Materials, design and construction

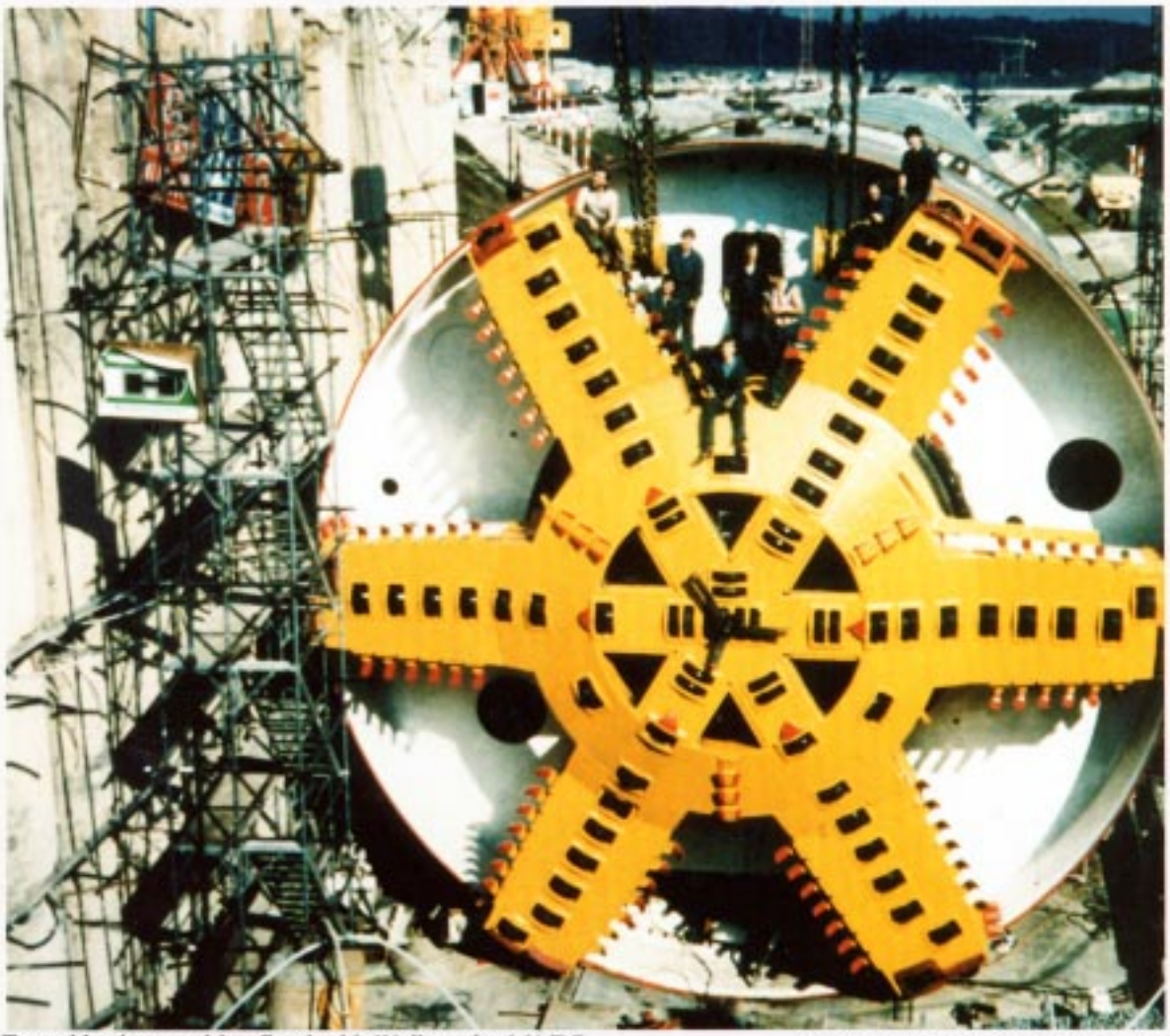
The following table outlines the range of materials most commonly used.

Reference	Materials	Max. # Temp. (°C)	Max. Speed m/s	General Features
M1	Nitrile (NBR)	120	12	Our standard material suitable for most applications. A flexible rubberised fabric back and rubber lip.
M2	Nitrile (NBR)	120	8	Material combination comprising rubber lip and a rigid fibre back. A self-retaining seal suitable for open housings.
M5	Butyl (IIR)	120	5	Used in some fluids for which nitrile (NBR)is not chemically compatible.
M6	Nitrile (NBR)	120	10	Incorporates an encapsulated steel band in the seal back. A self retaining seal suitable for open housings.
M8	Fluoroelastomer (FPM or FKM)	200	18	
M9	Fluoroelastomer (FPM or FKM)	140	22	As M1, but for higher speed applications.
NM28/80	Nitrile (NBR)	120	12	Rubber compounds incorporating lubricants to reduce seal wear and increase speed capability under adverse lubrication conditions.
NM48/80	Nitrile (NBR)	120	12	
Elast-O-Lion®	Hydrogenated Nitrile (HNBR)	150	12	High strength elastomer suitable for more aggressive applications including those where additional wear resistance is required.

