS
OF THE LINEAR HYDRAULIC MOTORS
For production, supply and operation of the hydraulic cylinders

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1. INTRODUCTION

These technical conditions (hereinafter referred to as "TC") are processed, in technical and economical terms, for production, supply, use and operation of the linear hydraulic motors (hereinafter referred to as "LHM") for road and constructional machinery. These hydraulic cylinders are specifically designed for use in the road and constructional machinery. They are binding for both supplier and customer and make part of the sale and purchase agreements.

2. SCOPE OF APPLICATION

2.1 Use

The linear hydraulic motors are the elements, which transform the pressure head into the mechanical i.e. axial force in the piston rod extraction or retraction.

The LHM constructed as single-purpose ones, for an integration into the hydraulic system of the road and constructional machinery. Their further utilization must be approved by a designer.

2.2. Conditional characteristics for the products are:

- keeping the manufacturer and customer informed on instructions for the tests, acceptance, supply, warranties, packing, transport, storage and maintenance requirements.
- they make an integral part at signing up of the economic agreements or contracts and solving the controversies between the manufacturer and customer.
- execution of modifications in the TC, which relate to the main technical parameters of the product, must be reciprocally approved between the manufacturer, customer and author of the TC

3. TECHNICAL PARAMETERS

Main installation dimensions are in the dimension drawing.

Nominal pressure:		16*	MPa
Maximal working pressure for a period of 10 sec.:		20*	MPa
Testing pressure:		25*	MPa
Work speed:		0.2	ms^{-1}
Efficiency at retraction:		0.92	
Efficiency at extraction:			0.94
Swinging out of the end positions in a speed of	up to	1	s^{-1}

*- the pressures are modified according to the cylinder type.

4. PARAMETERS CHARACTERIZING THE SCOPE OF APPLICATION

4.1 Operating conditions:

-ambient temperature:	253 K up to 343 K - 20 C up to + 70 C
-temperature of the working fluid:	253 K up to 353 K - 20 C up to + 80 C
-required filtration:	up to 40 μm
-working environment:	N 13 and MT 14
-recommended range of oil viscosity:	2.8.....380mm2/sec

-recommended oils: hydraulic oils of the ISO-L HM classes and HV grade 32 to 68, or their ecological equivalents.

If an operation in difficult temperature conditions of - 40 C up to + 80 C is required, some modifications of material, technical and technological configuration of the LHM will be necessary. The modifications have effect on an advanced price and prolongation of the term of delivery up to about 4 months.

4.2 Operating position:

Operating position of the linear hydraulic motor is optional. The installation must be carried out in such a manner that the piston rod is stressed only by axial forces. Radial load of the piston rod by external forces is not allowed. Rotational movement of the piston rod out of the end positions is allowed only in a restricted range. Fixation method is determined by the LHM construction and no restriction of the hinge bearing inclination in the range specified in the STN ISO 12240 may occur.

5. QUALITY PARAMETERS

5.1 Criteria of the reliability indicators according to STN 010606 standard

-product class:	3
-time mode of the operation:	operative
-reliability group	I.
-restriction of the utilization time:	forced.

5.2 Reliability indicators

-mean tech. lifetime up to the rejection: $\vec{t}_{\check{z}vyr}$=1.0 10^6 cycles up to the stroke of 1000 mm

or 1000 km of the path

-mean time between the malfunctions: $\vec{t}_{\check{z}} = 4.0 \,.\, 10^5$ cycles for the stroke up to 1000 mm

or $4 \,.\, 10^5$ m of the path for the stroke over 1000 mm

-mean operat. work expenditure of the repair or maintenance: $\vec{t}_{po} = \vec{t}_{pu} = 4$ hours

Reliability indicators are set on the basis of comparison of other linear hydraulic motors.

6. EFFECT ON ENVIRONMENT

Operation of the linear hydraulic motor at ordinary maintenance of the technical conditions has no negative impact on environment. Maintenance of the technical conditions of the linear hydraulic motor must be aimed at the tightness of all oil supply joints and good sealing of the piston rod. The wear of the piston rod sealing causes an excessive oil leakage therefore the sealing must be changed in time.

6.1 Tightness

-external: leakage of the working fluid of 0.003 cm^3/m^2 of the sealed surface at a nominal pressure and speed of 0.2 $m.s^{-1}$ and kinematic viscosity of the working fluid of 40 . $l0^{-6}$ mm/s^2

-internal - leakage of the working fluid at a nominal pressure and kinematic viscosity of 40 . $l0^{-6}$ mm/s^2 maximum

$L = 148 . 10^{-6}. D^2$

L = Leakage cm/3 minutes

D = Piston diameter mm

7. TECHNICAL DESCRIPTION AND REQUIREMENTS FOR THE PRODUCT EXECUTION

7.1 Technical description

The linear hydraulic motor consists of a steel pipe, which the lids and fastening elements are screwed down and sealed or welded up to. The inlet openings are located in the rear lid or welded up on the pipe. A piston with a piston rod, which are bind together by a thread and sealed, are placed in the pipe. The piston sealing is carried out by a compact sealing set, which contains also a guiding part. The piston rod is sealed by a slot cup inserted into the front lid, its guiding is provided by the guide rings. A scrapper ring is placed outside in the front lid and it prevents from an intrusion of the impurities to the inside of the linear hydraulic motor.

