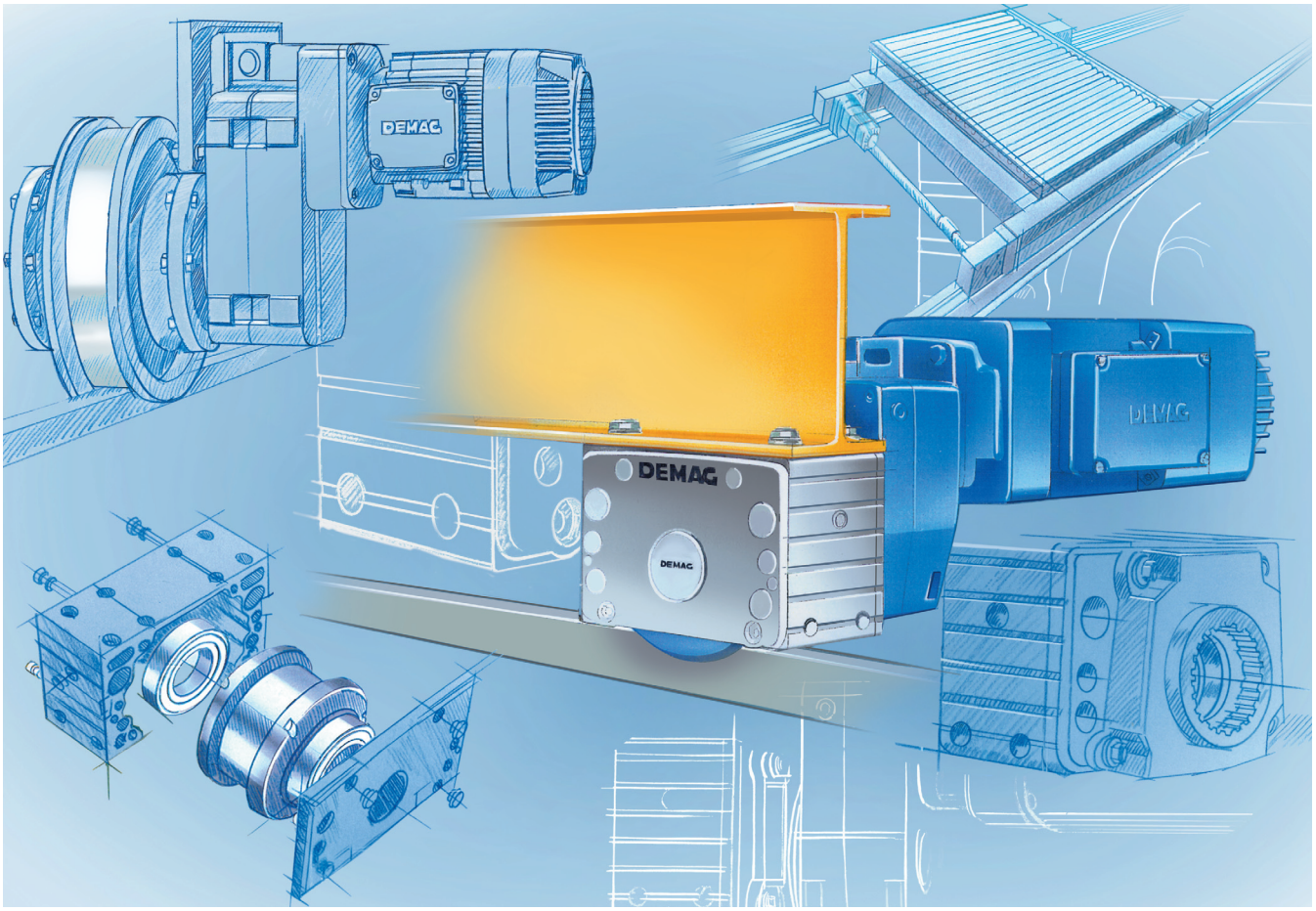
DEMAG
Cranes & Components

Demag DRS wheel block system



Other publications

Drive Designer

Guided selection and project engineering of Demag geared motors and travel unit components

Drive Designer online at

www.demag-drivedesigner.com

provides all information (no installation; data always up to date; many special functions).

With the publication of this catalogue, all previous issues of this document become invalid and should be considered as withdrawn. The same applies for all previous versions of Drive Designer on CD, 208 731 44 and 208 745 44, Version 5 and earlier.

General documents	Order no.			
	DE	EN	FR	ES
Brochures				
Demag drives brochure	208 732 44	208 734 44	208 735 44	208 736 44
Demag wheel range brochure	208 722 44	208 724 44	208 725 44	208 726 44
Catalogues / technical data				
Drive Designer Online	www.demag-drivedesigner.com			
Geared motors catalogue – DE / EN / FR	203 150 44			–
Geared motors catalogue – IT / EN / ES	–	203 250 44	–	203 250 44
DRS wheel block system catalogue	203 350 44	203 352 44	203 353 44	203 354 44
Demag RAE/RNE wheel set technical data	203 687 44	203 688 44	203 689 44	203 690 44
Geared motors for travel drive applications – Volume 3 – Quick selection and gearbox limit torque – DE / EN / FR	203 013 44			–
Geared motors for travel drive applications – Volume 3 – Quick selection and gearbox limit torque – IT / EN / ES	–	203 014 44	–	203 014 44
Operating instructions				
D 11 - D 41 helical gearbox operating instructions	214 719 44	214 720 44	214 721 44	214 722 44
D 50 - D 90 helical gearbox operating instructions	214 150 44	214 151 44	214 152 44	214 153 44
W 10 - W 100 angular gearbox operating instructions	214 057 44	214 058 44	214 059 44	214 060 44
A 10 - A 90 offset gearbox operating instructions	214 205 44	214 206 44	214 207 44	214 208 44
Motor operating instructions – Z motor range	214 227 44	214 228 44	214 229 44	214 230 44
KBA - KBF motor operating instructions	214 317 44	214 318 44	214 319 44	214 320 44
Operating instructions, brake accessories, Z motor range	214 040 44	214 041 44	214 042 44	214 043 44
Operating instructions / Amendment, plug connection for KB and Z motor ranges	214 021 44	214 022 44	214 023 44	214 024 44
Assembly, installation and operating instructions, DRS 112-200 wheel block system	214 275 44	214 276 44	214 277 44	214 278 44
Assembly, installation and operating instructions, DRS 250-500 wheel block system	214 326 44	214 327 44	214 328 44	214 329 44

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Demag DRS wheel block system catalogue

Valid from 1 April 2007

Demag Cranes & Components GmbH constantly works on improving its products. For this reason, we reserve the right to incorporate changes in line with technical progress and which do not detract from the quality of our products. Therefore, diagrams and technical information may not always correspond to the latest design.

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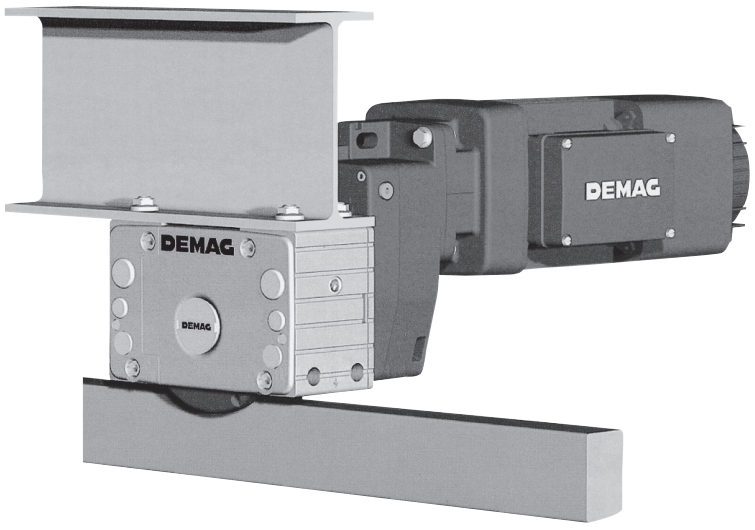
Optimum materials handling and drive solutions

Drives make materials handling systems move
Demag Cranes & Components has used its own drive technology for more than 125 years to ensure peak performance in materials handling solutions.

As a world leader, we offer the most comprehensive range of products in the industry. These include drives with solutions for a wide variety of requirements, such as starting and stopping motions, positioning, travel or variable speed drives.

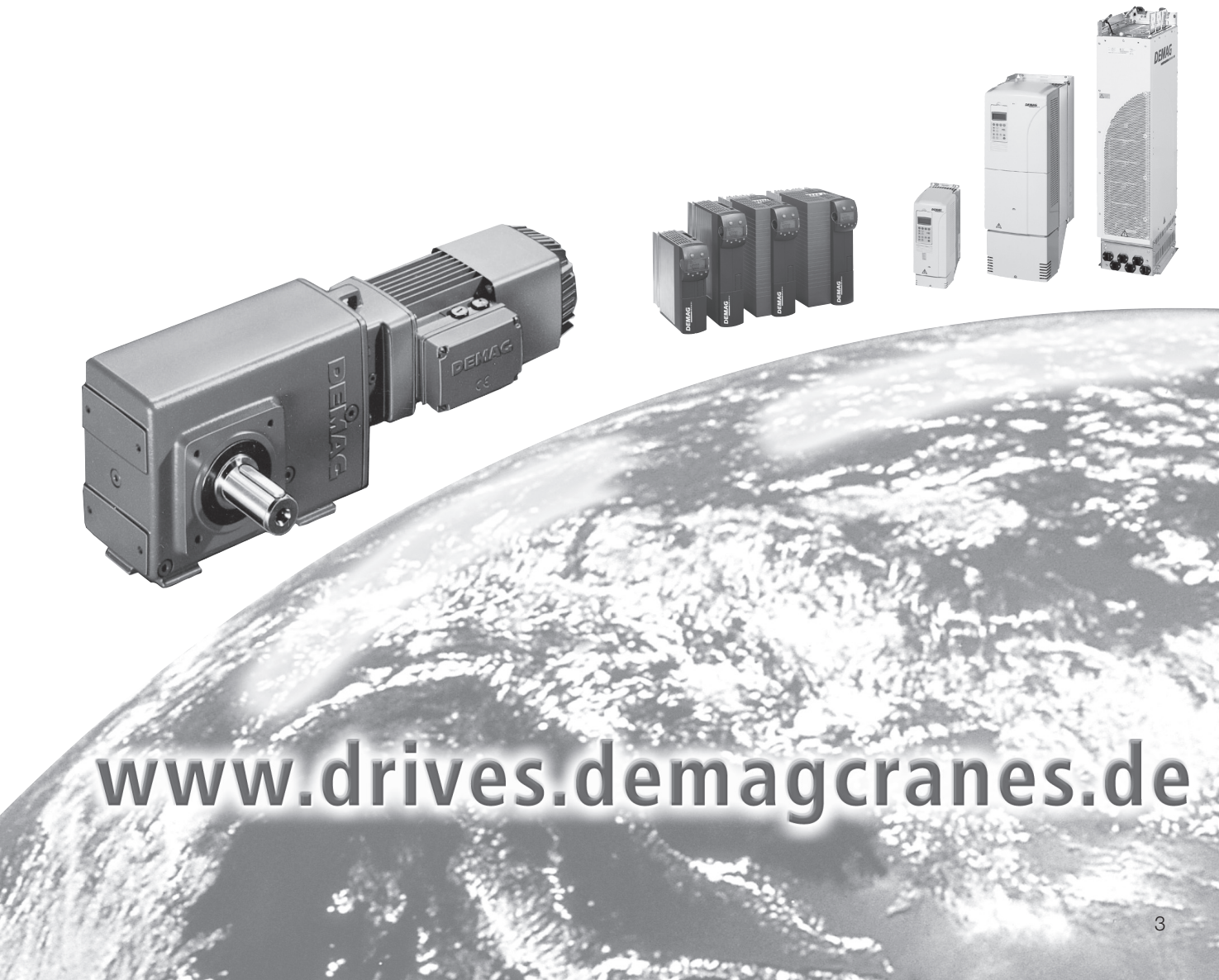
High quality and reliable service
The Drives group offers a comprehensive range with a high level of functional reliability, precision and long-term guaranteed spare part availability.



Thanks to our closely knit service network, reliable and expert drive service is also guaranteed all over the world – from specific consultation to erection and assembly to meet specific application requirements and for rapid repairs. Spare parts are also stocked worldwide and can be obtained at any time.

Innovative and market-oriented
With our motors, gearboxes, travel units and frequency inverters, we are always able to implement new solutions. We not only meet a wide variety of market needs, but also set standards, e.g. with Demag conical-rotor motors for stopping and starting travel drives. Demag cylindrical-rotor geared motors offer robust quality at a favourable price. Demag travel unit components range from wheel sets and non-driven wheel blocks to complete, non-driven travel units for a wide variety of applications in many industries.

Application versatility
The high quality level required for materials handling applications has resulted in Demag drive products also being used in many other industries. These include general mechanical engineering and plant engineering solutions, as well as operation under extreme conditions in galvanising facilities or special construction applications, e.g. for moving bridge elements, roofs or the sun canopy of the German parliament building in Berlin.

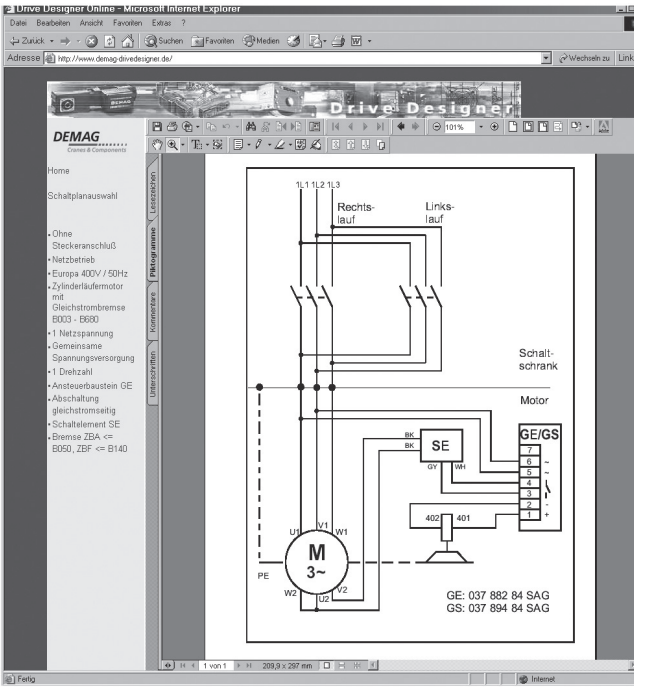


Leading edge – now via the Internet

Simple, fast and reliable at all times via www.demag-drivedesigner.com

Whatever you manufacture, whatever you need – using our Drive Designer online on the Internet you can point and click in only minutes to

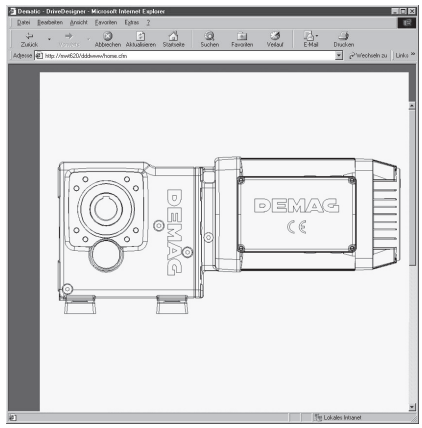
- call up all technical data and diagrams of our entire range of geared motors and wheel blocks,
- select and specify the optimum drives or travel units for your project,
- generate specific CAD files and import them into your designs,
- create dimension sheets,
- select circuit diagrams for the motor connection,
- utilise e-commerce connections.



