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HK Gear Couplings

Proven gear couplings for
demanding applications

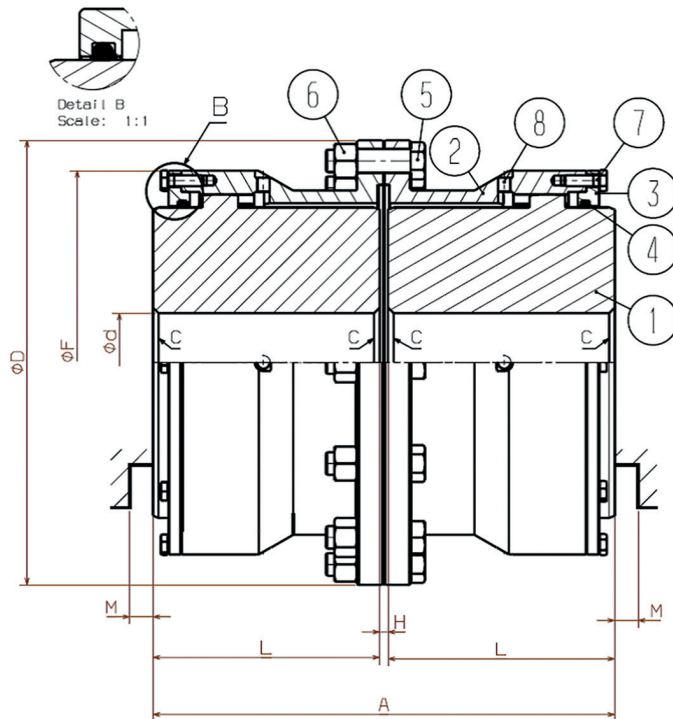
Contents

Selection	5
Example of selection	6
How to order	7
Coupling guards	8
Installation	8
Alignment of the shafts	9
Lubrication	11
Maintenance	13
Removal of coupling	14
Lifting of parts	15
O-ring table	15

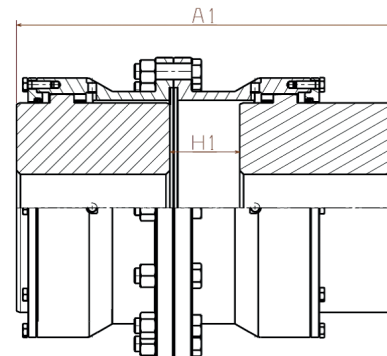


Figure 1.

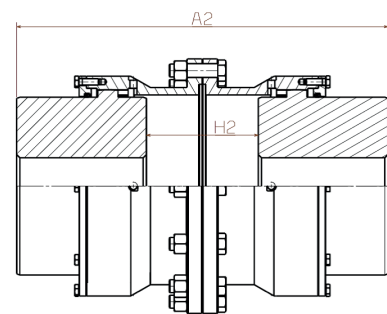
Standard



ORH. One Reversed Hub



TRH. Two Reversed Hubs



- M = Space required for installation
 B = Detail B are used in sizes HK401-404
 1 = Hub
 2 = Sleeve
 3 = End flange
 4 = Seal
 5 = Hexagon screw
 6 = Self locking hexagon nut
 7 = Hexagon screw
 8 = Grease filler plug (sizes HK-401 - HK-404, grease filler plug in coupling flange)

Table 1.

D_1/D_2	Bore Chamfer C
> 20 < 45	2
> 45 < 110	4
> 110 < 200	6
> 200 < 480	8

All coupling are delivered at standard coupling position seen at figure 1.
 Customer needs to take care of the coupling right mounting position.

Table 2.