Also see comments under "Performance" on page 2

Other rubber compounds and material combinations are available to meet your exacting demands. If assistance in material selection is required, advice is freely available from James Walker's applications engineers and our materials specialists.

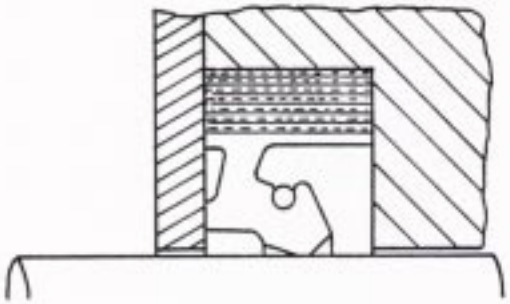
The above material designations in combination with the D7 design reference form a code which should be used for specifying Walkerseles e.g. M1/D7 Walkerseles are manufactured from M1 material (nitrile rubber lip with a rubberised fabric back). Separate literature is available for other designs such as the D6.



Tunnel boring machine fitted with Walkerseles M1/D7. *By kind permission of Herrenknecht GmbH.*

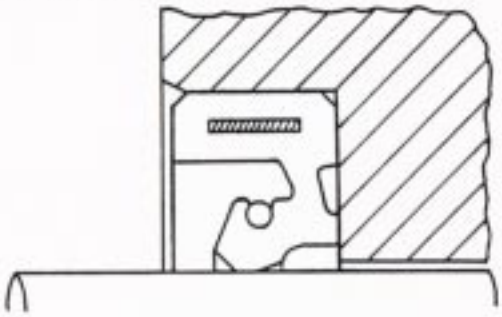
The D7 design of seal is available to suit two types of housing:

Retained seals



These seals must be used in housings fitted with retaining plates. Our standard material M1/D7 seals should be fitted in this way. Such seals can be supplied in split form, but see *Ease of fitting* below.