Outstanding benefits
With Drive Designer online, you not only save a lot of time. You also benefit from the fact that it requires no installation, does not take up any space on your hard disk and that it is always up-to-date. In addition, it is available at all times and in many languages, including measurements used in other countries, such as feet and pounds, for example.

The system also ensures that your enquiry is sent quickly to the relevant engineer and also avoids any errors in transmission. The spare parts you need are sent to you reliably and on schedule via our Demag Shop Internet order system.

Whatever you want
Drive Designer online generates your CAD files in 2D or 3D for any of the many thousand geometric variants you select when configuring your solution. The files are automatically sent to you via e-mail as exact scale drawings.



If you want to view the files, you can download our DXF viewer. Using the layer definition function, you can ensure that the files match the standards in your drawings.

Notes

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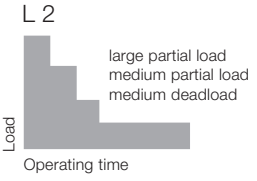

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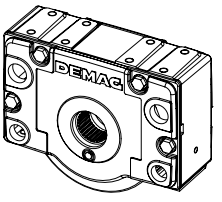

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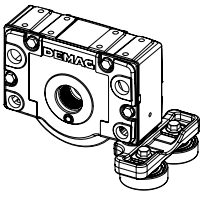

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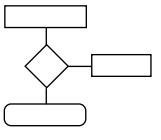

Selection example

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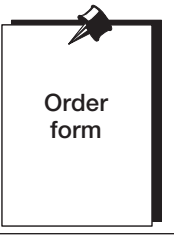
Service



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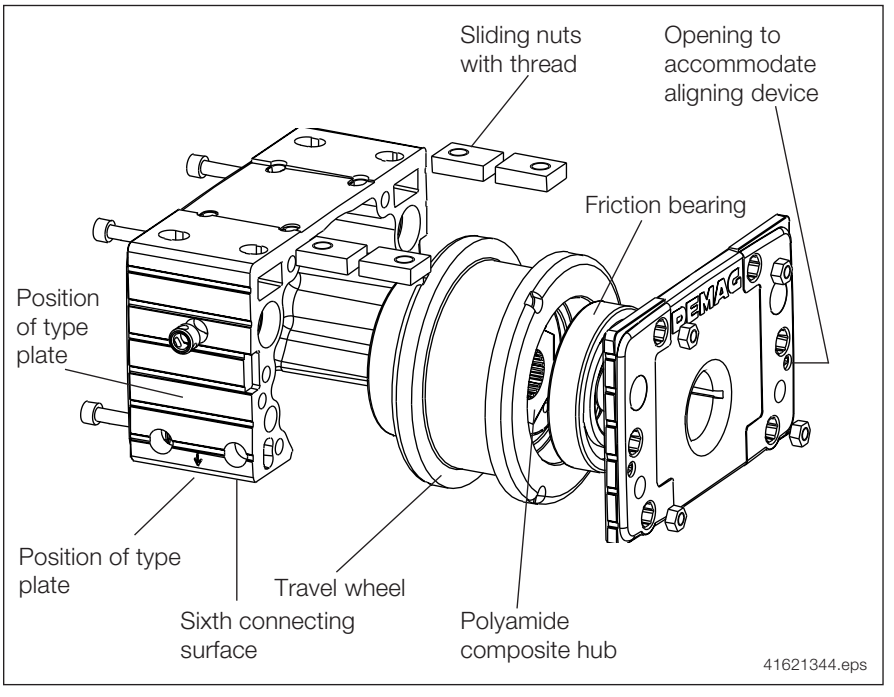
1 Demag DRS wheel block system Introduction

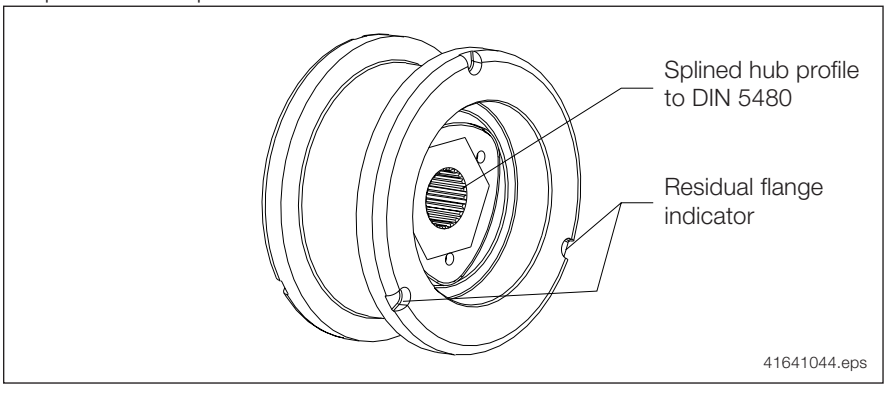
1.1 DRS 112 to 200 product description



The Demag DRS 112 to 200 wheel block system, suitable for loads up to 10,000 kg, is a concept designed to meet customer wishes.

The advantages of the system are:

- Most favourable ground clearance conditions with Demag offset geared motors.
- Robust aluminium housing with very good shape and position tolerances.
- Variable basic design by fitting various travel wheel materials and shapes.
- Weather-resistant due to surface powder coating (RAL 7001 silver grey). Special paint finish available on request. For further details on the paint finish, see section 1.8.
- Possible compensation of track gauge deviations up to 8 mm.
- Protected internal bearing arrangement.
- Minimum maintenance due to bearings lubricated for life.
- Travel wheel and bearings can be replaced thanks to bolted housing.
- High installation availability since the housing does not necessarily need to be removed to replace the travel wheel. Not having to realign the housing saves time.
- Damping element in the travel wheel reduces load on the gearbox.
- Sixth connecting surface (e.g. for switching flags).
- High-tensile bolted connections are galvanized and therefore provided with a special surface protection.



- Residual flange indicator enables preventive maintenance without risk to the installation.

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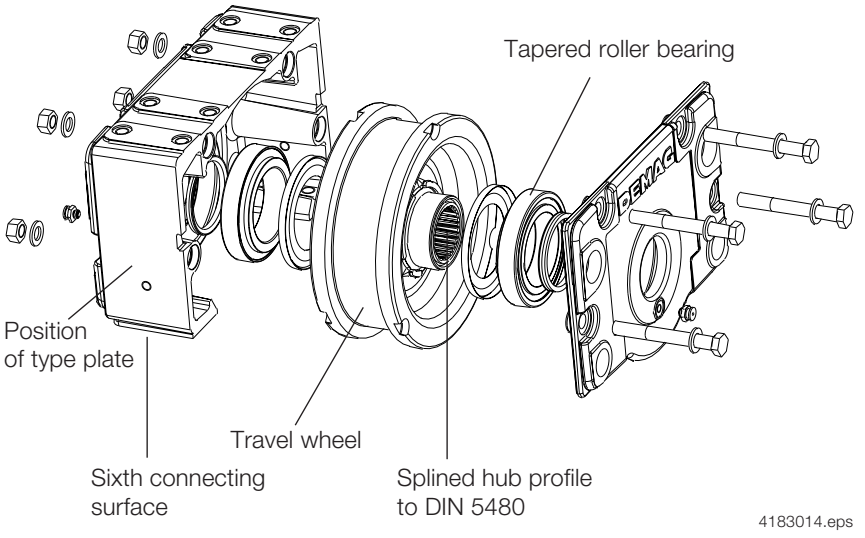
1.2 DRS 250 to 500 product description



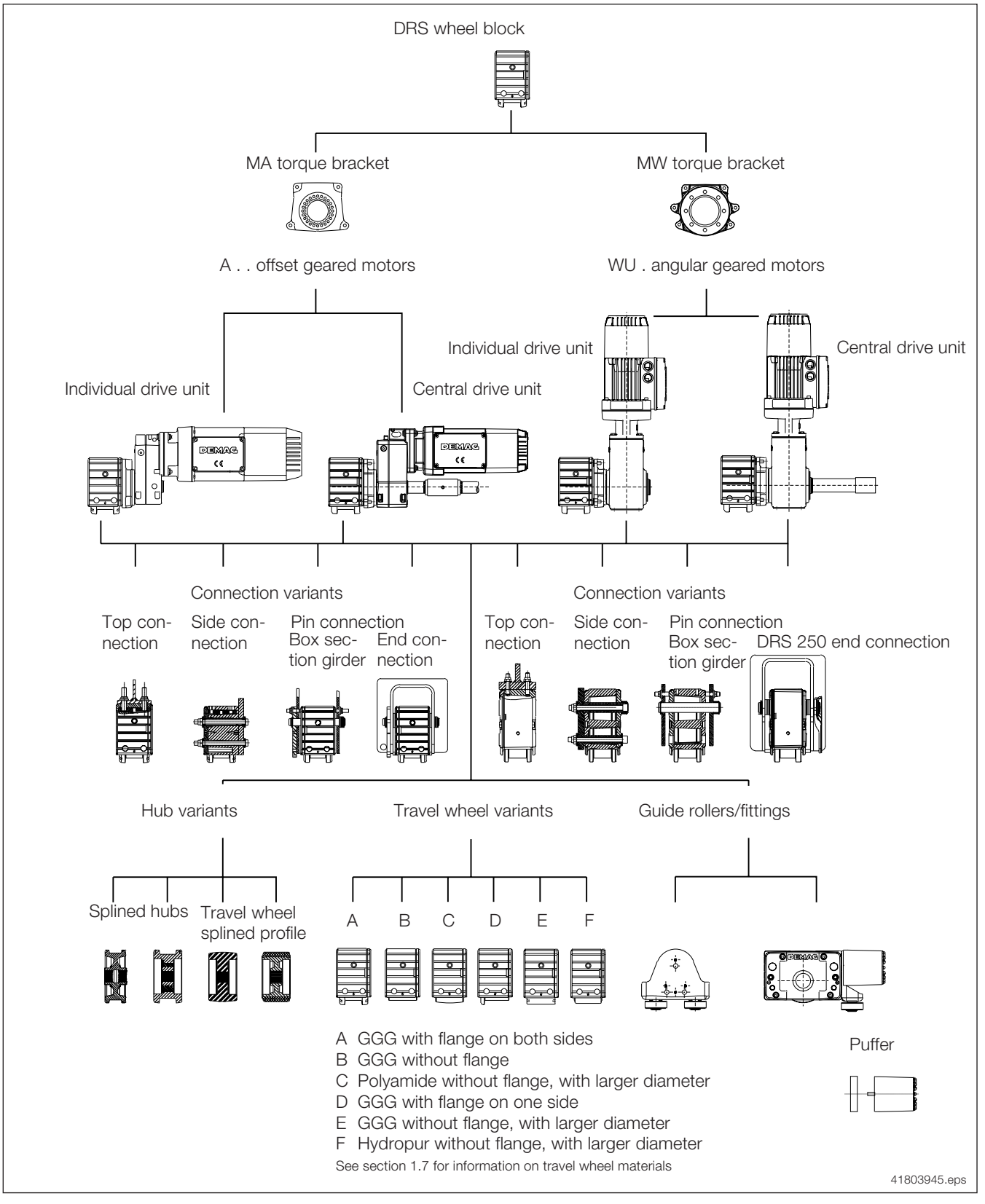
The Demag DRS 250 to 500 wheel block system, suitable for loads up to 40,000 kg, is designed as a heavy-duty travel unit based on the same principle as the smaller 112 – 200 series.

The advantages of the system are:

- Most favourable ground clearance conditions with Demag offset geared motors.
- A robust spheroidal graphite cast iron housing with precisely machined connecting surfaces.
- Variable basic design by fitting various travel wheel materials and shapes.
- For details on the paint finish, see section 1.8.
- Possible compensation of track gauge deviations up to 4 mm or skewing up to 14 ‰.
- Protected internal bearing arrangement featuring tapered-roller.
- Minimum maintenance due to bearings lubricated for life.
- The anti-friction bearing arrangement is prepared for re-lubrication and re-lubrication sets can be simply added later on.
- Travel wheel and bearings can be replaced thanks to bolted housing, without the housing having to be removed.
- High installation availability since the housing does not necessarily need to be removed to replace the travel wheel. Not having to realign the housing saves time.
- The torque bracket, designed to match the wheel block, reduces peak loads which occur as a result of the travel wheel slipping torque.
- High-tensile bolted connections are galvanized and therefore provided with a special surface protection.
- Residual flange indicator enables preventive maintenance without risk to the installation.

1.3 Modular wheel block system

The patented modular wheel block system is an optimum combination of drives and rail-guided travel units. The system is used for tasks such as supporting, guiding and driving loads. All fittings feature connection arrangements which have been proven over decades.



