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1 Hints

1.1 General Hints

Please read through these instructions for running-in carefully before you set the brake into operation.
Please pay special attention to the safety instructions!
The instructions for running-in are part of your product. Please keep them carefully.
The copyright for these instructions for running-in remains with **KTR** Kupplungstechnik GmbH.

1.2 Safety and Advice Hints

STOP	**DANGER!**	**Danger of injury to persons.**
!	**CAUTION!**	**Damages on the machine possible.**
☞	**ATTENTION!**	**Pointing to important items.**

2 Instructions – Running-in of Brake Pads

☞ **HINT!**
The present instructions for running-in exclusively apply for the brake pads supplied by KTR Kupplungstechnik GmbH.

2.1 General Hints for Brake Pads

New brake pads have a considerably reduced coefficient of friction compared to the brake disk.That is why the brake pads have to be adapted to the brake disk before the first normal use of the brake system via a running-in process in order to optimize the coefficient of friction compared to the brake disk. For that purpose the load has to be applied in several steps until the full load of the brake has been achieved.

⚠ **ATTENTION!**
If a running-in process is not performed with increasing load levels, only about 20 % of the friction pad surface are bearing which results in an impermissible amount of surface pressure and the destruction of the friction pad under operating conditions.

As a basis it should be checked if all preconditions of the operating instructions with regard to setting, installation as well as the condition of the brake disk and brake are adhered to. For that purpose specifically the geometry of the disk and the quality of the surface have to be checked.

☞ **HINT!**
Please make sure that the brake disk is free from all preserving agents, corrosion preventives like, for example, Tectyl, Rivolta etc., mounting grease, packaging material, etc.

It is recommended to run the running-in processes at different clamping forces and each 5 cycles per station. The stations should be effected in at least five steps while increasing the rated force of the brake by each 20 %. With spring-actuated brakes this can only be realized by maintaining a pressure against the elastic force, with active brakes by generating a corresponding reduced operating pressure (see chapter 3).
Please contact KTR Kupplungstechnik for any further questions.

2.2 Running-in of Organic Brake Pads

☞ **HINT!**
Please make sure that organic brake pads are concerned in your case.

The braking processes have to be performed with each cycle until a surface temperature of 150 °C has been achieved. The brake disk should cool down to a starting temperature of a maximum of 50 °C in between the individual running-in processes. If this cannot be realized, more cycles of a higher starting temperature per station have to be run accordingly. In this context it has to be made sure that a brake disk temperature of 200 °c is not exceeded in any case. If possible, the temperature should be measured during the braking cycle in different positions in torsional direction on the brake pad.

☞ **HINT!**
A friction speed of 5 m/s should not be exceeded as a maximum speed for the running-in process.

2 Instructions – Running-in of Brake Pads

2.3 Running-in of Powder Metal Brake Pads

☞ **HINT!**
Please make sure that powder metal brake pads are concerned in your case.

The braking processes have to be performed with each cycle until a surface temperature of 350 °C has been achieved. The brake disk should cool down to a starting temperature of a maximum of 100 °C in between the individual running-in processes. If this cannot be realized, more cycles of a higher starting temperature per station have to be run accordingly. In this context it has to be made sure that a brake disk temperature of 400 °C is not exceeded in any case. If possible, the temperature should be measured during the braking cycle in different positions in torsional direction on the brake pad.

☞ **HINT!**
A friction speed of 20 m/s should not be exceeded as a maximum speed for the running-in process.

2.4 Effect of the Running-in Process

One criterion for the effect of the running-in process is that the braking torque does no longer increase significantly between one cycle and another. If necessary, more than each 5 cycles per station have to be performed or the entire running-in process has to be repeated. Another criterion for a successful running-in process is the increasing amount of wear of the friction pad as well as a visible and even bearing surface on the brake disk surface. In this case the brake pad has a bearing surface of at least 80 % of the overall surface.

☞ **HINT!**
A friction speed of 5 m/s with organic brake pads or 20 m/s with powder metal brake pads do not have to be exceeded as a maximum speed for the running-in process.

⚠ **ATTENTION!**
Brake pads made of organic material are very sensitive to grease and oils and therefore cannot be cleaned. Brake pads having such kind of dirt need to be replaced and disposed of.

In contrast to the organic brake pads, brake pads made of powder metal can be cleaned from grease and oil as long as they are not fully soaked with grease and oil.

☞ **HINT!**
We would recommend to leave the brake pads in packed condition as long as possible in order to protect them against any kind of dirt.

Having completed the running-in process of the brake pads, it has to be checked by an appropriate test if the necessary braking torque or the necessary braking time have been achieved.

3 Calculation of Operating Pressure

The necessary operating pressure with reduced clamping force is calculated for hydraulically actuated brakes (active brake) as per chapter 3.1 and for spring-actuated brakes (passive brakes) as per chapter 3.2.

F_c = Rated clamping force [N]
$F_{c,\,erf}$ = Required clamping force [N]
$A_{K,\,wirk}$ = Effective piston surface [mm²]
p_{erf} = Required operating pressure [bar]
$p_{Prozent}$ = Percental share of rated clamping force [%]

3.1 Hydraulically Actuated Brake (Active Brake)

Formula to calculate the required operating pressure:

$$p_{erf} = \frac{F_{c,erf}}{A_{K,wirk}} \cdot 10$$

Example of calculation:

KTR-STOP® YAW M

Rated clamping force:	F_c	=	203.000 N
Effective piston surface:	$A_{K,\,wirk}$	=	12.700 mm²
Percental share of rated clamping force:	$p_{Prozent}$	=	10 %

$$F_{c,erf} = \frac{F_c \cdot p_{Prozent}}{100}$$

$$F_{c,erf} = \frac{203.000 \cdot 10\%}{100} [N]$$

$$F_{c,erf} = 20.300\ [N]$$

$$p_{erf} = \frac{F_{c,erf}}{A_{K,wirk}} \cdot 10$$

$$p_{erf} = \frac{20.300\ [N]}{12.700\ [mm^2]} \cdot 10$$

$$\boxed{p_{erf} \approx 16\ [bar]}$$

3.2 Spring-actuated Brake (Passive Brake)

Formula to calculate the required operating pressure:

$$p_{erf} = \frac{F_c - F_{c,erf}}{A_{K,wirk}} \cdot 10$$

Example of calculation:

KTR-STOP® M-xxx-F

Rated clamping force:	F_c	=	120.000 N
Effective piston surface:	$A_{K,\,wirk}$	=	13.740 mm²
Percental share of rated clamping force:	$p_{Prozent}$	=	20 %

$$F_{c,erf} = \frac{F_c \cdot p_{Prozent}}{100}$$

$$F_{c,erf} = \frac{120.000 \cdot 20\%}{100} [N]$$

$$F_{c,erf} = 24.000\ [N]$$

$$p_{erf} = \frac{F_c - F_{c,erf}}{A_{K,wirk}} \cdot 10$$

$$p_{erf} = \frac{(120.000 - 24.000)\ [N]}{13.740} \cdot 10$$

$$\boxed{p_{erf} \approx 70\ [bar]}$$