Coupling Size	Nominal Torque	Dimensions in mm									Moment of inertia 1) J	Mass 1)	Max. allowable speed	Allow. Parallel misalignment 2)	Lubricant capacity
		D ₁ /D ₂	DIN 6885	ANSI B17.1	D	F	L	A	M	H					
		min	max	max inch											
HK	Nm										kgm ²	kg	1/min	mm	dm ³
HK-401	2500	20	65	2 3/8	155	115	63	132	30	6	0.021	10	6200	0.9	0.1
HK-402	4200	30	80	3	175	135	80	166	30	6	0.044	16	5500	0.9	0.2
HK-403	6700	50	105	3 13/16	215	168	100	206	30	6	0.128	30	4400	1.3	0.4
HK-404	13500	60	135	4 15/16	250	204	125	256	30	6	0.316	54	3800	1.8	0.8
HK-405	25500	70	170	6 3/16	315	272	160	326	32	6	1.142	119	3000	2.5	0.8
HK-406	40000	80	190	6 7/8	340	295	200	406	32	6	1.953	174	2800	3.3	1.2
HK-407	56000	90	225	8	405	346	200	406	32	6	3.884	245	2400	3.2	1.7
HK-408	86000	110	245	9	445	384	250	506	37	6	7.309	377	2100	4.1	1.9
HK-409	107000	120	280	9 7/8	505	435	250	506	37	6	11.845	480	1900	4.1	2.4
HK-410	160000	140	305	11	550	476	300	606	37	6	19.693	668	1700	5.2	4.5
HK-311	225000	160	320	11 1/8	605	522	300	606	37	6	27.94	795	1600	5.1	8
HK-312	315000	200	360	12 6/8	685	594	360	726	42	6	54.34	1180	1400	6.4	10
HK-313	450000	230	400	14 1/16	760	685	400	810	42	10	89.38	1560	1200	7.1	18
HK-314	630000	260	440	15 3/16	850	774	450	910	45	10	166.74	2290	1100	7.9	28
HK-315	1000000	300	480	16 7/8	950	865	500	1010	45	10	273	3000	1000	9	60

1) Values calculated with min. bore of hub

2) Values correspond to max. allowable angular misalignment (0.6°)

Unless otherwise agreed, hub bore tolerance J7, keyways to DIN 6885 and keyway width tolerance JS9.

Allowable angular misalignment of the shafts 0.6°/ coupling half, with unloaded coupling 1°/coupling half.

Couplings with larger angular misalignment capacity are custom-made. Allowable axial float of a correctly mounted coupling relative to its nominal size (-inwards / + outwards):

HK-401-404 -6 / +8 mm

HK-405-312 -6 / +12 mm

HK-313-315 -10 / +15 mm

Table 3.

Coupling Size	Nominal Torque	One reversed hub		Two reversed hubs	
HK	Nm	A1	H1	A2	H2
HK-401	2500	NOT ALLOWED			
HK-402	4200	NOT ALLOWED			
HK-403	6700	234	34	260	60
HK-404	13500	304	54	351	101
HK-405	25500	393	73	458	138
HK-406	40000	508	108	608	208
HK-407	56000	507	107	607	207
HK-408	86000	644	144	780	280
HK-409	107000	644	144	780	280
HK-410	160000	793	193	978	378

Selection

Select the coupling size as basis of torque as follows:

$$T = \frac{9550 \cdot P}{n} \text{ (Nm)}$$

$$T_1 > f \cdot T \text{ (Nm)}$$

$$T_1 = \text{Nominal torque of coupling (Nm)}$$

$$T = \text{Operating torque of coupling (Nm)}$$

$$P = \text{Power requirement of driven machine (kW)}$$

$$n = \text{Coupling speed RPM}$$

$$f = \text{Service factor. Select the service factor for normal applications from Table 4 below}$$

Table 4.

Load type	Service factor f		
	Hours of operation/ day		
	3	8	24
Uniform	1.0	1.4	1.6
Moderate shock load	1.4	1.6	2.0
Heavy shock load	1.6	2.0	2.5

Check

- a) that the allowable speed of the coupling will not be exceeded
- b) that the shafts will fit into the bores of the coupling ($D_{\min}$, $D_{\max}$)
- c) that the allowable misalignments and axial floats will not be exceeded
- d) that there will be enough space (M) to align the coupling

Example of selection

Application:

Water turbine drive (mini hydro power plant). A gear coupling is needed between a speed reducer and a generator.

Operating power = 1050 kW

Speed = 765 1/min

Select the coupling size on the basis of torque as follows:

$$T = \frac{9550 \cdot P}{n} = \frac{9550 \cdot 1050}{765} = 13107.84 \text{ Nm}$$

Read service factor from the table 4:

$f = 1.6$ (continuous operation, uniform load)

$f \cdot T = 1.6 \cdot 13107.84 \text{ Nm} = 20973 \text{ Nm}$

The nominal torque of the coupling HK405 is sufficient since

$T_1 = 25500 \text{ Nm} > 20973 \text{ Nm}$

Check

a) **The speed: 765 < 3000, HK-405 will do**

b) **The shaft diameters:**

- Reducer shaft: $\varnothing$ 190 mm m6, shaft journal free length = 300 mm

- Generator shaft: $\varnothing$ 140 mm m6, shaft journal free length = 250 mm

A $\varnothing$ 190 mm reducer shaft will not fit into a HK-405 coupling.