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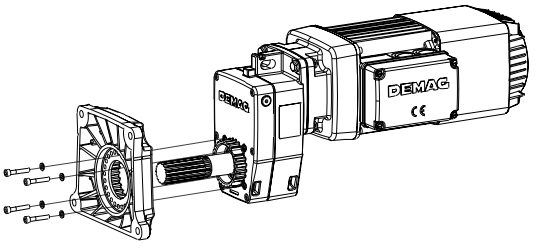
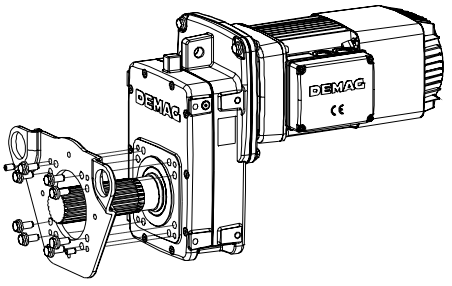
1.4 Drive arrangements

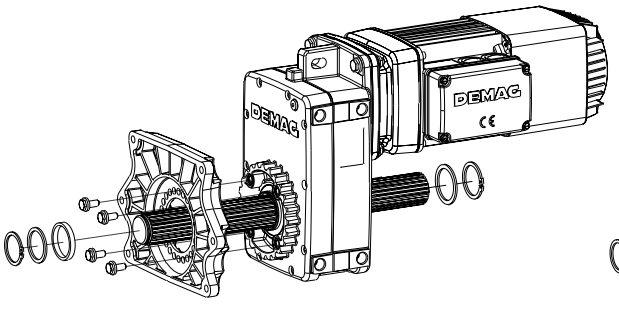
AME 10 – 40 offset gearboxes



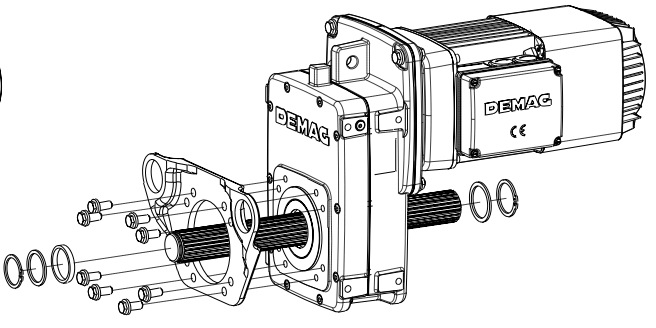
ADE 40 – 80 offset gearboxes



AMK 10 – 40 offset gearboxes



ADK 40 – 80 and AUK 90 offset gearboxes



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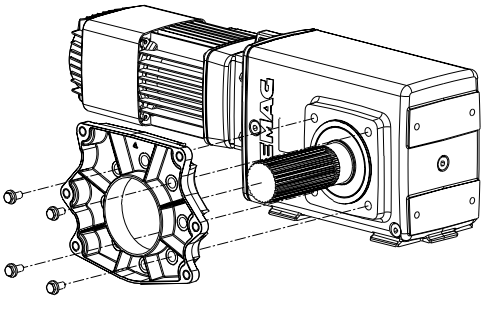
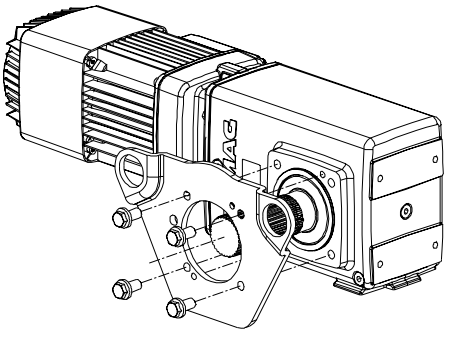
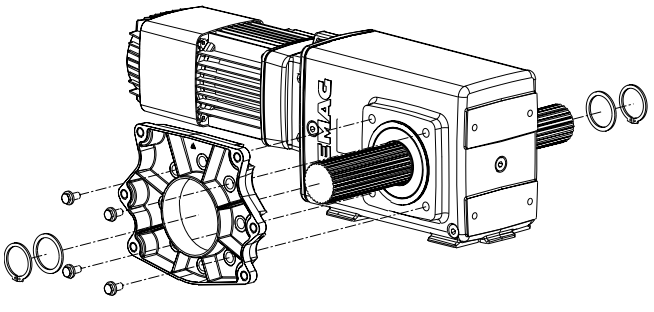
WUE 10 – 50 angular gearboxes



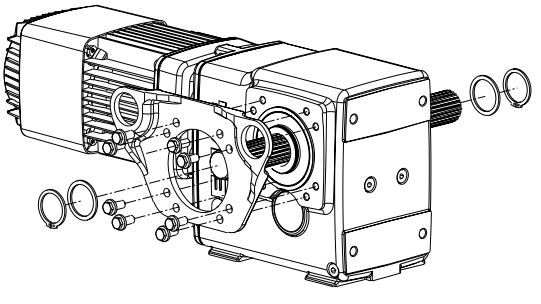
WUE 40 – 80 angular gearboxes



WUK 10 – 50 angular gearboxes



WUK 40 – 100 angular gearboxes



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1.5 Prohibited practises, improper use

Under the following operating conditions, malfunctions, failure or hazard to life and limb may occur, e.g. in the case of:

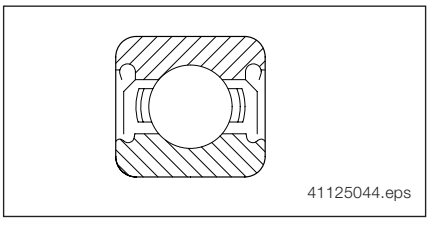
- Acidic, corrosive air as coolant
- Explosion hazard atmospheres
- Operation outside the permitted temperature range
- Exceeding the permissible load
- Exceeding the design service life
- Operation under prohibited ambient conditions
- Use of connecting elements not designed for use with the wheel block
- Use of non-genuine Demag parts
- Non-compliance with the assembly instructions
- Bolted connections which are not tightened with the specified torque
- Incomplete assembly of connecting elements
- Occurrence of peak loads which were not considered in the design

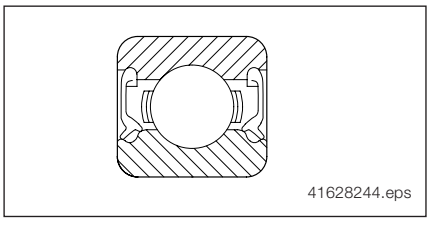
Note: Please contact the manufacturer for special operating conditions.

Safety measures must not be rendered inoperative or modified or used for purposes other than those for which they are intended.

1.6 Friction bearing arrangement

1.6.1 Friction bearings (DRS 112 bis 200)





Standard:

The friction bearings of DRS 112 – 200 wheel blocks are protected and arranged inside the wheel block housing. This bearing arrangement features grooved ball bearings lubricated for life and sealed with two cover discs, reducing maintenance to a minimum, and are particularly suitable for high axial loads.

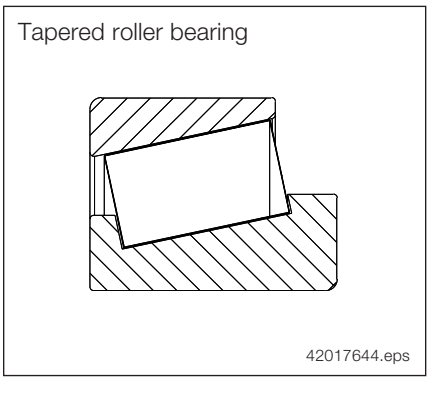
Suitable for temperatures from –20° C to +70° C and normal ambient conditions.

Options:

Use low-maintenance grooved ball bearings with double-lip seals for extreme moist conditions.

Suitable for temperatures from -20° C to +110° C and normal ambient conditions.

1.6.2 Friction bearings (DRS 250 – 500)



Standard:

The friction roller bearing arrangement of the DRS 250 – 500 wheel block is protected within the wheel block housing. The compact tapered roller bearing with NILOS and V sealing rings saves space despite the high radial and axial load capability and is filled with grease ready for application. The housing and travel wheel arrangement provide an additional trap system. The bearing is lubricated for life. Appropriate greases are used for temperature ranges from -20 ° C to +70 ° C and normal ambient conditions.

Options:

Relubrication with flat lubrication nipple or relubrication line, see section 4.8.

Temperature range + 70° C to 150° C ambient temperature with use of hot bearing grease, Viton (FPM) - V- sealing ring and screw plug in the lubrication opening.

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1.7 Travel wheel materials

EN-GJS-700-2 (GGG 70)

GJS-700-2 (GGG 70) is a spheroidal graphite cast iron, a material with a self-lubricating effect owing to the graphite incorporated in it. This means that the wheels feature high resistance to wear for a low travel resistance, with rail wear also being reduced to a minimum. The high inherent damping effect of the travel wheels guarantees good running characteristics for the travel unit. Travel wheels which perform a guide function, e.g. flange-guided, with a minimum gap between the edge of the tread and the travel wheel rail of 1 mm and a guide roller assembly with the same distance are available. If extreme wear is expected, e.g. casting sand or similar, the travel wheel tread surface or guide flange can be hardened to 56 ± 2 HRc for slip-free operation. This hardening is only to reduce wear.

Travel wheels with Hydropur tyre

Hydropur is a polyurethane elastomer which features good resistance to hydrolyses compared to other conventional polyurethanes (such as Vulkollan, for example). This material features significantly higher friction values compared to GJS (GGG) wheels, thus making travel wheels with a Hydropur tyre predestined for highly dynamic applications. Running noises are reduced to a minimum owing to the good dampening characteristics. Attention must be paid to the considerably reduced permissible load capacities compared to wheels of GJS-700-2 (GGG 70). Wheels with Hydropur tyres are particularly suitable for operation on concrete surfaces owing to the low contact area pressure or in the case of particularly high acceleration rates of up to 1,5 m/s^2 for friction drives due to the high friction coefficient between the travel wheel tyre and counterpart material. This material can be used at up to 100 °C for high temperature applications.

Polyamide

Compared to GJS-700-2 (GGG 70) travel wheels, travel wheels made of polyamide (PA 6 casting) feature significantly reduced travel noise for comparable friction values. Attention must also be paid to the significantly reduced permissible load capacity compared to travel wheels made of GJS-700-2 (GGG 70). Owing to the high specific contact pressure as a result of the round shape, polyamide is only suitable for operation on steel materials or similar.

Application of the various travel wheel types

Properties	Spheroidal graphite cast iron	Hydropur	Polyamide	Stainless
High acceleration with friction connection above 0,5 m/s^2	O	●	O	O
High acceleration as positive connection above 0,5 m/s^2	●	–	–	●
High pressure: wheel/rail	●	–	–	●
Counterpart material: steel	●	●	●	●
Counterpart material: aluminium	O	●	●	O
Counterpart material: concrete	–	●	–	–
Counterpart material: screed	–	●	–	–
Counterpart material: wood	O	●	●	–
Temperature up to 100 °C (DRS 112 to 200)	O	O	O	O
High humidity at high temperatures	O	O	O	●
Outdoor operation with ice and snow	●	O	O	●

● suitable O partially suitable – not suitable

Travel wheels with hardened treads

For operating conditions in which increased travel wheel wear is likely (e.g. rails with extreme dirt accumulation), the running surfaces and flanges of the spheroidal graphite cast iron travel wheels can be hardened (to a depth of 2 to 3 mm). For this to be possible, travel wheel sizes 112 – 200 must not feature any flange wear indicators. Hardening is then to 56 ± 2 HRc.

1.8 Paint finish

Standard

DRS 112 – 200

The aluminium wheel block housings are provided with a weather-resistant powder coating in RAL 7001 (silver grey) with a minimum thickness of 90 µm before leaving the factory.

A uniform coating quality is ensured by a works standard oriented to meet wheel block housing requirements (ident no. 012 326 99).

DRS 250 – 500

Primer coat: Single coat of silver grey paint, coat thickness approx. 40 µm

Finish coat: Silver grey RAL 7001, 50% shine, approx. 50 µm

Special paint finish

DRS 112 – 200

For special paint finishes, wheel blocks can be supplied with a dual component PUR finish coat at the request of the customer.

If the paint finish is to be applied by the customer, attention must be paid to works standard for special paint finish on powder-coated wheel block surfaces (ident no. 012 328 99).

DRS 250 – 500

For non-standard RAL colours, a corresponding finish coat may be applied to wheel blocks at the request of the customer.

Special paint finishes on request.

Acid-resistant paint finish

DRS 112 – 200

The surfaces of wheel blocks with a powder-coated finish may be used in environments with acid vapours without any treatment. Alternatively, a dual component acid protection paint finish may be applied to appropriately pre-treated housings. Wheel blocks must also be fitted with ball bearings featuring double lip seals. The gap between the housing and the cover is seated with an acid-proof varnish.

DRS 250 – 500

Wheel blocks can be supplied with an acid protection paint finish for applications in environments with acid vapours.

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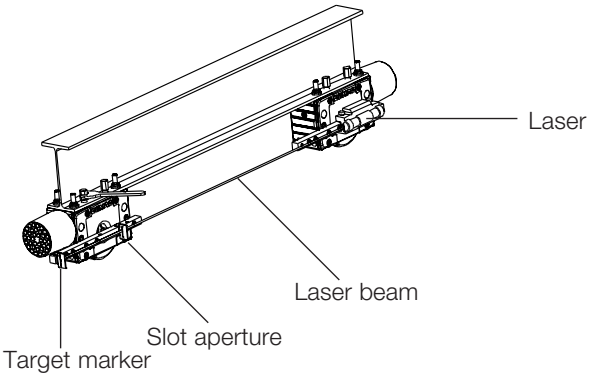
1.9 Aligning system for top connection

DRS 112 – 500



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- Fast and optimum alignment of wheel blocks using the Demag alignment device.
- Reduced wear thanks to exactly aligned travel wheels.
  Achievable accuracy with the measuring device: 1,6 ‰.
- The sliding nut arrangement (DRS 112 to DRS 200) or the difference between the threaded pin diameter to the bore hole diameter of the connecting structure (DRS 250 to DRS 500) offers a lateral alignment path of ± 3 mm.

Further details: see assembly, installation and operating instructions,
order no. 214 276 44 (DRS 112 – 200)
order no. 214 327 44 (DRS 250 – 500).

1.10 Permissible horizontal loads for DRS wheel blocks

- **Wheel blocks with flange guide arrangement**
  The permissible horizontal force must not exceed 20 % of the actual wheel load.

- **Wheel blocks with roller guide arrangement**
  The permissible horizontal force must not exceed 15 % of the actual wheel load.

Exception: DRS 200 with top connection

The permissible horizontal force is limited to 10 % of the actual wheel load.
If higher horizontal loads are to be expected, the roller guide arrangement can be fitted to the steel superstructure, however, not to the wheel block.

The guide roller arrangement as a solo part may transmit 20 % of the actual wheel load.

1.11 Reduction factor for driven wheel blocks

A uniform temperature-dependent reduction factor f_K is used for the entire wheel block.

for temperature f_K

DRS wheel block size	– 20 °C up to + 40 °C	up to 50 °C	up to 60 °C	up to 70 °C	up to 80 °C
112 – 200	1	0,85	0,8	0,75	0,6
250 – 500	1	1	0,92	0,90	0,88

for rail material f_{St}
Travel wheel material GJS-700-2 (GGG 70)

	Material	Factor f_{St}		Standard
		Linear contact	Point contact	
Rail	St 70-2/E 360	1	1	DIN EN 10025
	St 60-2/E 335	1	0,44	
	St 52-3/S 355 J 2 G 3	1	0,38	
	St 37-2/ S 235 J R	0,25	0,01	

Convex travel wheel – straight rail or
straight travel wheel – curved rail

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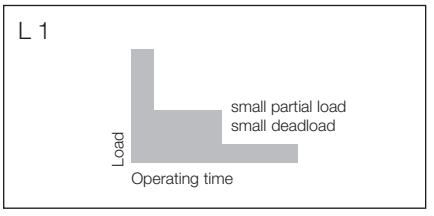
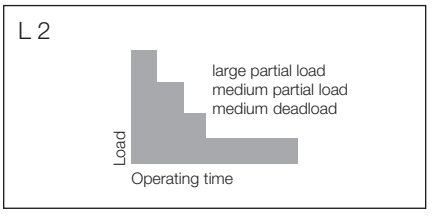
2.1 Load spectra



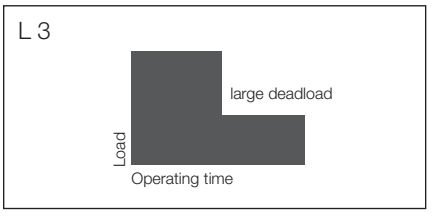
Light (k ≤ 0,5):

Mechanisms, or parts thereof, usually subject to light loads and occasional maximum loads.