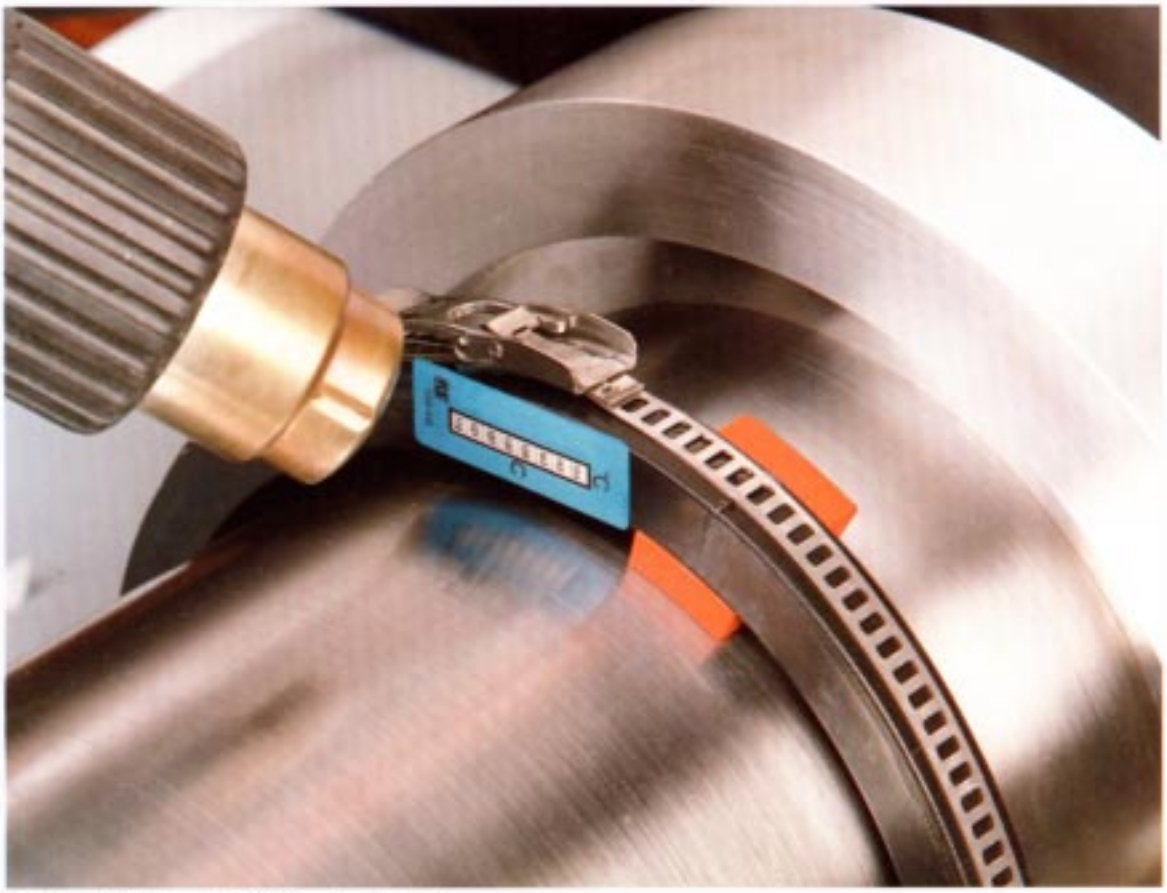
Self-retained seals



These seals may be fitted to open ended housings when sealing external fluids. The heel of the seal lip must be supported therefore the seal cannot be fitted facing inboard without a retaining plate.

Ease of fitting

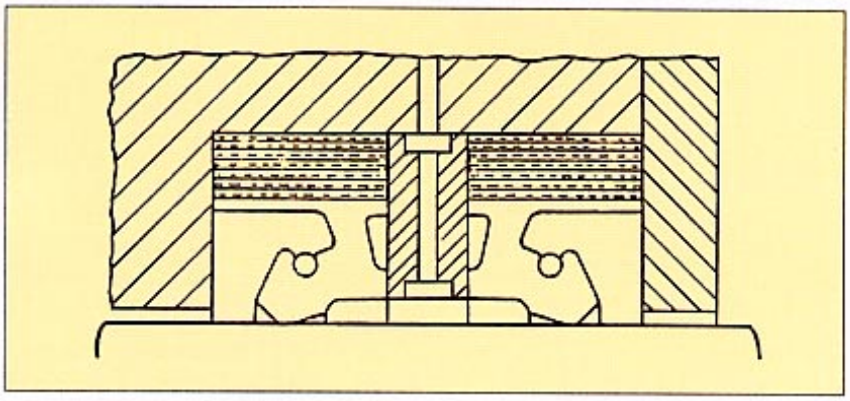
Ease of fitting is a prime consideration for all Walkersele products. Unlike rigid metal backed seals, the total flexibility of the Walkersele allows for easy fitting and removal. To reduce fitting time, retained seals can be fitted in split form; however as the D7 design is intended for pressure applications we recommend the use of Walkersele OSJ (on-site join) so as to ensure endless seal integrity. A separate brochure is available describing this product.



A typical Walkersele OSJ being joined.

Seal lubrication

When two or more seals are fitted in the same housing, an inter-seal plate must be fitted to ensure that the heel of the seals' lips are supported. If inter-seal lubrication is required, the support plate should be ported.



Availability and how to order

Existing moulds

An extensive inventory of permanent moulds is available (see lists). These seals are available on a short delivery time without mould charge. Unless otherwise specified, endless seals will be supplied.

Specials

Sizes not listed in the mould lists can be manufactured from new permanent moulds, or for smaller quantities or prototypes utilising our unique temporary mould facility. Seals to suit shaft diameters between 30mm and 2300mm can be produced using conventional moulding techniques. Larger sizes can be manufactured by utilising our sophisticated vulcanised joining methods.

When enquiring or ordering please state shaft diameter, housing diameter, housing depth, material/design combination e.g. 300mm I/D x 344mm O/D x 20mm deep, M1/D7. Unless otherwise specified, endless seals will be supplied.

Special materials such as fluoroelastomers are available on request. If you have any doubt with respect to material selection, our technical advisory service will be pleased to discuss your requirements.