Select the next size HK-406 where $D_{\max} = 190 \text{ mm} = \text{reducer shaft } \varnothing$

c) **The misalignments and axial floats:**

The reducer and the generator are mounted on the same base. The only faults will be mounting faults and displacements caused by temperature differentials. Both can be accommodated by the coupling

d) Check also the coupling max. speed:

HK-406: $n_{\max} = 2800 \text{ 1/min} > 765 \text{ 1/min}$

How to order

When ordering a gear coupling HKBR-402, specify it as follows:

Bores	$D_1 = 190\text{J7}$
	$D_2 = 190\text{J7}$
Keyways	DIN 6885
Speed	$n = 765 \text{ 1/min}$
Nominal torque	$T_1 = 40000 \text{ Nm}$
Operating torque	$T = 13108 \text{ Nm}$
Service factor	$f = 3$

Coupling guards

For safety reasons, a rotating coupling must always be equipped with an appropriate guard meeting safety regulations. David Brown Santasalo has developed standard guards for couplings which meet safety regulations. The guards will be offered upon request.

Installation

Clean any protective grease from the coupling. Check the seals and the sealing faces. Lift the outer sleeve with its seals (sizes 401-404) or the end flange with its seals (sizes 405-315) on the shaft. Heat the hub, for example, in oil or with a gas flame to about 90°C and press it on the shaft. **Use oil resistant glue to seal the ends of the keyway to prevent the lubricant from leaking out.** Lift the outer sleeve (sizes 405-315) on its place. Align the shafts according to section 6. **Apply sealing compound on the sealing faces of the flanges.** Lift the pipeshaft on its place. Install the flange joint fitting screws in place. Table 5 presents the tightening torque for the fitting screws. Install the end flanges with seals in place and install the end flange fixing screws (sizes 405-315). Grease the coupling halves according to section 7.

Table 5.

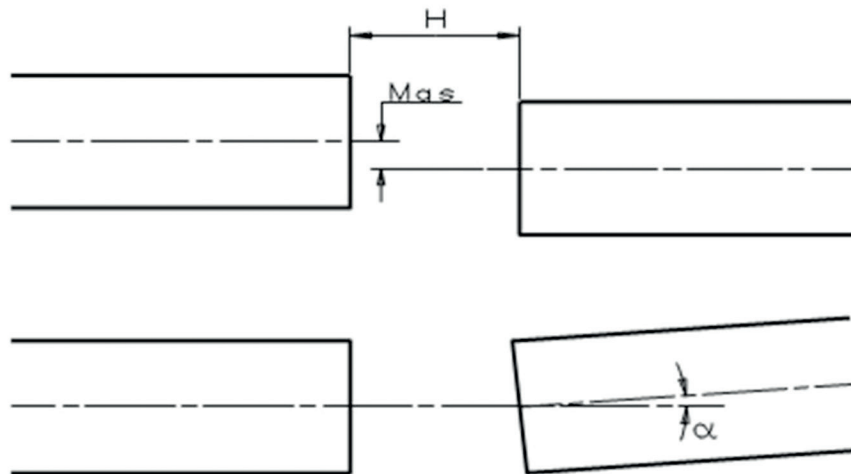
Tightening torque (Screws oiled)		(Strength class 8.8 Zne)
Size	Screw	Tightening torque (Nm)
HK-401...402	M10	51
HK-403...404	M12	89
HK-405...406	M16	218
HK-407...408	M20	426
HK-409...312	M24	735
HK-313...315	M30	1450

Note! Care should be taken not to damage the seals or the sealing faces.