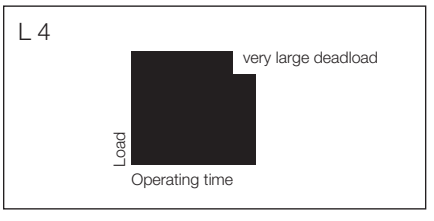
Medium (0,5 < k ≤ 0,63):

Mechanisms, or parts thereof, usually subject to light loads, but with a higher incidence of maximum load.



Heavy (0,63 < k ≤ 0,8):

Mechanisms, or parts thereof, usually subject to medium loads, and frequently to maximum loads.



Very heavy (0,8 < k ≤ 1):

Mechanisms, or parts thereof, usually subject to maximum or almost maximum loads.

		Average daily operating time in hours							
Load spectrum		**≤ 0,25**	**≤ 0,5**	**≤ 1**	**≤ 2**	**≤ 4**	**≤ 8**	**≤ 16**	**> 16**
light	k ≤ 0,50	–	–	–	1 Bm	1 Am	2 m	3 m	4 m
medium	k ≤ 0,63	–	–	1 Bm	1 Am	2 m	3 m	4 m	5 m
heavy	k ≤ 0,80	–	1 Bm	1 Am	2 m	3 m	4 m	5 m	–
very heavy	k ≤ 1	1 Bm	1 Am	2 m	3 m	4 m	5 m	–	–

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2.2 Wheel block size selection

Rapid selection of wheel block sizes depending on the loads to be displaced according to stress factor groups and travel speed.

The basis for selection is the maximum useful rail head width for flat rails.

Refer to the permissible load capacity tables for linear contact (section 2.6.5) for more detailed information on groups of mechanisms 1 Am, 2 m, ..., 5 m.

Group of mechanisms/load factor group					Travel speed in m/min											
FEM	3 m	2 m	1 Am	1 Bm	12,5	16	20	25	31,5	40	50	63	80	100	125	160
ISO	M 6	M 5	M 4	M 3												
Mass in kg	1140	1440	1810	2280												
	1240	1560	1970	2480				112								
	1340	1680	2120	2670												
	1440	1810	2280	2750												
	1580	1990	2500	3150												
	1710	2090	2720	3420												
	1840	2320	2930	3690				125								
	1990	2500	3150	3970												
	2150	2710	3420	4300												
	2320	2930	3690	4650												
	2500	3150	3970	5000												
	2900	3650	4520	5560												
	3150	3960	4870	6000				160								
	3390	4230	5210	6410												
	3650	4520	5570	6850												
	3950	4850	5980	7000												
	4350	4900	6040	7440												
	4720	5290	6510	8010												
	5080	5650	6960	8570				200								
	5480	6040	7440	9160												
	5930	6490	7990	9840												
	6340	6960	8570	10000												
	6450	7200	8860	10910												
	6730	8290	10200	12560												
	7200	8860	10910	13430				250								
	7730	9520	11720	14430												
	8290	10200	12550	15470												
	9520	11720	14430	16000												
	12050	12920	13850	16410												
	12360	13240	14350	17670												
	12640	13540	15340	18890				315								
	12920	13850	16410	20200												
	13230	14310	17620	21700												
	13540	15340	18890	22000												
	17480	19390	20980	25830												
	18540	19880	22590	27810				400								
	18960	20320	24150	29740												
	19390	20980	25830	30000												
	21668	24792	28041	34523												
	23120	25411	30197	37176				500								
	24244	26225	32287	39750												
	24792	28041	34523	40000												

2.3 Wheel block system drive combinations

with offset geared motors

Offset gearbox	DRS wheel block size																													
	112			125						160						200						250		315		400		500	
Hub profile	N 30			N 30			N 35			N 35			N 45			N 45			N 50			N 50	N 65	N 65	N 75	N 75	N 90	N 90	N 110
Travel wheel material / Gearbox size	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2
A 10	●	●	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A 20	○	○	○	–	–	–	●	–	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A 30	–	–	–	–	–	–	○	–	○	–	–	–	●	–	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–
A 40	–	–	–	–	–	–	–	–	–	–	–	–	○	–	○	–	–	–	●	–	●	●	–	–	–	–	–	–	–
A 50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	○	–	●	●	–	–	–	–	–
A 60	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●	●	–	–	–
A 70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●	●	–
A 80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●
A 90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○
Universal shaft F	●	●	●	–	–	–	●	–	●	–	–	–	●	–	●	–	–	–	●	–	●	–	●	–	●	–	●	–	●

● = Possible combination with journal shafts

○ = Possible combination with splined hollow shaft for splined shafts

– = not possible

Note:
Check the motor mounting arrangement for central drives

with angular geared motors

Angular gearbox	DRS wheel block size																													
	112			125						160						200						250		315		400		500	
Hub profile	N 30			N 30			N 35			N 35			N 45			N 45			N 50			N 50	N 65	N 65	N 75	N 75	N 90	N 90	N 110
Travel wheel material / Gearbox size	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	Polyamide	Hydropur	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2	GJS-700-2
W 10	●	●	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
W 20	○	○	○	–	–	–	●	–	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
W 30	–	–	–	–	–	–	○	–	○	–	–	–	●	–	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–
W 40	–	–	–	–	–	–	–	–	–	–	–	–	○	–	○	–	–	–	●	–	●	●	–	–	–	–	–	–	–
W 50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	○	–	●	●	–	–	–	–	–
W 60	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	○	–	●	●	–	–	–	–	–
W 70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●	●	–	–	–
W 80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●	●	–
W 90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	–	●
W 100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○
Universalwelle F	●	●	●	–	–	–	●	–	●	–	–	–	●	–	●	–	–	–	●	–	●	–	●	–	●	–	●	–	●

● = Possible combination with journal shafts

○ = Possible combination with splined hollow shaft

– = not possible

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2.4 ZI central drive unit, inside arrangement

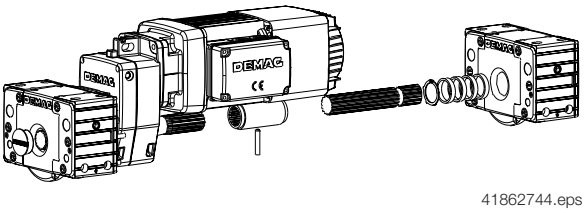
Possible combinations of wheel block, gearbox and motor (A type offset gearbox) determined on the basis of the degree of freedom between the shaft coupling and motor bottom edge

Motor frame size		DRS wheel block size															
		112		125		160		200		250		315		400		500	
		A offset gearbox size															
		10	20	20	30	30	40	40	50	50	60	60	70	70	80	80	90
ZBF	ZBA																
63A, 71A	63A/B, 71A/B	●	●	●	●	●	●	●									
80A	80A/B, 90A		●	●	●	●	●	●	●	●	●	●		●	●	●	
90B, 100A	90B, 100A/B				●	●	●	●	●	●	●	●	●	●	●	●	●
112A, 132A/B	112A, 132A/B/C								●	●	●	●	●	●	●	●	●
	160A/B,180A											●	●	●	●	●	●
	180B,200A														●	●	●
	225A/B														●	●	●
KBF	KBA																
71A, 71B	71A, 71B	●	●	●	●	●	●	●	●	●	●						
80A	80A/B		●	●	●	●	●	●	●	●	●	●					
90A	90A/B				●	●	●	●	●	●	●	●	●	●	●		
100A	100A/B				●	●	●	●	●	●	●	●	●	●	●		
112A	112B						●	●	●	●	●	●	●	●	●	●	●
125A	125B								●	●	●	●	●	●	●	●	●
140A	140B								●	●	●	●	●	●	●	●	●
	160B												●	●	●	●	●
	180B														●	●	●
	200B														●	●	●
	225B																●

● = Possible combination

I central drive unit, inside arrangement

No limitation for DRS wheel block and angular geared motor combinations



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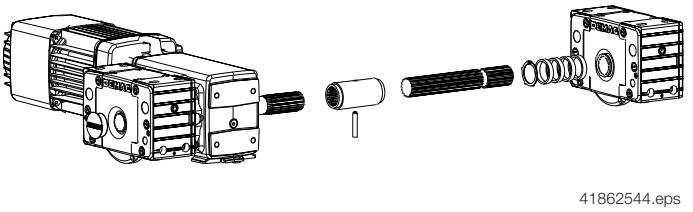

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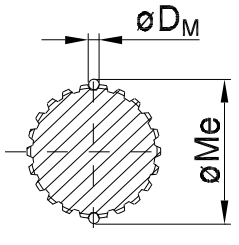

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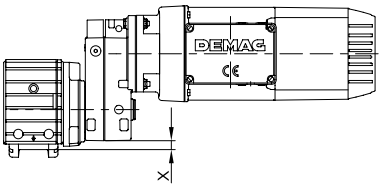
Splined shaft profile to DIN 5480 (Pressure angle 30°)	Diametral checking dimension M_e M_e	Measuring pin diameter D_M
W30x1,25x22 6g/7H	33,078 $^{-0,0196}$	2,75
W35x2x16 6g/7H	38,972 $^{-0,023}$	4
W45x2x21 6g/7H	48,907 $^{-0,022}$	4
W50x2x24 6g/7H	54,187 $^{-0,025}$	4
W65x2x31 6g/7H	69,024 $^{-0,028}$	4
W75x3x24 6g/7H	81,292 $^{-0,028}$	6
W90x3x28 6g/7H	95,945 $^{-0,0265}$	6
W110x3x35 6g/7H	116,036 $^{-0,0306}$	6

2.5 Ground clearance between wheel tread surface and lower edge of gearbox or motor

Gearbox: vertical arrangement

AM/AD offset gearbox



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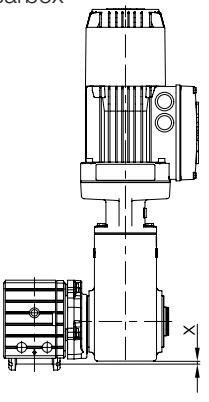
WU angular gearbox



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DRS wheel block size	Gearbox type	Ground clearance x 1) in mm	Component obstacle edge
112	AM 10	+ 5	A
	AM 20	–1,5	A
	WU 10	– 18	B
	WU 20	– 24	B
125	AM 10	+ 5	B
	AM 20	+ 5	B
	AM 30	– 13	A
	WU 10	– 13	B
	WU 20	– 18	B
	WU 30	– 28	A
160	AM 20	+ 11	B
	AM 30	+ 5	A
	AM 40	– 10	A
	WU 20	– 2	B
	WU 30	– 10	A
	WU 40	– 25	A
200	AM 30	+ 15	B
	AM 40	+ 10	A
	AD 50	– 15	A
	WU 30	– 5	B
	WU 40	– 5	B
	WU 50	– 20	A
	WU 60	– 10	B
250	AD 40	+ 20	B
	AD 50	+ 10	A
	AD 60	– 15	A
	WU 40	+ 20	A
	WU 50	+ 5	A
	WU 60	+ 15	A
	WU 70	– 5	A

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket

Ground clearance between wheel tread surface and lower edge of gearbox or motor

Gearbox: vertical arrangement

DRS wheel block size	Gearbox type	Ground clearance x 1) in mm	Component obstacle edge
315	AD 50	+ 29	B
	AD 60	+ 17	A
	AD 70	– 8	A
	WU 50	+ 29	B
	WU 60	+ 29	B
	WU 70	+ 27	A
	WU 80	– 28	A
400	AD 60	+ 55	B
	AD 70	+ 35	A
	AD 80	– 1	A
	WU 70	+ 55	B
	WU 80	+ 15	A
	WU 90	– 5	A
500	AD 70	+ 82	B
	AD 80	+ 49	A
	AU 90	+ 10	A
	WU 80	+ 65	A
	WU 90	+ 45	A
	WU 100	– 10	A

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

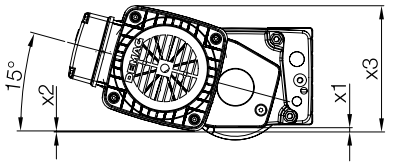
Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket

The ground clearance results from the mounting combinations (gearbox – torque bracket or gearbox – motor)

Ground clearance between wheel tread surface and lower edge of gearbox or motor

Gearbox: horizontal arrangement

AM 20 offset gearbox, turned 15°



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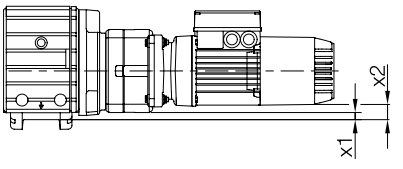
AM/AD offset gearbox



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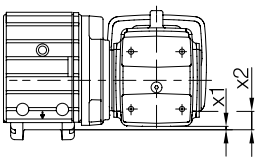
WU angular gearbox