7.2. Production

Production of the linear hydraulic motor will be provided according to a valid drawing documentation and these TC. Quality of the worked surfaces and manufacturing tolerances must be maintained according to ISO 2768-mK. Marginal divergences of the geometric shape and position must be maintained as it is stated on the individual drawings. Requirements for the material quality, heat treatment, production accuracy, quality and grade of the treatment and requirements for the surface finishing must be observed.

All divergences from the modifications of the drawing documentation must be reviewed by the constructor. An eventual modification of material of the substantial parts of the linear hydraulic motor must be reviewed by the constructor. Manufacturing technology must ensure an interchangeability of the functional parts during the product installation and repairs.

7.3. Installation

It must be carried out according to the valid arrangement drawing and fitting instructions with use of the tools suitable for the installation method. Suitable installation spaces, storage spaces as well as the spaces for the surfacing execution must be provided in the manufacturing organization. No use of the parts, which are damaged by corrosion, is allowed for the installation. Carry out the installation in a clean environment and in a procedure eliminating a pollution of the internal parts of the linear hydraulic motor. Pay a special attention to the sealing installation quality.

7.4. Surfacing

The surfacing depends on the weather resistance range. It is necessary to arrange the finishing with the manufacturer in case of the user requirement. The surfacing must be realized on the whole surface of the linear hydraulic motor, except for the overhanging parts of the piston rod, threaded parts and functional areas of the inlet openings.

8. PRODUCT EQUIPMENT

The linear hydraulic motor will be supplied in a constructional version determined by the TC. The delivery must include:

- Assembled and tested linear hydraulic motor containing a cover on the inlet opening
- certificate on quality and completeness of the product is delivered to every dispatched lot
- the spare parts may be delivered on the basis of a separate order of the customer, after a previous agreement with the linear hydraulic motor supplier.

9. PRODUCT DESIGNATION

The following data are embossed on every product:

a/ Manufacturer name and registered seat
b/ Main dimensions
c/ Nominal pressure expressed in MPa
d/ Version with a numeric and alphabetic code
e/ Serial number
f/ Month/year of production
g/ Weight expressed in kg
h/ Schematic mark of the product STN ISO 1219-1
i/ OTK (Technical Inspection Department) review body mark
See the Annex.

10. QUALITY MANAGEMENT

The quality management will be carried out by OTK of the manufacturing corporation on the basis of the valid background documents and TC requirements

Product modifications, preservation quality check, packing and product dispatch are provided by a verification of the product quality by the

production tests

acceptance tests

10.1 Production tests

Each product is subject to the production tests according to STN 119008, STN 119373 in this extent after the final installation. The production tests are carried out for verification of:

- by an external inspection the surfacing, paint quality, working area condition, connection threads and designation are checked
- minimal pressure for the piston motion
- external tightness at a nominal pressure in an ejected position
- external tightness at passive resistances in the whole stroke

Functionality by 10 strokes

- verification of the installation dimensions, connecting dimensions and stroke.

Products, which pass the production test, will be marked by OTK by its own mark and it will issue a certificate of product quality and completeness for each dispatch delivery.

10.2 Acceptance tests.

The acceptance tests are performed by the manufacturer according to the customer requirements. Range of the acceptance tests is set by STN 119008 and STN 119105 standards. The tests serve for verification of the parameters with the values set in the technical documentation.

Range of the defined tests:

l/ External inspection
2/ Dimensions
3/ Weight
4/ Minimal pressure for the piston motion
5/ Extraction and retraction force
6/ Characteristics
7/ Internal and external tightness.

The test results must be specified in the test protocol.

11. PACKING AND PROTECTIVE MEASURES

11.1 Preservation

Before sending any linear hydraulic motor to a customer the product must be furnished with preservation and packed according to the point 11.2 of these TC.

Internal spaces of the linear hydraulic motor are conserved with a test fluid having a preservation effect. The inlet opening must be tightly closed by a cover. Free end and unpainted areas are spread with preserving grease and covered by a foil wrapper.

Basic preservation period is 6 months. After expiration of this period the preservations must be restored. Date of the first preservation is specified in the certificate of product quality and completeness.

11.2 Packing

The packing must provide the product protection against damage, contamination and weather effects. The packing conditions are specified by an agreement with the customer and they will make part of an economic contract for the linear hydraulic motor supply.

