

Diaphragms - BEWARE!

The humble diaphragm fitted in the service portion of brake actuators may look like a simple component, but don't be fooled. A lot of experience and technology has gone into ensuring the diaphragm provides the actuator with the desired output characteristic.

Background

Actuators for wedge brakes have a maximum stroke of 45, 50 or 53mm and generally come in sizes of T9, T10.5, T12 and T14 (the number denoting the effective area of the diaphragm in square inches). Actuators for S-cam brakes originally had a maximum stroke of 57mm, however, with the advent of automatic slack adjusters the maximum stroke increased to 64mm and many trailers need 75mm of stroke to cope with additional legal requirements and the wind-up of long camshafts. These S-cam actuators normally had sizes of T16, T24, T30 and T36.

With the introduction of air disc brakes as standard on most trucks and buses and the need to fine tune the vehicle's braking system to achieve optimum performance, brake system designers required actuators with interim sizes, such as T18, T22 and T27.

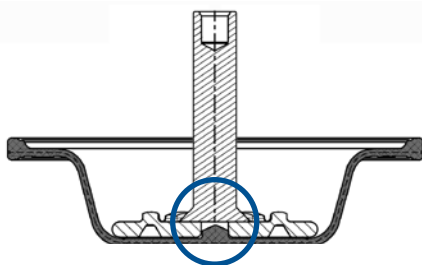
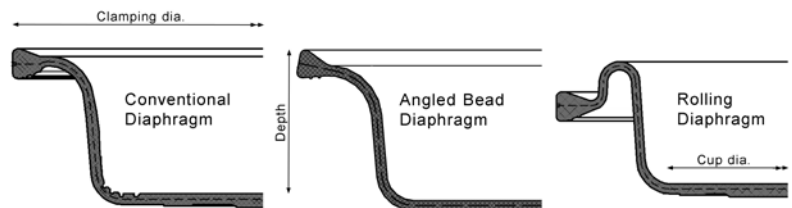
So you can see that the need has arisen for diaphragms to be used in actuators providing varying combinations of size and stroke capability. Fortunately many of the requirements have been rationalised resulting in fewer diaphragm variants. However, the rationalisation is not always obvious and this is where **users must beware!**

Design Variants

The main technical features of a diaphragm (in addition to the effective area) can be summarised as:

- General configuration – divided into three groups, namely: 'Conventional', 'Angled Bead' and 'Rolling' (see diagram).
- Clamping diameter – the diameter of the bead which is gripped by the actuator to form a seal.
- Cup diameter – the diameter of the base of the diaphragm in which the actuator's push plate sits.
- Depth – as it implies – this is the factor that mainly determines the maximum stroke capability of the diaphragm.

For most applications 'Conventional' and 'Angled Bead' diaphragms are interchangeable although installation of a diaphragm in an actuator left in situ on the vehicle may prove difficult. 'Rolling' diaphragms are obviously a breed apart.



The interchangeability of diaphragms with respect to other features relies on matching the dimensions as closely as possible, but this may not be the whole story. An example of this is the provision of a central 'pip' on some diaphragms which locates in a hole in the push plate (avoids the need for gluing the diaphragm to the push plate) to ensure that the push plate stays centrally located in actuators where it does not fill the 'cup diameter' of the diaphragm.

In summary, the wisest policy is to replace diaphragms on a "like for like" basis unless there is a manufacturer's stated alternative.
(see overleaf for more details on common Knorr-Bremse diaphragms)

Diaphragms for use in the Aftermarket

Knorr-Bremse's product range has benefited from the product portfolios of the many companies that have been integrated into today's organisation. Consequently the company has applied its expertise to offer a rationalised range of diaphragms for use in the Aftermarket effectively reducing the number of diaphragms that need to be stocked.

Below is a table setting out the commonly found actuator diaphragms and their Aftermarket replacement numbers:

TABLE OF COMMON KNORR-BREMSE ACTUATOR DIAPHRAGMS

Diaphragm Part No.	Application	Diaphragm Type	Aftermarket use	Diaphragm Part No.	Application	Diaphragm Type	Aftermarket use
1185301	T36	Angled Bead	234362DK	B64322	T24	Conventional	234100K
1188093	T18	Conventional	20LS	B66412	T24	Conventional	234100K
1188094	T22	Conventional	24LS	B74479	T12 & 14	Conventional	234226K
1188206	T25 & 27	Conventional	30LS	B75383	T30	Conventional	234101K
1189902	T20	Conventional	234099K	B79883	T14 & 16	Conventional	234189K
1190023	T27	Angled Bead	234101K	B81573	T10.5	Conventional	B81573
1480503006	T12	Conventional	234226K	B91475	T24	Conventional	234100K
1480503010	T16	Conventional	234189K	C31949	T10 & 12	Convntnl (with pip)	C31949
1480503018	T22	Conventional	234099K	C34578F	T12 & 14	Rolling (with pip)	C34578F
1480503024	T16	Conventional	234189K	C52066	T22	Conventional	234099K
1480503028	T14	Conventional	234189K	C60220	T22	Conventional	234099K
16LS	T16	Angled Bead	16LS	C60489	T20	Conventional	234099K
20LS	T20	Angled Bead	20LS	C60491	T16	Conventional	234189K
234099K	T20 & 22	Angled Bead	234099K	C66410	T16 & 18	Conventional	234189K
234100K	T24	Angled Bead	234100K	C66411	T18 & 20	Conventional	234099K
234101K	T30	Angled Bead	234101K	C66412	T24	Conventional	234100K
234189K	T14, 16 & 18	Angled Bead	234189K	C67204	T14	Conventional	234189K
234226K	T10.5 & 12	Angled Bead	234226K	C72336	T18 & 20	Rolling	C72336
234362DK	T36	Conventional	234362DK	C72337	T24	Rolling	C72337
234433K	T9	Angled Bead	234433K	C72568	T27	Conventional	234101K
236664	T12	Conventional	KY1505/2	C72580	T30	Rolling	C72580
24LS	T24	Angled Bead	24LS	C72596	T16	Rolling	C72596
272489	T9	Angled Bead	234433K	EB00612	T24	Angled Bead	EB00612
272647L	T15 & 16	Angled Bead	234189K	EB00747	T20	Angled Bead	20LS
272648L	T20	Angled Bead	234099K	EB00758/1	T16	Conventional	16LS
272649L	T24	Angled Bead	234100K	EB00758/2	T16	Angled Bead	16LS
272650L	T30	Angled Bead	234101K	EB00759	T30	Angled Bead	30LS
30LS	T30	Angled Bead	30LS	K025090	T16	Conventional	K025090
75681210	T14 & 16	Conventional	234189K	K025113	T20	Rolling	K025113
75681211	T20	Conventional	234099K	K025114	T24	Rolling	K025114
75681212	T24	Conventional	234100K	KY1505/1	T9	Conventional	KY1505/1
B49363/2	T16	Conventional	234189K	KY1505/2	T12	Conventional	KY1505/2
B61184	T20	Conventional	234099K	Z012791	T22	Rolling (with pip)	C72337
B61290	T16	Conventional	234189K				

NOTES: The replacement numbers shown are only to be read in the direction shown, i.e. the reverse is not necessarily true. The diaphragm that has been selected for Aftermarket use has been carefully chosen to provide the technical requirements of the diaphragm it is replacing as a minimum.

The Knorr-Bremse replacement part numbers ending in 'K' are improved versions of the the base number. Diaphragms from other manufacturers using the same base number do not have the improved characteristics of the Knorr-Bremse diaphragms.