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DRS wheel block size	Gearbox	Ground clearance x_1 1) in mm to gearbox housing	Component obstacle edge	Ground clearance x_2 1) in mm to motor housing depending on size						
				Z63 / Z71	Z80 / Z90A	Z90B / Z100	Z112 / Z132	Z160A/B / Z180A	Z180B / Z200	Z225
112	AM 10 D	+ 1	A	– 14	– 23	– 42	–	–	–	–
	AM 20 D/T	– 10	A	– 14	– 23	– 42	–	–	–	–
	WU 10 D	– 18	B	+ 7	– 1	–	–	–	–	–
	WU 20 D/T	– 24	A	+ 10	+ 2	– 18	–	–	–	–
125	AM 10 D	+ 5	B	– 8	– 16	–	–	–	–	–
	AM 20 D/T	– 3	A	– 8	– 16	– 36	–	–	–	–
	AM 30 D/T	– 16	A	– 8	– 16	– 36	–	–	–	–
	WU 10 D	– 13	B	+ 14	+ 5	–	–	–	–	–
	WU 20 D/T	– 18	A	+ 17	+ 8	– 11	–	–	–	–
	WU 30 D/T	– 28	A	+ 20	+ 11	– 8	–	–	–	–
160	AM 20 D/T	+ 11	B	+ 10	+ 1	– 18	–	–	–	–
	AM 30 D/T	+ 2	A	+ 10	+ 1	– 18	–	–	–	–
	AM 40 D/T	– 14	A	+ 10	+ 1	– 18	– 50	–	–	–
	WU 20 D/T	– 2	B	+ 34	+ 26	+ 6	–	–	–	–
	WU 30 D/T	– 10	A	+ 37	+ 29	+ 9	–	–	–	–
	WU 40 D/T	– 25	A	+ 38	+ 30	+ 10	– 22	–	–	–
200	AM 30 D/T	+ 15	B	+ 30	+ 21	+ 2	–	–	–	–
	AM 40 D/T	+ 6	A	+ 30	+ 21	+ 2	– 30	–	–	–
	AD 50 D/T	– 25	A	+ 30	+ 21	+ 2	– 30	–	–	–
	WU 30 D/T	– 5	B	+ 57	+ 49	+ 29	–	–	–	–
	WU 40 D/T	– 5	B	+ 58	+ 50	+ 30	- 2	–	–	–
	WU 50 D/T	– 20	A	+ 63	+ 55	+ 35	+ 3	–	–	–
	WU 60 T	– 105	A	+ 18	+ 10	– 10	– 42	–	–	–
	WU 60 Q	– 105	A	– 25	- 33	– 53	– 85	–	–	–
250	AD 40 D/T	+ 20	B	+ 55	+ 46	+ 27	– 5	–	–	–
	AD 50 D/T	0	A	+ 55	+ 46	+ 27	– 5	–	–	–
	AD 60 D/T	– 20	A	+ 55	+ 46	+ 27	– 5	–	–	–
	WU 40 D/T	+ 20	B	+ 83	+ 75	+ 55	+ 23	–	–	–
	WU 50 D/T	+ 5	A	+ 88	+ 80	+ 60	+ 28	–	–	–
	WU 60 T	– 80	A	+ 43	+ 35	+ 15	– 17	– 44	–	–
	WU 60 Q	– 80	A	0	– 8	– 28	– 60	– 87	–	–
	WU 70 T	– 120	A	+ 49	+ 40	+ 21	– 11	– 38	– 78	– 101
	WU 70 Q	– 120	A	– 1	– 10	– 29	– 61	– 88	– 128	– 151

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket

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Ground clearance between wheel tread surface and lower edge of gearbox or motor

Gearbox: horizontal arrangement

DRS wheel block size	Gearbox		Ground clearance x_1 1) in mm to gearbox housing	Component obstacle edge	Ground clearance x_2 1) in mm to motor housing depending on size						
					Z63 / Z71	Z80 / Z90A	Z90B / Z100	Z112 / Z132	Z160/A/B / Z180A	Z180B / Z200	Z225
315	AD 50	D/T	+ 29	B	+ 87	+ 79	+ 59	+ 27	–	–	–
	AD 60	D/T	+ 12	A	+ 87	+ 79	+ 59	+ 27	–	–	–
	AD 70	D/T	– 16	A	+ 87	+ 79	+ 59	+ 27	–	–	–
	WU 50	D/T	+ 29	B	+ 121	+ 112	+ 93	+ 61	–	–	–
	WU 60	T	– 48	A	+ 76	+ 67	+ 48	+ 16	– 11	– 51	– 74
	WU 60	Q	– 48	A	+ 33	+ 24	+ 5	– 27	– 54	– 94	– 117
	WU 70	T	– 88	A	+ 81	+ 73	+ 53	+ 21	– 6	– 46	– 69
	WU 70	Q	– 88	A	+31	+ 23	+ 3	– 29	– 56	– 96	– 119
	WU 80	T	– 118	A	+ 55	+ 47	+ 27	– 5	– 32	– 72	– 95
	WU 80	Q	– 118	A	+ 5	– 3	– 23	– 55	– 82	– 122	– 145
400	AD 60	D/T	+ 55	B	+ 130	+ 121	+ 102	+ 70	–	–	–
	AD 70	D/T	+ 27	A	+ 130	+ 121	+ 102	+ 70	–	–	–
	AD 80	D/T	– 11	A	+ 130	+ 121	+ 102	+ 70	–	–	–
	WU 70	T	– 45	A	+ 124	+ 115	+ 96	+ 64	+ 37	– 3	– 26
	WU 70	Q	– 45	A	+ 74	+ 65	+ 46	+ 14	– 13	– 53	– 76
	WU 80	T	– 75	A	+ 98	+ 89	+ 70	+ 38	+ 11	– 29	– 52
	WU 80	Q	– 75	A	+ 48	+ 39	+ 20	– 12	– 39	– 79	– 102
	WU 90	T	– 115	A	+ 98	+ 89	+ 70	+ 38	+ 11	– 29	– 52
	WU 90	Q	– 115	A	+ 37	+ 28	+ 9	– 23	– 50	– 90	– 113
500	AD 70	D/T	+ 77	A	+ 180	+ 171	+ 152	+ 120	+ 93	+ 53	+ 30
	AD 80	D/T	+ 39	A	+ 180	+ 171	+ 152	+ 120	+ 93	+ 53	+ 30
	AU 90	D/T	0	A	+ 180	+ 171	+ 152	+ 120	+ 93	+ 53	+ 30
	WU 80	T	– 25	A	+ 148	+ 139	+ 120	+ 88	+ 61	+ 21	– 2
	WU 80	Q	– 25	A	+ 98	+ 89	+ 70	+ 38	+ 11	– 29	– 52
	WU 90	T	– 65	A	+ 148	+ 139	+ 120	+ 88	+ 61	+ 21	– 2
	WU 90	Q	– 65	A	+ 87	+ 78	+ 59	+ 27	0	– 40	– 63
	WU 100	T	– 140	A	+ 136	+ 127	+ 108	+ 76	+ 49	+ 9	– 14
	WU 100	Q	– 140	A	+ 58	+ 49	+ 30	- 2	– 29	– 69	– 92

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket

The ground clearance results from the mounting combinations (gearbox – torque bracket or gearbox – motor).

Note: More favourable ground clearance can be achieved when gearbox type WU 60 – 100 model B14.2/B14.8 is used.

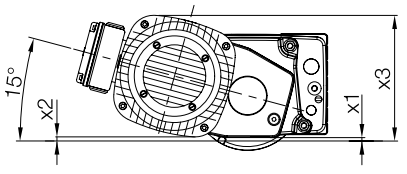
AM 20 offset gearbox fitted to the wheel block turned by 15°

DRS wheel block size	Gearbox type	Ground clearanc x_1 1) in mm to gearbox housing	Component obstacle edge	Ground clearance x_2 1)			Ground clearance x3 1)		
				in mm					
				to motor housing depending on size					
				Z63 / Z71	Z80 / Z90A	Z90B / Z100	Z63 / Z71	Z80 / Z90A	Z90B / Z100
112	AM 20 D/T	– 2	A	+ 3	– 6	– 28	163	173	195
125		+ 5	A	+ 10	0	– 22	169	179	201
160		+ 11	B	+ 27	+ 18	– 4	187	197	219

Ground clearance between wheel tread surface and lower edge of gearbox or motor for coupling connection arrangement with KBF motor

Gearbox: horizontal arrangement

AM 20, offset gearbox turned 15°



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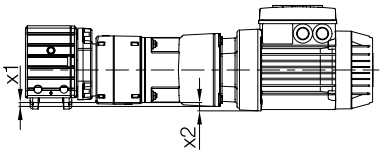
Offset gearbox



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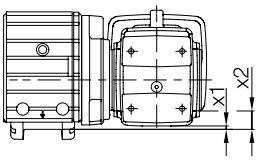
Angular gearbox



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DRS wheel block size	Gearbox	Ground clearance x_1 1) in mm to coupling housing	Component obstacle edge	Ground clearance x_2 1) in mm to motor housing depending on size										
				KB71	KB80	KB90	KB100	KB112	KB125	KB140	KB160	KB180	KB200	KB225
112	AM 10 D	– 7	C	– 14	– 23	–	–	–	–	–	–	–	–	–
	AM 20 D/T	– 10	A	– 14	– 23	– 33	–	–	–	–	–	–	–	–
	WU 10 D	– 18	B	+ 7	– 2	–	–	–	–	–	–	–	–	–
	WU 20 D/T	– 24	A	+ 10	+ 1	– 9	–	–	–	–	–	–	–	–
125	AM 10 D	0	C	– 8	– 17	–	–	–	–	–	–	–	–	–
	AM 20 D/T	– 3	A	– 8	– 17	– 27	–	–	–	–	–	–	–	–
	AM 30 D/T	– 18	C	– 8	– 17	– 27	– 36	–	–	–	–	–	–	–
	WU 10 D	– 13	B	+ 14	+ 5	–	–	–	–	–	–	–	–	–
	WU 20 D/T	– 18	A	+ 17	+ 8	– 2	–	–	–	–	–	–	–	–
	WU 30 D/T	– 28	A	+ 20	+ 11	+ 1	– 8	–	–	–	–	–	–	–
160	AM 20 D/T	+ 11	B	+ 10	+ 1	– 9	–	–	–	–	–	–	–	–
	AM 30 D/T	0	C	+ 10	+ 1	– 9	– 18	–	–	–	–	–	–	–
	AM 40 D/T	– 14	A	+ 10	+ 1	– 9	– 18	–	–	–	–	–	–	–
	WU 20 D/T	- 2	B	+ 34	+ 25	+ 15	–	–	–	–	–	–	–	–
	WU 30 D/T	– 10	A	+ 37	+ 28	+ 18	+ 9	–	–	–	–	–	–	–
	WU 40 D/T	– 25	A	+ 38	+ 29	+ 19	+ 10	– 2	– 15	–	–	–	–	–
200	AM 30 D/T	+ 15	B	+ 30	+ 21	+ 11	+ 2	–	–	–	–	–	–	–
	AM 40 D/T	+ 6	A	+ 30	+ 21	+ 11	+ 2	–	–	–	–	–	–	–
	AD 50 D/T	– 25	A	+ 30	+ 21	+ 11	+ 2	– 10	– 23	– 37	–	–	–	–
	WU 30 D/T	– 5	B	+ 57	+ 48	+ 38	+ 29	–	–	–	–	–	–	–
	WU 40 D/T	– 5	B	+ 58	+ 49	+ 39	+ 30	+ 18	+ 5	–	–	–	–	–
	WU 50 D/T	– 20	A	+ 63	+ 54	+ 44	+ 35	+ 23	+ 10	– 4	–	–	–	–
	WU 60 T	– 105	A	+ 18	+ 9	– 1	– 10	– 22	– 35	– 49	– 69	–	–	–
	WU 60 Q	– 105	A	– 25	+ 34	– 44	– 53	– 65	–	–	–	–	–	–
250	AD 40 D/T	+ 20	B	+ 55	+ 46	+ 36	+ 27	–	–	–	–	–	–	–
	AD 50 D/T	0	A	+ 55	+ 46	+ 36	+ 27	+ 15	+ 2	– 12	–	–	–	–
	AD 60 D/T	– 20	A	+ 55	+ 46	+ 36	+ 27	+ 15	+ 2	– 12	–	–	–	–
	WU 40 D/T	+ 20	B	+ 83	+ 74	+ 64	+ 55	+ 43	+ 30	–	–	–	–	–
	WU 50 D/T	+ 5	A	+ 88	+ 79	+ 69	+ 60	+ 48	+ 35	+ 21	–	–	–	–
	WU 60 T	– 80	A	+ 43	+ 34	+ 24	+ 15	+ 3	– 10	– 24	– 44	–	–	–
	WU 60 Q	– 80	A	0	– 9	– 19	– 28	– 40	–	–	–	–	–	–
	WU 70 T	– 120	A	+ 49	+ 40	+ 30	+ 21	+ 9	– 4	– 18	– 38	– 58	– 78	–
	WU 70 Q	– 120	A	– 1	– 10	– 20	– 29	– 41	– 54	– 68	–	–	–	–

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket
Obstacle edge C = Coupling housing

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Ground clearance between wheel tread surface and lower edge of gearbox or motor for coupling connection arrangement with KBF motor

Gearbox: horizontal arrangement

DRS wheel block size	Gearbox		Ground clearance x_1 1) in mm to coupling housing	Component obstacle edge	Ground clearance x_2 1) in mm to motor housing depending on size										
					KB71	KB80	KB90	KB100	KB112	KB125	KB140	KB160	KB180	KB200	KB225
315	AD 50	D/T	+ 29	B	+ 87	+ 78	+ 68	+ 59	+ 47	+ 34	+ 20	–	–	–	–
	AD 60	D/T	+ 12	A	+ 87	+ 78	+ 68	+ 59	+ 47	+ 34	+ 20	–	–	–	–
	AD 70	D/T	- 16	A	+ 87	+ 78	+ 68	+ 59	+ 47	+ 34	+ 20	0	–	–	–
	WU 50	D/T	+ 29	B	+ 121	+ 112	+ 102	+ 93	+ 81	+ 68	+ 54	–	–	–	–
	WU 60	T	– 48	A	+ 76	+ 67	+ 57	+ 48	+ 36	+ 23	+ 9	– 11	–	–	–
	WU 60	Q	– 48	A	+ 33	+ 24	+ 14	+ 5	– 7	– 20	– 34	– 54	–	–	–
	WU 70	T	– 88	A	+ 81	+ 72	+ 62	+ 53	+ 41	+ 28	+ 14	– 6	– 26	– 46	–
	WU 70	Q	– 88	A	+ 31	+ 22	+ 12	+ 3	– 9	– 22	– 36	–	–	–	–
	WU 80	T	– 118	A	+ 55	+ 46	+ 36	+ 27	+ 15	+ 2	– 12	– 32	– 52	– 72	–
	WU 80	Q	– 118	A	+ 5	– 4	– 14	– 23	– 35	– 48	– 62	–	–	–	–
400	AD 60	D/T	+ 55	B	+ 130	+ 121	+ 111	+ 102	+ 90	+ 77	+ 63	–	–	–	–
	AD 70	D/T	+ 27	A	+ 130	+ 121	+ 111	+ 102	+ 90	+ 77	+ 63	+ 43	–	–	–
	AD 80	D/T	- 11	A	+ 130	+ 121	+ 111	+ 102	+ 90	+ 77	+ 63	+ 43	+ 23	+ 3	–
	WU 70	T	– 45	A	+ 124	+ 115	+ 105	+ 96	+ 84	+ 71	+ 57	+ 37	+ 17	– 3	–
	WU 70	Q	– 45	A	+ 74	+ 65	+ 55	+ 46	+ 34	+ 21	+ 7	–	–	–	–
	WU 80	T	– 75	A	+ 98	+ 89	+ 79	+ 70	+ 58	+ 45	+ 31	+ 11	– 9	– 29	–
	WU 80	Q	– 75	A	+ 48	+ 39	+ 29	+ 20	+ 8	– 5	– 19	–	–	–	–
	WU 90	T	– 115	A	–	–	–	–	+ 58	+ 45	+ 31	+ 11	– 9	– 29	– 52
	WU 90	Q	– 115	A	–	+ 28	+ 18	+ 9	– 3	– 16	– 30	– 50	–	–	–
500	AD 70	D/T	+ 77	A	+ 180	+ 171	+ 161	+ 152	+ 140	+ 127	+ 113	+ 93	–	–	–
	AU 80	D/T	+ 39	A	–	+ 171	+ 161	+ 152	+ 140	+ 127	+ 113	+ 93	+ 73	+ 53	–
	AU 90	D/T	0	A	–	–	–	–	+ 140	+ 127	+ 113	+ 93	+ 73	+ 53	+ 30
	WU 80	T	– 25	A	+ 148	+ 139	+ 129	+ 120	+ 108	+ 95	+ 81	+ 61	+ 41	+ 21	–
	WU 80	Q	– 25	A	+ 98	+ 89	+ 79	+ 70	+ 58	+ 45	+ 31	–	–	–	–
	WU 90	T	– 65	A	–	–	–	–	+ 108	+ 95	+ 81	+ 61	+ 41	+ 21	– 2
	WU 90	Q	– 65	A	–	+ 78	+ 68	+ 59	+ 47	+ 34	+ 20	0	–	–	–
	WU 100	T	– 140	A	–	–	–	–	+ 96	+ 83	+ 69	+ 49	+ 29	+ 9	– 14
	WU 100	Q	– 140	A	–	+ 49	+ 39	+ 30	+ 18	+ 5	– 9	– 29	– 49	– 69	–

1) Table values are based on the nominal travel wheel diameter (wheel block size). The ground clearance increases for travel wheel types C, E and F owing to the larger travel wheel diameter.