Alignment of the shafts

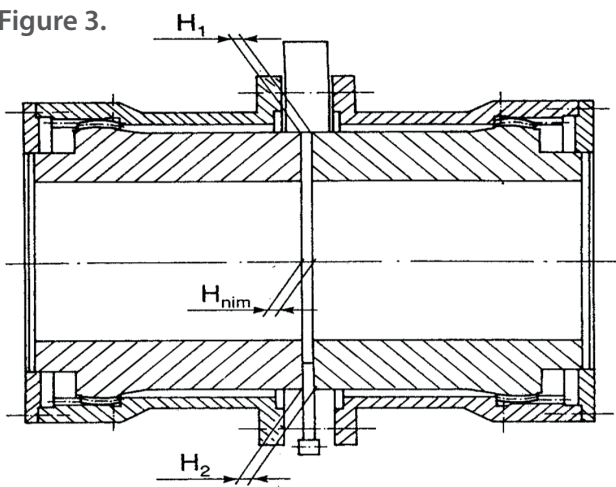
Exact coupling alignment improves functionality and lengthens the operational life of the coupling. Align the couplings as accurately as possible, trying to predict the misalignments caused, for instance, by temperature differentials during running.

Figure 2.



Check the parallel offset and angular misalignment of the shafts as shown in figure 2. Table 6 gives the recommended mounting tolerances of the couplings and a recommendation for the H_{nim} distance between the shaft ends (Figure 3).

Figure 3.



Note: The axial float can be checked by measuring the axial movement of the outer sleeve after installation.

Table 2.

Recommended mounting tolerances (mm)							
Coupling Size	H _{nim}	n<500 ¹ /min		500...1000 ¹ /min		n>1000 ¹ /min	
		Mas	H ₁ -H ₂	Mas	H ₁ -H ₂	Mas	H ₁ -H ₂
HK-401	6	0.10	0.05	0.05	0.05	0.05	0.05
HK-402	6	0.10	0.10	0.05	0.05	0.05	0.05
HK-403	6	0.15	0.15	0.10	0.10	0.05	0.10
HK-404	6	0.20	0.20	0.15	0.15	0.10	0.10
HK-405	6	0.25	0.25	0.15	0.20	0.10	0.10
HK-406	6	0.25	0.35	0.20	0.25	0.10	0.15
HK-407	6	0.30	0.35	0.20	0.25	0.15	0.15
HK-408	6	0.35	0.45	0.25	0.30	0.15	0.20
HK-409	6	0.35	0.45	0.30	0.30	0.20	0.20
HK-410	6	0.40	0.55	0.30	0.40	0.20	0.25
HK-311	6	0.45	0.65	0.35	0.50	0.20	0.30
HK-312	6	0.50	0.70	0.40	0.50	0.25	0.35
HK-313	10	0.60	0.75	0.45	0.55	0.30	0.40
HK-314	10	0.70	0.85	0.50	0.65	0.30	0.40
HK-315	10	0.75	1.00	0.55	0.75	0.35	0.50

Recommended mounting angular misalignments which correspond to values H1-H2							
Coupling Size	H _{nim}	n<500 ¹ /min		500...1000 ¹ /min		n>1000 ¹ /min	
		mm/mm	o	mm/mm	o	mm/mm	o
HK-401-402	0.031	0.05/100	0.031	0.05/100	0,031	0.05/100	0.05
HK-403-406	0.067	0.12/100	0.051	0.09/100	0.035	0.06/100	0.05
HK-407-315	0.084	0.15/100	0.062	0.11/100	0.042	0.07/100	0.10

Lubrication

For the lubrication of couplings used in normal operating conditions, we recommend gear coupling greases or semi-fluid greases suitable for lubricating gear couplings.

We recommend gear coupling greases with the minimum basic oil viscosity of ISO VG 630 cSt (40°C).

It is recommended that the grease contains EP, anti-wear, sticking and corrosion prevention and antioxidant additives.

The NLGI class of the grease should be 00 or 0.

The recommended lubricants are listed in Table 8A and Table 8B. The recommended lubricant volumes are presented in Table 7.

Grease the coupling with the bored lubrication holes in a horizontal position (at the 9 and 3 o'clock positions). Feed the grease volume, as presented in Table 7, into the coupling through the lubrication holes. Grease both halves separately.

Table 7.

Lubricant capacity	
Coupling Size	Lubricant Capacity dm ³
HK-401	2x0.05
HK-402	2x0.10
HK-403	2x0.20
HK-404	2x0.35
HK-405	2x0.40
HK-406	2x0.60
HK-407	2x0.85
HK-408	2x0.95
HK-409	2x1.20
HK-410	2x2.25
HK-311	2x4.00
HK-312	2x5.00
HK-313	2x9.00
HK-314	2x14.00
HK-315	2x30.00

Table 8A.