Recommended housing sizes and tolerances

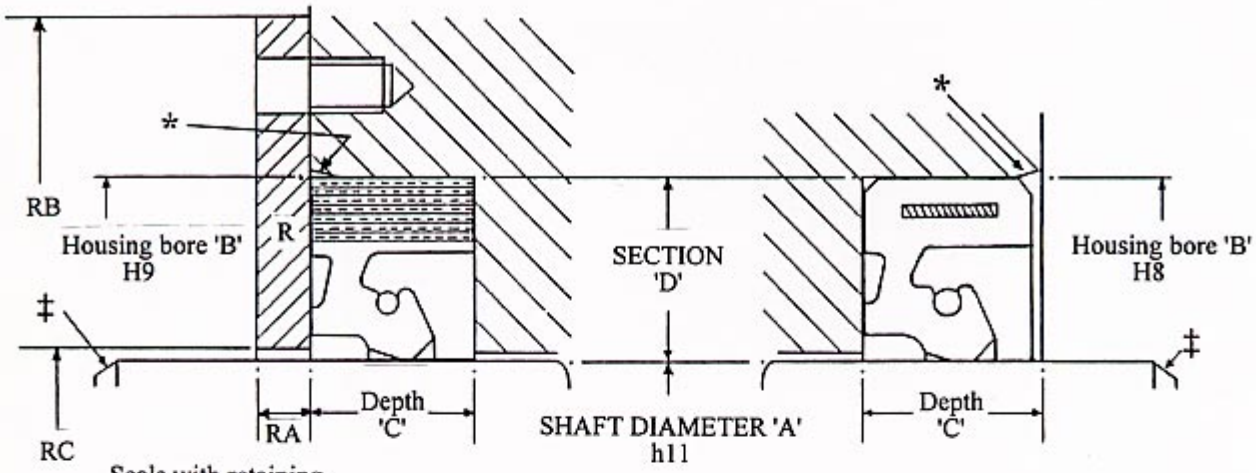
For guidance purposes our recommended housing sizes for given shaft diameters are:-

SEALS WITH RETAINING PLATE			
Shaft Diameter 'A'		Nominal Housing	
>	⩽	Depth 'C'	Section 'D'
30	100	15	17.5
100	250	16	20
250	400	20	22
400	600	22	25
600		25	32

SELF RETAINING SEALS (M2, M6,M8)			
Shaft Diameter 'A'		Nominal Housing	
>	⩽	Depth 'C'	Section 'D'
30	250	15	15
250	330	16	17.5
330	450	20	20
450	600	22	25
600		25	30

All dimensions in mm

Housing tolerances



Seals with retaining plate (R) i.e. all materials except M2 and M6.

Self-retaining seals i.e. materials M2 and M6.

Housing depth (C) limits		
Single seals	mm	inch
	0.1	0.004
Double seals	+0.2 - 0	+0.008 - 0

‡ Shaft chamfer ‡					
mm			inch		
Shaft Dia 'A'		Chamfer min. axial depth	Shaft Dia 'A'		Chamfer min. axial depth
>	⩽		>	⩽	
3	50	8 x 15°	0.12	1.97	5/16 x 15°
50	250	10 x 15°	1.97	9.85	3/8 x 15°
250	800	15 x 15°	9.85	31.5	9/16 x 15°
800		20 x 15°	31.5		3/4 x 15°

***Housing chamfer**

A chamfer should be provided at the entrance to the housing to facilitate assembly (particularly for M2 and M6 Walkerseles). Where the nominal housing depth is equal to the seal depth, the chamfer dimensions should not exceed 1mm x 30° for seals up to and including 10mm deep, 2mm x 30° for seals over 10mm deep.

N.B. - M6 seals are not available below 50mm outside diameter.

Retaining plate (R) dimensions. All dimensions in mm

NOMINAL SHAFT DIAMETER A		MINIMUM THICKNESS (RA)		OUTSIDE DIAMETER (RB) Min	INSIDE DIAMETER (RC) Max	BOLTING		
Above	Up to & Inc.	Single Seals	Double Seals			Size	No.	P.C.D.
	35	3	4.5	B + 28	A + 3	M 5	4	B+13
35	65	4	6	B + 30	A + 3	M 5	6	B+13
65	100	5	7.5	B + 43	A + 3	M 8	6	B+20
100	250	7	10.5	B + 45	A + 4	M 8	8	B+20
250	400	8	12	B + 56	A + 4	M10	8	B+24
400	600	10	15	B + 65	A + 4	M12	12	B+30
600	900	12.5	18.8	B + 76	A + 5	M14	16	B+34
900	1200	12	22.5	B + 76	A + 5	M14	20	B+34

Retaining plates should cover the full base width of the seal.

Shaft surfaces

The sealing area of the shaft should be a fine ground finish of 0.4 to 0.8µm CLA (16 to 32µ in Ra) for most applications but, for higher speeds it is recommended that the surface finish be improved to 0.2 to 0.4µm CLA (8 to 16 µ in Ra). In all cases it is important that the shaft sealing area is free from machining marks, dents, burrs, scratches and single pass grinding wetness patterns.