Obstacle edge A = Gearbox housing
Obstacle edge B = Torque bracket
Obstacle edge C = Coupling housing

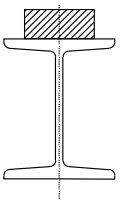
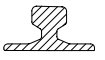
The ground clearance results from the mounting combinations (gearbox – torque bracket or gearbox – motor).

AM 20 offset gearbox fitted to the wheel block turned by 15°

DRS wheel block size	Gearbox type	Ground clearanc x_1 1) in mm to gearbox housing	Component obstacle edge	Ground clearance x_2 1)			Ground clearance x3 1)		
				in mm					
				to motor housing depending on size					
				KB 71	KB 80	KB 90	KB 71	KB 80	KB 90
112	AM 20 D/T	– 2	A	+ 8	– 2	– 12	158	168	178
125		+ 5		+ 14	+ 5	– 6	165	174	201
160		+ 11		+ 32	+ 22	+ 12	182	192	202

2.6 Rail types

2.6.1 Assessment of rail types

Rail shape		Flat rail to DIN 1017 or 1014	DIN 536 Shape A	DIN 5601
Assessment criteria				
Wheel loads	- small (≤ 200 kN) 1)	+	+	+
	- medium (> 200 kN, ≤ 500 kN)	+	+	–
	- large (> 500 kN)	O	+	–
Duty	- small (B1, B2) 2)	+	+	+
	- medium (B3, B4)	+	+	+
	- large (B5, B6)	O	+	O
Rail support and assignment to crane runway	- steel	+	+	+
	- concrete	–	+	+
	- sleepers	–	–	+
To accommodate lateral forces		+	+	O
Lateral guidance	- guide rollers	+	+	O
	- flanges	+	+	+
For fitting	- wind drift safety devices	+	+	+
	- tilt safety devices	–	O	+

Source: based on VDI 3576, July 1995

+ suitable

O partially suitable

– not suitable

1) Verification of calculation required

2) Stress factor groups to DIN 15018

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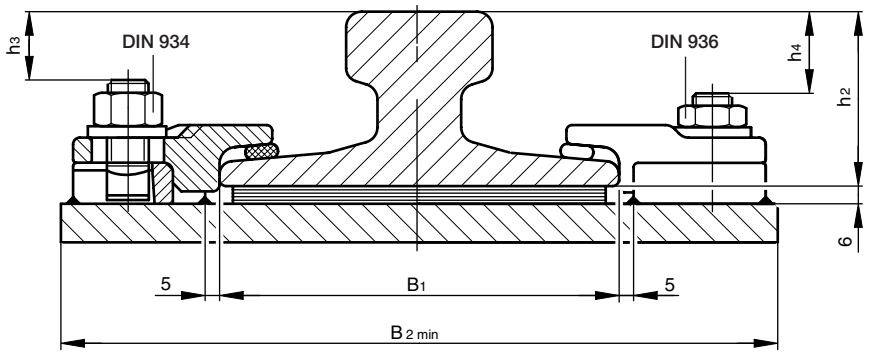
Clamping plate for alignment to RIW-NO 17938



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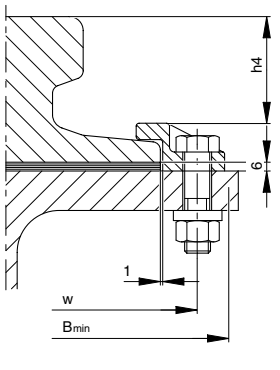
Rated size	Crane rail		Dimensions							Tightening torque	
	with pad	without pad	B1	B2	h2	h3	h4	Bolt Nut		Nut	
						934	936	DIN 934	DIN 936	DIN 934	DIN 936
14	–	A 45	125	245	55	14	19	M 16x40	M 16x35	205 Nm	100 Nm
		A 55	150	270	65	24	29				
		A 65	175	295	75	34	39				
		A 75	200	320	85	44	49				
		A 100			95	54	50				
18	A 45	–	125	245	55	15	20	M 16x45	M 16x40	205 Nm	100 Nm
	A 55		150	270	65	25	30				
	A 65		175	295	75	35	40				
	–	A 120	220	340	105	59	64				
22	A 75	–	200	320	85	40	45	M 16x50	M 16x45	205 Nm	100 Nm
	A 100				95	50	55				
	A 120		220	340	105	60	65				

Clamping plate for crane rail to RIW-NO 17942



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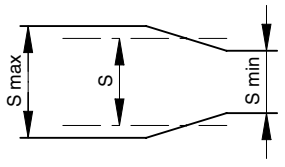
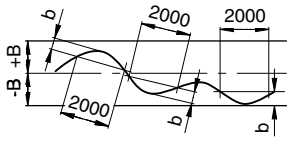
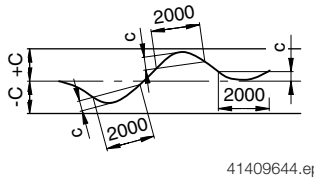
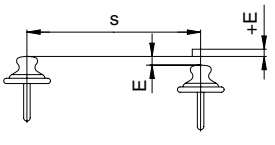
Rated size	Application	Girder width	Clearance dimension for guide rollers	Bore hole spacing
1)	for rail	B min	h4	W
16	A 45/A 55	207/232	34/45	171/196
18	A 65/A 75	257/282	53/63	221/246
20	A 100	282	71	246
22	A 120	302	79	266
24	A 150		122	

1) Allows for a 6 mm pad. Select the relevant rated size for other thicknesses. Use the next smaller rated size for the clamped version.

2.6.2 Manufacturers' tolerances

Tolerance		Crane runways		
Designation	**Diagram**	**Tolerance class 1**	**Tolerance class 2**	**Tolerance class 3**
Tolerance A of track gauge dimension s of crane rails with reference to the rail centre and crane runway length	 41409444.eps $S_{max} = s + A$ $S_{min} = s - A$	for s ≤ 16 m: A = ± 3 mm for s > 16 m: A = ± [3 + 0,25 (s – 16)] A in mm use s in m	for s ≤ 16 m: A = ± 5 mm for s > 16 m: A = ± [5 + 0,25 (s – 16)] A in mm use s in m	for s ≤ 16 m: A = ± 8 mm for s > 16 m: A = ± [8 + 0,25 (s – 16)] A in mm use s in m
Tolerance B of the lateral straightness of the rail head with reference to the crane runway length Tolerance b of the lateral straightness with reference to 2000 mm measured length (sample length) at any point of the rail head	 41409544.eps Position of a rail seen in plan	B = ± 5 mm b = 1 mm	B = ± 10 mm b = 1 mm	B = ± 20 mm b = 2 mm
Tolerance C of the straightness with reference to the height of the crane rail centre and crane rail length Tolerance c of the straightness with reference to 2000 mm measured length (sample measurement) at any point of the crane runway	 41409644.eps Position of a rail seen in elevation (longitudinal slope)	C = ± 5 mm c = 1 mm	C = ± 10 mm c = 2 mm	C = ± 20 mm c = 4 mm
Tolerance E of the height with reference to perpendicular measuring points at every point of the crane runway	 41409744.eps Position of rails in relation to one another in elevation (transverse slope)	E = ± 0,5°/% x s in mm use s in mm E_{max} = ± 5 mm	E = ±1°/% x s in mm use s in mm E_{max} = ± 10 mm	E = ±2°/% x s in mm use s in mm E_{max} = ± 20 mm

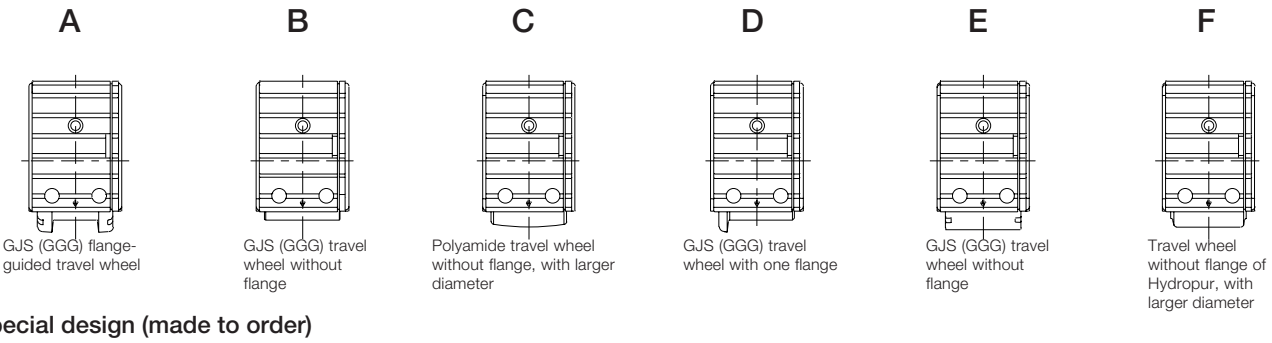
20320004.tbl

Source: VDI 3576

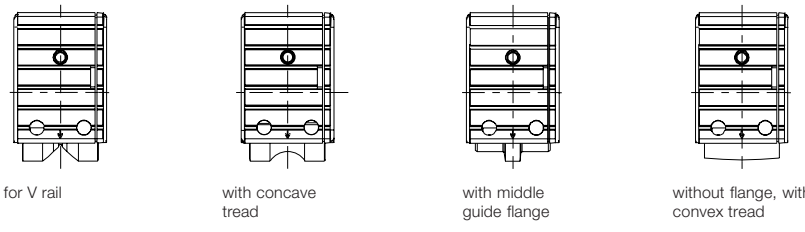
Recommended: Tolerance class 2

2.6.3 Travel wheel types

Standard travel wheel designs

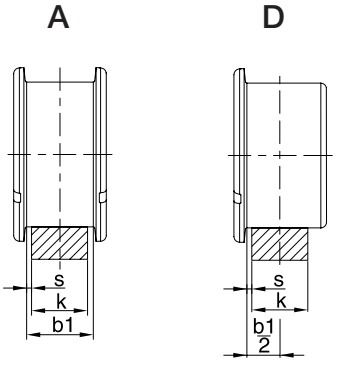


Special design (made to order)



2.6.4 Wheel tread/crane rail widths

GJS-700-2 (GGG 70)
spheroidal graphite
cast iron travel wheel



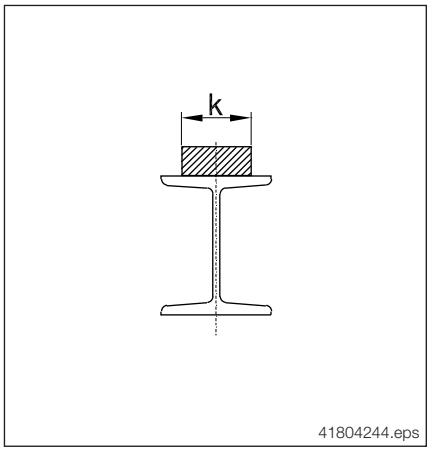
Travel wheel diameter	Travel wheel width	Travel wheel type				Distance s per side 1)		Rail width
		A			D			
		Travel wheel tread b1 2)						
		to	to 3)	Standard	Standard	min.	max.	k
112	80	60	62	**47, 60**	**47**	1	5	40, 45, 50, 55, 60
125	80	60	62	**47, 60**	**47, 60**	1	5	40, 45, 50, 55, 60
160	89	65	67	**47, 60, 65**	**47, 65**	1	5	40, 45, 50, 55, 60, 65
200	101	67	75	**65, (75 3))**	**65**	1	5	50, 55, 60, 70
250	110	77	80	**52, 65, 75**	**65, 75**	1	5	50, 55, 60, 70, 75
315	130	90	96	**80, 90**	**80, 90**	1	5	60, 70 75, 80, 90
400	155	110	-	**80, 90, 110**	**80, 110**	1	5	65, 70, 75, 80, 90, 100
500	170	110	-	**90, 110**	**90, 110**	1	5	70, 75, 80, 90, 100

1) Tolerance class 2 to VDI 3576
2) DRS 112 – 200 available in steps of 1 mm
3) Hardened travel wheels (treads and flanges), flanges without wear indicator

short delivery times

2.6.5 Linear contact

Flat rail – straight travel wheel



GGG spheroidal graphite cast iron travel wheel material

Rail shape	Suitable for guide roller arrangement								Useful rail head width	
Flat rail	DRS									
DIN 1017	112	125	160	200	250	315	400	500	k	k_1 in mm
45 x 30	●	●	(–)	(–)	–	–	–	–		45
45 x 45	●	●	●	●	●	–	–	–		45
50 x 30	●	●	(–)	(–)	–	–	–	–		50
50 x 40	●	●	●	●	–	–	–	–		50
55 x 30	●	●	(–)	(–)	–	–	–	–		55
55 x 55	●	●	●	●	●	●	–	–		55
60 x 30	●	●	(–)	(–)	–	–	–	–		60
60 x 40	●	●	●	●	(–)	–	–	–		60
60 x 50	●	●	●	●	●	●	●	–	$k = k_1$	60
60 x 60	●	●	●	●	●	●	–	–		60
65 x 40	●	●	●	●	(–)	–	–	–		65
70 x 40	–	–	●	●	–	–	–	–		70
70 x 50	–	–	●	●	●	●	●	–		70
75 x 40	–	–	●	●	(–)	–	–	–		75
80 x 40	–	–	–	●	(–)	–	–	–		80
80 x 50	–	–	–	●	●	●	●	–		80
90 x 60	–	–	–	–	–	●	●	●		90
100 x 60	–	–	–	–	–	–	●	●		100

(-) May be used for some applications. Check with engineering department for special design

$$R_{perm\ (rail)} = R_{perm\ (linear)} \cdot f_{St}$$

$R_{perm\ (rail)}$ = permissible wheel load for linear contact on steel rails

$R_{perm\ (linear)}$ = permissible wheel load for linear contact (table value, see page 39 onwards)

f_{St} = reduction factor for rail material for linear contact

	Material	Factor f_{St} Linear contact	Standard
Rail	St 70-2/E 360	1	DIN EN 10025
	St 60-2/E 335	1	
	St 52-3/S 355 J 2 G 3	1	
	St 37-2/ S 235 J R	0,25	

Permissible wheel loads $R_{perm\ (rail)}$ are used in section 5.3 for determining the maximum permissible wheel load for a wheel block.

$$R_{perm\ (temperature)} = R_{perm\ (linear)} \cdot f_k$$

f_k = reduction factor for temperature of driven design, see section 1.11

Comparison of $R_{perm\ (temperature)}$ with $R_{perm\ (rail)}$

Important: Use the **smallest permissible value** for further calculation.