Recommended lubricants				
Lubricant		NLGI-class	Operating temperature range (°C)	Soap Type
MOBIL	Mobilgrease XTC Centaur XHP 461	1 1	-30...+120 -20...+130	Lithium/polymer Calcium sulfonate
NESTE	Avora	0,5	-30...+140	Lithium/Calcium complex
KLÜBER	Klüberplex GE 11-680	0 / 00	0...+140	Aluminium complex
SHELL	Gadus S2 High Speed Coupling Grease	0 / 1	-28...+120	Lithium
TEBOIL	Gear Grease XHP	0,5	-30...+140	Lithium/Calcium complex
TOTAL	Multis Complex RT-1	1	-20...+177	Lithium complex
TEXACO	Coupling Grease KP 0/1 K-30	0 / 1	-10...+120	Lithium
CASTROL-TRIBOL	Tribol 3020/1000-1	1	-30...+120	Lithium

Table 8B.

Recommended lubricants/ High rotation speed and temperature *)				
Lubricant		NLGI-class	Operating temperature range (°C)	Soap Type
MOBIL	Mobilgrease XTC	1	-30...+120	Lithium/polymer
KLÜBER	Klüberplex GE 11-680	0 / 00	0...+140	Aluminium complex
SHELL	Gadus S2 High Speed Coupling Grease	0 / 1	-28...+120	Lithium
TEXACO	Coupling Grease KP 0/1 K-30	0 / 1	-10...+120	Lithium

*) = Rotating speed > 1500rpm and temperature > 80°C

Maintenance

Check the tightening torque of the screws in the mounting flange of the coupling after approximately 100 hours of operation.

Refilling with lubricant is recommended every 7,000 operating hours, or at least once a year.

- Turn the lubrication holes to a horizontal position (the 9 and 3 o'clock positions). Feed the new lubricant into the coupling through the boreholes so that some grease overflows from the opposite borehole. Grease both halves separately.

Disassembly and inspection of the coupling is recommended every 15,000 operating hours or every 3 years at a minimum.

- Clean the coupling components.
- Inspect the condition of the cogs and seals.
- Check the shaft alignment.
- Grease the coupling with new lubricant as specified in section 7.

When the coupling is used in high temperatures (80...100°C) or at low speeds (radial velocity <5m/s), or with reversible loads, it is recommended that the maintenance, disassembly and inspection interval is half of the recommended intervals defined in these instructions.

When using a new lubricant, the coupling must be flushed by pumping an appropriate solvent (for example, spirit) through it. You can use pressurised air to clean the coupling.

DO NOT MIX GREASES WITH DIFFERENT BASIC INGREDIENTS!



Removal of coupling

The hub has four tapped holes for a puller (table 9). The hub can also be heated to facilitate removal (max. temperature 120°C). Large coupling hubs (sizes 313-315) are removed with hydraulic pressure and are therefore provided with the necessary tapped holes and grooves.

Table 9.

HK & HKBR	Tapped hole for a puller
401	M8x10
402	M10x15
403	M10x15
404	M12x25
405	M16x30
406	M16x30
407	M20x40
408	M24x50
409	M24x50
410	M24x50
311	M30x60
312	M30x60
313	M30x50
314	M30x50
315	M30x50

Lifting of parts

The hubs of the couplings (sizes 311-315) are provided with a tapped hole for an eye bolt, see Figure 4 and Table 10.

Figure 4.

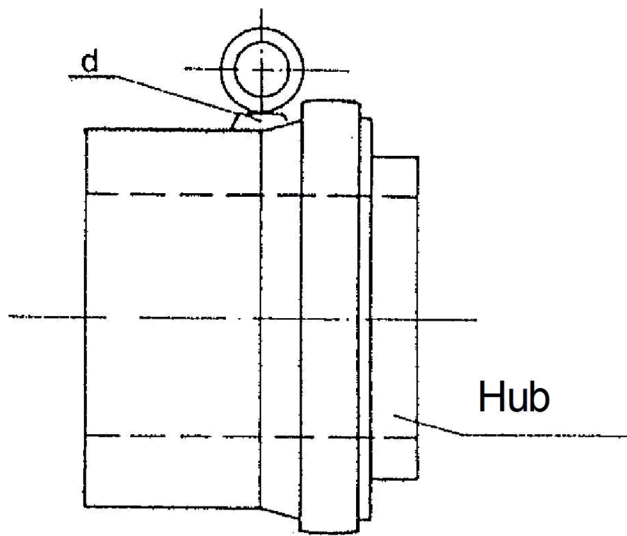


Table 10.