11.3 Transport

Linear hydraulic motors may be transported by ordinary means of transport in a package, which will provide their protection against damage, contamination and weather effects. During the time of transport the packages containing the linear hydraulic motors must be properly fixed to the means of transport.

11.4 Storage

It is necessary to store the linear hydraulic motors being preserved in reserved and dustless places with a relative air humidity of max.70 % at a stagnation ambient temperature. Sudden ambient temperature variations are not allowed since they can cause a dew of the metal parts and whereby danger of an accelerated corrosion occurs.

The storage space must be protected against intrusion of aggressive substances and must not be used at the same time for storage of chemicals. The storage position is horizontal and in pallets. When 6 months expire after the last or first preservation, a new preservation of internal and external parts must be carried out according to the Art. 11.1.

11.5 Warranties

The manufacturer provides a warranty of 8 months from the supply date, maximum up to 10^6 cycles or 400 km of the slide way of the sealants used in the operation (by reason of the sealant lifetime) if not agreed otherwise with the customer.

When enforcing a complaint, it is necessary to submit the certificate of product quality and completeness or a photocopy of the certificate (from the dispatched lot), as well as a written protocol on the pressure test execution after the LHM installation (10 cycles with a rated load of the LHM).

Only purified LHM without connection and clamping elements of the customer and with the plugged inlet openings and without any intervention to the LHM, will be accepted for complaint. Warranty may be enforced only if the TC of the product in question and these TC are observed.

12. INSTRUCTIONS FOR SERVICE

12.1. Operation

Hydraulic circuit must be completely deaerated after the LHM integration into the object – this must be provided also after an operation termination of the LHM longer than 48 hours – by execution of several double strokes without load up to the extreme positions with a pressure holding time of min. 10 seconds.

No underpressure and LHM air intake during operation is allowed. At activation of the LHM there may be an increased quantity of oil on the piston rod in the first several tens of the operation cycles. It is the oil, which remains in the space between the oil scrapper ring and sealing ring after the installation. This phenomenon will discontinue after having taken max. 100 complete double strokes and it is not a reason for complaint enforcement for an external leakage.

It is necessary to protect the piston rod against any mechanical damage, impact by a hard object and the like, during the LHM storage or operation. The piston rod is equipped with a hard chrome coat, which provides a high wear resistance, but not a perfect corrosion resistance. Therefore in case of a longer discontinuity of the machine operation it is suitable to keep the piston rod inserted. If this is not possible and there is a longer work discontinuity (more than 5 days), then it is necessary to coat the piston rod with a preserving grease.

Before re-actuation of the machine it is necessary to remove hardened impurities from the piston rod. During the winter operation, before putting the machine into service, it is necessary to remove any frost deposit from the extracted piston rod (the frost will damage the sealing in one stroke).

12.2. Maintenance

Linear hydraulic motors do not require any special maintenance during the time of their operation; however, it is necessary to check regularly whether some foreign particles did not damage the piston rod or whether there was no excessive leakage of oil around the piston rod, eventually whether the scrapper ring was not damaged.

Repair or replacement of the damaged parts must be carried out in a specialist workshop dedicated for it and by a specialist assigned for hydraulic devices repair.

The eye bearings must be regularly and sufficiently lubricated.

13. WARRANTY CONDITIONS

13.1. Warranty

The manufacturer provides warranty for a failure-free warranty of the LHM for a period of 18 months or for 4 x 10^5 working strokes in accordance with the point 5.2 of the TECHNICAL CONDITIONS (TC).

The warranty or complaint does not cover the following:

- an increased occurrence of oil on the cylinder piston rod by reasons mentioned in point 12.1 of the TC
- if any LHM was used in defiance of the recommendations on the LHM storage, operation and maintenance, see points 11.4, 12.1 and 12.2 of the TC
- defects arising during a crash of the device, which the LHM in question was installed to
- defects arising by reasons of natural disasters.

13.2. Warranty period

The warranty period begins on the day of the LHM handover to the customer in form of a signed dispatch note.

The condition for an acknowledgement of warranty period for a failure-free operation is submission of a dispatch note and a remittance slip for the LHM in question. This condition does not relate to the invoices prior to maturity.

Warranty period after an acknowledged repair is provided for a period in accordance with the point 13.1 of the TC.

14. COMPLAINTS PROCEDURE

Failure or defect must be clearly defined; in case of mechanical failures it must be proved by photos and by reason of an LHM identification supported by a copy of the dispatch note.

Failure arising on the basis of so called hidden faults of used materials must be discussed and acknowledged by the supplier by means of a log.

The buyer will report his complaint to the e-mail address:
avast@avast.sk

The complaint is not acknowledged without a written or electronic report sent in time.