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Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 112 Top and side connection

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30							2700	2520	2350	2190	2050	1910
		35									2740	2560	2400	2220
		40				2750								
		45										2720	2520	2320
		50												
		≥ 55												
1 Am	M 4	30				2700	2520	2350	2190	2050	1910	1780	1670	1550
		35						2740	2560	2390	2220	2080	1940	1810
		40			2750									
		45							2720	2520	2320	2160	2000	1840
		50												
		≥ 55												
2 m	M 5	30	2700	2510	2350	2190	2050	1910	1780	1660	1550	1450	1350	1260
		35			2740	2560	2390	2220	2080	1940	1810	1680	1560	1430
		40		2750										
		45				2720	2520	2320	2160	2000	1840	1710	1590	1460
		50												
		≥ 55												
3 m	M 6	30	2200	2130	2040	1980	1870	1750	1670	1530	1400	1290	1180	1060
		35	2640	2490										
		40			2320	2160	2000	1840	1710	1580	1460	1360	1260	1160
		45	2720	2500										
		50												
		≥ 55												
4 m	M 7	30	1980	1920	1840									
		35												
		40												
		45	2170	2000	1850	1720	1590	1470	1360	1260	1170	1080	1000	920
		50												
		≥ 55												
5 m	M 8	30												
		35												
		40												
		45	1720	1590	1470	1370	1270	1170	1080	1000	930	860	800	730
		50												
		≥ 55												

Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 112 **Pin connection**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30				3446	3215	2993	2799	2612	2431	2303	2252	2197
		35						3492	3266	3047	2836	2687		
		40												
		45			3500				3430	3175	2932	2722	2527	2327
		50												
		≥ 55												
1 Am	M 4	30	3446	3200	2993	2799	2612	2431	2303	2250	2197	2149		
		35			3492	3266	3047	2836	2687					
		40												
		45		3500		3430	3175	2932	2722	2520	2327	2160	2006	1847
		50												
		≥ 55												
2 m	M 5	30	2799	2599	2431	2303	2250	2197	2149					
		35	3266	3033	2836	2687								
		40												
		45	3430	3159	2932	2722	2520	2327	2160	2000	1847	1715	1592	1466
		50												
		≥ 55												
3 m	M 6	30	2303	2247	2197	2149								
		35	2687											
		40	2722											
		45		2507	2327	2160	2000	1847	1715	1588	1466	1361	1263	1164
		50												
		≥ 55												
4 m	M 7	30	2152											
		35												
		40												
		45	2172	2000	1857	1724	1596	1474	1368	1267	1170	1986	1008	928
		50												
		≥ 55												
5 m	M 8	30												
		35												
		40												
		45	1728	1592	1478	1372	1270	1173	1089	1008	931	864	802	739
		50												
		≥ 55												

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Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 125 **For all connection variants**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30	4730	4390	4110	3840	3580	3330	3120	2910	2710	2530	2370	2200
		35	5000		4790	4480	4180	3890	3640	3390	3160	2950	2760	2570
		40					4780	4450	4160	3880	3610	3380	3160	2930
		45							4640	4300	3970	3680	3420	3150
		50												
		≥ 55												
1 Am	M 4	30	3840	3570	3330	3120	2910	2710	2530	2360	2200	2060	1920	1780
		35	4480	4160	3890	3640	3390	3160	2950	2760	2570	2400	2240	2080
		40	5000	4760	4450	4160	3880	3610	3380	3150	2930	2740	2560	2380
		45				4640	4300	3970	3680	3410	3150	2920	2710	2500
		50												
		≥ 55												
2 m	M 5	30	3120	2900	2710	2530	2360	2200	2060	1920	1780	1670	1560	1450
		35	3640	3380	3160	2950	2760	2570	2400	2240	2080	1950	1820	1690
		40	4140	3870	3610	3380	3150	2930	2740	2560	2380	2230	2080	1930
		45	4640	4270	3970	3680	3410	3150	2920	2710	2500	2320	2150	1980
		50												
		≥ 55												
3 m	M 6	30	2530	2410	2330	2260	2160	2030	1910	1780	1640	1510	1390	1260
		35	2950	2810	2720	2630	2520	2370	2230	2080	1910	1760	1620	1470
		40	3380	3210	3110	2920	2710	2500	2320	2150	1980	1840	1710	1570
		45	3680	3390	3150									
		50												
		≥ 55												
4 m	M 7	30	2230	2160	2100	2030	1960	1830	1720	1610	1470	1360	1250	1140
		35	2600	2530	2450	2330	2160	1990	1850	1710	1580	1470	1360	1250
		40	2940	2710	2510									
		45												
		50												
		≥ 55												
5 m	M 8	30	1980	1920	1860	1800	1720	1580	1470	1360	1260	1170	1080	1000
		35	2310	2150	2000	1850								
		40	2340											
		45												
		50												
		≥ 55												

Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 160 **For all connection variants**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30	6400	6050	5660	5300	4940	4600	4300	4010	3730	3490	3270	3060
		35	7000		6610	6180	5760	5370	5020	4680	4360	4070	3810	3540
		40					6590	6130	5740	5350	4980	4660	4360	4040
		45						6900	6450	6020	5600	5240	4900	4550
		50								6690	6230	5820	5450	5060
		≥ 55									6850	6410	5990	5560
1 Am	M 4	30	5300	4920	4600	4300	4010	3730	3490	3260	3030	2840	2650	2460
		35	6180	5740	5370	5020	4680	4360	4070	3800	3540	3310	3090	2870
		40	7000	6560	6130	5740	5350	4980	4660	4350	4040	3780	3540	3280
		45			6900	6450	6020	5600	5240	4890	4550	4260	3980	3700
		50					6690	6230	5820	5430	5060	4730	4420	4110
		≥ 55						6850	6410	5980	5560	5200	4870	4520
2 m	M 5	30	4300	3990	3730	3490	3260	3030	2840	2650	2460	2300	2150	2000
		35	5020	4660	4360	4070	3800	3540	3310	3090	2870	2690	2510	2330
		40	5740	5330	4980	4660	4350	4040	3780	3530	3280	3070	2870	2670
		45	6450	5990	5600	5240	4810	4550	4260	3970	3700	3460	3230	3000
		50	7000	6660	6230	5820	5430	5060	4730	4410	4110	3840	3590	3330
		≥ 55			6850	6410	5980	5560	5200	4850	4520	4220	3950	3650
3 m	M 6	30	3490	3240	3080	2990	2890	2760	2600	2440	2290	2090	1940	1780
		35	4070	3780	3590	3480	3370	3220	3040	2850	2670	2440	2260	2070
		40	4660	4320	4110	3980	3850	3680	3470	3260	3050	2790	2580	2370
		45	5240	4870	4620	4480	4340	4150	3910	3670	3430	3140	2910	2670
		50	6020	5410	5140	4980	4820	4610	4340	4080	3780	3490	3230	2960
		≥ 55	6020	5730	5580	5360	5080	4760	4420	4090	3780	3510	3260	3000
4 m	M 7	30	2940	2860	2770	2690	2600	2490	2340	2200	2060	1880	1740	1600
		35	3440	3330	3230	3130	3030	2900	2730	2570	2400	2200	2030	1870
		40	3930	3810	3700	3580	3470	3320	3130	2930	2740	2510	2320	2130
		45	4420	4290	4160	4030	3900	3730	3520					
		50	4800	4570	4450	4280	4050	3800	3530	3260	3010	2800	2600	2390
		≥ 55	4800	4570	4450	4280	4050	3800	3530					
5 m	M 8	30	2620	2540	2460	2390	2310	2210	2080	1950	1830	1670	1550	1420
		35	3050	2960	2870	2790	2700	2580	2430	2280	2130	1950	1810	1660
		40	3490	3390	3290	3180	3080	2950	2780				2060	
		45								2600	2400	2230		1900
		50	3820	3640	3540	3400	3230	3020	2810				2070	
		≥ 55												

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Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +50 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 200 **For all connection variants**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30	8000	8000	7570	7080	6600	6150	5750	5360	4990	4670	4370	4050
		35	9340	9340	8830	8260	7710	7170	6710	6260	5830	5450	5090	4730
		40	10000			9440	8810	8200	7670	7150	6660	6230	5820	5410
		45					9910	9220	8630	8050	7490	7010	6550	6080
		50							9580	8940	8320	7780	7280	6760
		≥ 55								9840	9160	8560	8010	7440
1 Am	M 4	30	7080	6570	6150	5750	5360	4990	4670	4360	4050	3790	3550	3290
		35	8260	7670	7170	6710	6260	5830	5450	5080	4730	4420	4140	3840
		40	9440	8770	8200	7670	7150	6660	6230	5810	5410	5060	4730	4390
		45	10000	9860	9220	8630	8050	7490	7010	6540	6080	5690	5320	4940
		50				9580	8940	8320	7780	7260	6760	6320	5910	5490
		≥ 55					9840	9160	8560	7990	7440	6950	6500	6040
2 m	M 5	30	5750	5340	4990	4670	4360	4050	3790	3540	3290	3080	2880	2670
		35	6710	6230	5830	5450	5080	4730	4420	4130	3840	3590	3360	3120
		40	7670	7120	6660	6230	5810	5410	5060	4720	4390	4110	3840	3570
		45	8630	8010	7490	7010	6540	6080	5690	5310	4940	4620	4325	4010
		50	9580	8900	8320	7780	7260	6760	6320	5900	5490	5130	4800	4460
		≥ 55	10000	9790	9160	8560	7990	7440	6950	6490	6040	5650	5280	4900
3 m	M 6	30	4670	4340	4050	3850	3730	3610	3450	3260	3060	2860	2620	2420
		35	5450	5060	4730	4490	4360	4220	4030	3800	3570	3330	3060	2820
		40	6230	5780	5410	5140	4980	4820	4610	4340	4080	3810	3490	3230
		45	7010	6500	6080	5780	5600	5420	5180	4890	4590	4290	3930	3630
		50	7780	7230	6760	6420	6220	6030	5760	5430	5100	4770	4370	4040
		≥ 55	8560	7950	7440	7070	6850	6630	6340	5920	5470	5080	4710	4340
4 m	M 7	30	3810	3680	3570	3470	3360	3250	3110	2930	2750	2570	2360	2180
		35	4440	4300	4170	4040	3920	3790	3630	3420	3210	3000	2750	2540
		40	5080	4910	4770	4620	4480	4340	4150	3910	3670	3430	3140	2910
		45	5720	5520	5360	5200	5040	4880	4660	4400	4130	3860	3540	3270
		50	6350	6140	5960	5780	5600	5420	5180	4840	4470	4150	3850	3550
		≥ 55	6990	6750	6480	6290	6010	5640	5230					
5 m	M 8	30	3370	3270	3180	3080	2990	2890	2760	2600	2440	2290	2090	1940
		35	3930	3820	3710	3590	3480	3370	3220	3040	2850	2670	2440	2260
		40	4490	4360	4240	4110	3980	3850	3680	3470	3260	3050	2790	2580
		45	5050	4910	4770	4620	4480	4340	4150	3850	3560	3300	3070	2820
		50	5610	5390	5160	5010	4780	4480	4160					
		≥ 55	5670											

Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +50 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 250 For all connection variants