Tapped holes for lifting	
Coupling size	d
HK-311	M12
HK-312	M16
HK-313...314	M20
HK-315	M24

O-ring table

The sealing of the couplings (401-312) is implemented at o-rings that are seen in table 11.

The couplings (313-315) sealing is implemented with vulcanized o-ring band, diameter and length seen in table 12.

Table 11.

Coupling size	O-ring
HK-401	OR 89.2 x 5.7 FPM
HK-402	OR 109.1 x 5.7 FPM
HK-403	OR 139.3 x 5.7 FPM
HK-404	OR 174.2 x 5.7 FPM
HK-405	OR 219.3 x 5.7 FPM
HK-406	OR 239.3 x 5.7 FPM
HK-407	OR 279.3 x 5.7 FPM
HK-408	OR 319.3 x 5.7 FPM
HK-409	OR 359.3 x 5.7 FPM
HK-410	OR 389.3 x 5.7 FPM
HK-311	OR 379.3 x 5.7 FPM
HK-312	OR 439.3 x 5.7 FPM

Table 12.

Coupling size	O-ring band
HKBR-313	BAND Ø5.7 / L=1550mm
HKBR-314	BAND Ø5.7 / L=1900mm
HKBR-315	BAND Ø5.7 / L=2050mm



Europe

Finland
Jyväskylä, Hyvinkää & Oulu
T: +358 293 401000
E: finland@dbsantasalo.com

France
Bordeaux
T: +33 547 745 402
E: france@dbsantasalo.com

France
Thann
T: +33 389 370 113
E: france@dbsantasalo.com

Germany
Wuppertal
T: +49 202 24 14 0
E: germany@dbsantasalo.com

Sweden
Gothenburg & Gällivare
T: +46 31 710 20 50
E: sweden@dbsantasalo.com

UK
Huddersfield
T: +44 1484 465500
E: uk@dbsantasalo.com

Americas

Brazil
Sorocaba, São Paulo
T: +55 15 3031 5300
E: brasil@dbsantasalo.com

Canada
Cambridge, Ontario
T: +1 519 621 6390
E: canada@dbsantasalo.com

Canada
Montreal
T: +1 514 457 7700
E: canada@dbsantasalo.com

Chile
Santiago
T: +562 2920 6778
T: +562 2234 5000
E: chile@dbsantasalo.com

Chile
Antofagasta
T: +56 55 249 2800
E: chile@dbsantasalo.com

Peru
Arequipa
T: +51 9 7763 7240
E: peru@dbsantasalo.com

USA
Greenville, SC
T: +1 864 627 1700
E: usa@dbsantasalo.com

Asia Pacific

Australia
Adelaide, Bulli & Melbourne
T: +61 2 4283 0300
E: australia@dbsantasalo.com

Australia
Mackay
T: +61 7 4842 3222
E: australia@dbsantasalo.com

Australia
Perth
T: +61 8 9365 5555
E: australia@dbsantasalo.com

Australia
Somersby
T: +61 2 4340 2338
E: australia@dbsantasalo.com

China
Suzhou
T: +86 512 6299 8852
E: suzhou@dbsantasalo.com

China
Beijing
T: +86 10 6779 0932
E: beijing@dbsantasalo.com

China
Nanjing
T: +86 25 8361 1837
E: nanjing@dbsantasalo.com

India
Tamil Nadu
T: +91 4344 420054
E: india@dbsantasalo.com

Indonesia
Surabaya
T: +62 31 8910977
E: indonesia@dbsantasalo.com

Philippines
Subic Bay
T: + 63 047 250 2407
E: philippines@dbsantasalo.com

Middle East

Dubai
T: +971 4 8870274
E: dubai@dbsantasalo.com

Africa

South Africa
Benoni
T: +27 11 748 0000
E: salessa@dbsantasalo.com

South Africa
Sishen
T: +27 53 723 0002
E: salessa@dbsantasalo.com