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30	10100	10100	10100	9800	9150	8500	7950	7400	6900	6450	6050	5600
		35	11800	11800	11800	11400	10650	9900	9300	8650	8050	7550	7050	6550
		40	13500	13500	13500	13050	12200	11350	10600	9890	9200	8600	8050	7500
		45	15150	15150	15150	14700	13700	12750	11950	11150	10350	9700	9050	8400
		50					15200	14150	13250	12350	11500	10750	10050	9350
		55			16000			15600	14600	13600	12650	11850	11050	10300
		60							15900	14850	13800	12900	12100	11200
		≥ 65									14950	14000	13100	12150
1 Am	M 4	30	9800	9100	8500	7950	7400	6900	6450	6050	5600	5250	5100	4950
		35	11400	10600	9900	9300	8650	8050	7550	7050	6550	6100	5950	5800
		40	13050	12100	11350	10600	9890	9200	8600	8050	7500	7000	6800	6600
		45	14700	13650	12750	11950	11150	10350	9700	9050	8400	7850	7600	7450
		50		15150	14150	13250	12350	11500	10750	10050	9350	8750	8450	8250
		55			15600	14600	13600	12650	11850	11050	10300	9600	9300	9100
		60		16000		15900	14850	13800	12900	12050	11200	10500	10150	9900
		≥ 65						14950	14000	13050	12150	11350	11000	10750
2 m	M 5	30	7950	7400	6900	6450	6050	5600	5250	5100	4950	4850	4750	4650
		35	9300	8600	8050	7550	7050	6550	6100	5950	5800	5650	5550	5400
		40	10600	9850	9200	8600	8050	7500	7000	6750	6600	6450	6300	6150
		45	11950	11050	10350	9700	9050	8400	7850	7600	7450	7250	7100	6950
		50	13250	12300	11500	10750	10050	9350	8750	8450	8250	8100	7900	7700
		55	14600	13550	12650	11850	11050	10300	9600	9300	9100	8900	8700	8500
		60	15900	14750	13800	12900	12050	11200	10500	10150	9900	9700	9500	9250
		≥ 65	16000	16000	14950	14000	13050	12150	11350	11000	10750	10500	9900	9300
3 m	M 6	30	6450	6000	5600	5250	5100	4950	4850	4750	4650	4500	4400	4300
		35	7550	7000	6550	6100	5950	5800	5650	5550	5400	5300	5150	5050
		40	8600	8000	7500	7000	6800	6600	6450	6300	6150	6050	5900	5750
		45	9700	9000	8400	7850	7600	7450	7250	7100	6950	6800	6650	6500
		50	10750	10000	9350	8750	8450	8250	8100	7900	7700	7550	7350	7200
		55	11850	11000	10300	9600	9300	9100	8900	8700	8500	8300	8100	7600
		60	12900	12000	11200	10500	10150	9900	9700	9500	9250	8650		
		≥ 65	14000	13000	12150	11350	11000	10750	10500	9900	9300			
4 m	M 7	30	5250	5100	4950	4850	4750	4650	4550	4450	4300	4250	4150	4050
		35	6150	5950	5800	5650	5550	5400	5300	5150	5050	4950	4800	4700
		40	7050	6750	6600	6500	6350	6200	6050	5900	5750	5650	5500	5400
		45	7900	7600	7450	7300	7100	6950	6800	6650	6500	6350	6200	6050
		50	8800	8450	8300	8100	7900	7700	7550	7400	7200	7050	6600	6150
		55	9650	9300	9100	8900	8700	8500	8300	8100	7600			
		60	10550	10150	9950	9700	9500	9250	8650					
		≥ 65	11400	11000	10750	10500	9900	9300						
5 m	M 8	30	4850	4750	4650	4550	4450	4350	4250	4150	4050	3950	3850	3750
		35	5650	5550	5400	5300	5150	5050	4950	4800	4700	4600	4500	4400
		40	6500	6300	6200	6050	5900	5750	5650	5500	5400	5250	5150	5000
		45	7300	7100	6950	6800	6650	6500	6350	6200	6050	5750	5350	
		50	8100	7900	7750	7550	7400	7200	7050	6600	6150			
		55	8900	8700	8500	8300	8100	7600						
		60	9700	9500	9250	8650								
		≥ 65	10550	9900	9300									

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Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +50 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 315 **For all connection variants**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	30	12750	12750	12750	12750	12350	11500	10750	10000	9300	8700	8150	7550
		35	14750	14850	14850	14850	14400	13400	12550	11700	10900	10150	9500	8850
		40	17000	17000	17000	17000	16450	15300	14300	13350	12450	11650	10850	10100
		45	19100	19100	19100	19100	18500	17200	16100	15050	14000	13100	12250	11350
		50	21250	21250	21250	21250	20550	19150	17900	16700	15550	14550	13600	12600
		55						21050	19700	18350	17100	16000	14950	13900
		60			22000				21450	20050	18650	17450	16300	15150
		≥ 65								21700	20200	18900	17650	16400
1 Am	M 4	30	12750	12250	11500	10750	10000	9300	8700	8150	7550	7100	6650	6400
		35	14850	14300	13400	12550	11700	10900	10150	9500	8850	8250	7750	7450
		40	17000	16350	15300	14300	13350	12450	11650	10900	10100	9450	8850	8550
		45	19100	18400	17200	16100	15050	14000	13100	12200	11350	10650	9950	9600
		50	21250	20450	19150	17900	16700	15550	14550	13550	12600	11800	11050	10650
		55			21050	19700	18350	17100	16000	14900	13900	13000	12150	11700
		60		22000		21750	20050	18650	17450	16250	15150	14150	13250	12800
		≥ 65					21700	20200	18900	17650	16400	15350	14350	13850
2 m	M 5	30	10750	9950	9300	8700	8150	7550	7100	6600	6400	6250	6100	5950
		35	12550	11650	10900	10150	9500	8850	8250	7700	7450	7300	7150	6950
		40	14300	13300	12450	11650	10850	10100	9450	8800	8550	8350	8150	7950
		45	16100	14950	14000	13100	12200	11350	10650	9900	9600	9400	9150	8950
		50	17900	16600	15550	14550	13550	12600	11800	11000	10700	10400	10200	9950
		55	19700	18300	17100	16000	14900	13900	13000	12100	11700	11450	11200	10950
		60	21450	19950	18650	17450	16250	15150	14150	13200	12800	12500	12200	11950
		≥ 65	22000	21600	20200	18900	17650	16400	15350	14300	13850	13550	13250	12950
3 m	M 6	30	8700	8100	7550	7100	6600	6400	6250	6100	5950	5850	5700	5550
		35	10150	9450	8850	8250	7700	7450	7300	7150	6950	6800	6650	6500
		40	11650	10800	10100	9450	8800	8550	8350	8150	7950	7800	7600	7400
		45	13100	12150	11350	10650	9900	9600	9400	9150	8950	8750	8550	8350
		50	14550	13500	12650	11800	11000	10650	10400	10200	9950	9750	9500	9300
		55	16000	14850	13900	13000	12100	11700	11450	11200	10950	10700	10450	10200
		60	17450	16200	15150	14150	13200	12800	12500	12200	11950	11650	11400	11150
		≥ 65	18900	17550	16400	15350	14300	13850	13550	13250	12950	12650	12350	12050
4 m	M 7	30	7110	6600	6400	6250	6100	6000	5850	5700	5600	5450	5350	5200
		35	8300	7700	7450	7300	7150	6950	6800	6650	6500	6350	6200	6100
		40	9500	8800	8550	8350	8150	7950	7800	7600	7450	7250	7100	6950
		45	10700	9900	9600	9400	9200	8950	8750	8550	8350	8200	8000	7800
		50	11850	11000	10650	10450	10200	9950	9750	9500	9300	9100	8900	8650
		55	13050	12100	11750	11450	11200	10950	10700	10450	10200	10000	9750	9550
		60	14250	13200	12800	12550	12250	11950	11700	11400	11150	10900	10650	10400
		≥ 65	15400	14300	13850	13550	13250	12950	12650	12350	12100	11800	11550	11250
5 m	M 8	30	6250	6100	6000	5850	5700	5600	5450	5350	5200	5100	5000	4850
		35	7300	7150	7000	6800	6650	6500	6350	6200	6100	5950	5800	5650
		40	8350	8150	7950	7800	7600	7450	7300	7100	6950	6800	6650	6500
		45	9400	9150	8950	8750	8550	8350	8200	8000	7800	7650	7450	7300
		50	10450	10200	9950	9750	9500	9300	9100	8900	8700	8500	8300	8100
		55	11500	11200	10950	10700	10500	10250	10000	9750	9550	9350	9150	8900
		60	12550	12250	11950	11700	11450	11150	10900	10650	10400	10200	9950	9700
		≥ 65	13600	13250	12950	12650	12400	12100	11800	11550	11300	11050	10800	10500

Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +50 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 400 **For all connection variants**

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	40	21600	21600	21600	21600	21600	20900	19550	18200	16950	15850	14850	13800
		45	24300	24300	24300	24300	24300	23500	21950	20500	19100	17850	16700	15500
		50	27000	27000	27000	27000	27000	26100	24400	22800	21200	19850	18550	17200
		55	29650	29650	29650	29650	29650	28700	26850	25050	23300	21800	20400	18950
		60							29300	27350	25450	23800	22250	20650
		65				30000				29600	27550	25800	24100	22400
		70									29700	27750	25950	24100
		≥ 75										29750	27800	25850
1 Am	M 4	40	21600	21600	20900	19550	18200	16950	15850	14800	13800	12900	12050	11200
		45	24300	24300	23500	21950	20500	19100	17850	16650	15500	14500	13550	12600
		50	27000	27000	26100	24400	22800	21200	19850	18500	17200	16100	15050	14000
		55	29650	29650	28700	26850	25050	23300	21800	20350	18950	17700	16550	15400
		60				29300	27350	25450	23800	22200	20650	19350	18100	16800
		65		30000			29600	27550	25800	24050	22400	20950	19600	18200
		70						29700	27750	25900	24100	22550	21100	19600
		≥ 75							29750	27750	25850	24150	22600	21000
2 m	M 5	40	19550	18150	16950	15850	14800	13800	12900	12000	11200	10850	10600	10350
		45	21950	20400	19100	17850	16650	15500	14500	13500	12600	12200	11950	11650
		50	24400	22650	21200	19850	18500	17200	16100	15050	14000	13550	13250	12950
		55	26850	24950	23300	21800	20350	18950	17700	16550	15400	14900	14600	14220
		60	29300	27200	25450	23800	22200	20650	19350	18050	16800	16250	15900	15500
		65		29450	27550	25800	24050	22400	20950	19550	18200	17600	17250	16800
		70	30000		29700	27750	25900	24100	22550	21050	19600	18950	18550	18100
		≥ 75				29750	27750	25850	24150	22550	21000	20350	19900	19400
3 m	M 6	40	15850	14750	13800	12900	12000	11200	10850	10600	10350	10100	9900	9650
		45	17850	16550	15500	14500	13500	12600	12200	11900	11650	11400	11100	10850
		50	19850	18400	17200	16100	15050	14000	13550	13250	12950	12650	12350	12050
		55	21800	20250	18950	17700	16550	15400	14900	14550	14200	13900	13600	13250
		60	23800	22100	20650	19350	18050	16800	16250	15900	15500	15150	14850	14500
		65	25800	23950	22400	20950	19550	18200	17600	17200	16800	16450	16100	15700
		70	27750	25800	24100	22550	21050	19600	18950	18550	18100	17700	17300	16900
		≥ 75	29750	27600	25850	24150	22550	21000	20350	19850	19400	18950	18550	17500
4 m	M 7	40	12950	12000	11250	10850	10600	10350	10150	9900	9650	9450	9250	9000
		45	14550	13500	12650	12200	11950	11650	11400	11150	10900	10650	10400	10150
		50	16200	15050	14050	13550	13250	12950	12650	12400	12100	11800	11550	11250
		55	17800	16550	15450	14950	14600	14250	13950	13600	13300	13000	12700	12400
		60	19400	18050	16850	16300	15900	15550	15200	14850	14500	14200	13850	13550
		65	21050	19550	18250	17650	17250	16850	16450	16100	15700	15350	15000	
		70	22650	21050	19650	19000	18550	18150	17750	17350	16900	16450	15400	14300
		≥ 75	24250	22550	21100	20350	19900	19450	19000	18550	17600			
5 m	M 8	40	10850	10600	10350	10150	9900	9650	9450	9250	9050	8850	8650	8400
		45	12250	11950	11650	11400	11150	10900	10650	10400	10150	9950	9700	9500
		50	13600	13250	12950	12700	12400	12100	11850	11550	11300	11050	10800	10550
		55	14950	14600	14250	13950	13600	13300	13000	12700	12400	12150	11850	11600
		60	16300	15900	15550	15200	14850	14500	14200	13850	13550	13250		
		65	17650	17250	16850	16500	16100	15700	15350	15000			12550	11650
		70	19000	18550	18150	17750	17350	16950	16500	15400	14300	13400		
		≥ 75	20350	19900	19450	19000	18600	17650						

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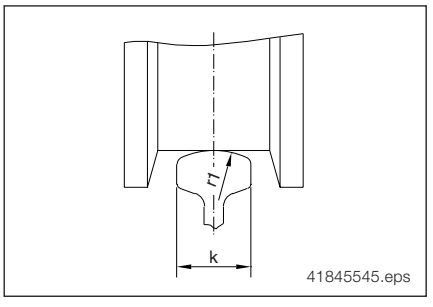
Linear contact
GGG spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +50 °C (for further temperature ranges see section 1.11)
Rail material: St 70-2/E 360, St 60-2/E 335, St 52-3/S 355 J 2 G 3

DRS 500 — **For all connection variants**

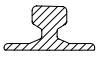
Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
1 Bm	M 3	40	26950	26950	26950	26950	26950	26950	26100	24350	22650	21200	19800	18400
		45	30300	30300	30300	30300	30300	30300	29350	27350	25500	23850	22300	20700
		50	33700	33700	33700	33700	33700	33700	32600	30400	28300	26500	24750	23000
		55	37050	37050	37050	37050	37050	37050	35850	33450	31150	29150	27250	25300
		60	40000						39150	36500	34000	31800	29700	27600
		65								39550	36800	34450	32200	29900
		70									39650	37100	34650	32200
		≥ 75										39750	37150	34500
1 Am	M 4	40	26950	26950	26950	26100	24350	22650	21200	19750	18400	17200	16100	14950
		45	30300	30000	30300	29350	27350	25500	23850	22250	20700	19350	18100	16800
		50	33700	33700	33700	32600	30400	28300	26500	24700	23000	21500	20100	18650
		55	37050	37050	37050	35850	33450	31150	29150	27150	25300	25800	22100	20550
		60	40000			39150	36500	34000	31800	29650	27600	25800	24150	22400
		65					39550	36800	34450	32100	29900	27950	26150	24300
		70						39650	37100	34600	32200	30100	28150	26150
		≥ 75							39750	37050	34500	32250	30150	28000
2 m	M 5	40	26100	24200	22650	21200	19750	18400	17200	16050	14950	13950	13550	13200
		45	29350	27250	25500	23850	22250	20700	19350	18050	16800	15700	15200	14850
		50	32600	30250	28300	26500	24700	23000	21500	20050	18650	17450	16900	16500
		55	35850	33300	31150	29150	27150	25300	23650	22050	20550	19200	18600	18150
		60	39150	36350	34000	31800	29650	27600	25800	24050	22400	20950	20300	19800
		65	40000	39350	36800	34450	32100	29900	27950	26100	24300	22700	22000	21450
		70			39650	37100	34600	32200	30100	28100	26150	24450	23700	23100
		≥ 75				39750	37050	34500	32250	30100	28000	26200	25400	24750
3 m	M 6	40	21200	19650	18400	17200	16050	14950	13950	13500	13200	12900	12600	12300
		45	23850	22100	20700	19350	18050	16800	15700	15200	14850	14500	14200	13850
		50	26500	24600	23000	21500	20050	18650	17450	16900	16500	16150	15800	15400
		55	29150	27050	25300	23650	22050	20550	19200	18600	18150	17750	17350	16950
		60	31800	29500	27600	25800	24050	22400	20950	20300	19800	19350	18950	18500
		65	34450	31950	29900	27950	26100	24300	22700	22000	21450	21000	20500	20000
		70	37100	34450	32200	30100	28100	26150	24450	23650	23100	22600	22100	21550
		≥ 75	39750	36900	34500	32250	30100	28000	26200	25350	24750	24200	23100	21650
4 m	M 7	40	17300	16050	15000	14050	13550	13200	12950	12650	12350	12050	11800	11500
		45	19450	18050	16900	15800	15250	14850	14550	14200	13900	13550	13250	12950
		50	21600	20050	18750	17550	16950	16550	16150	15800	15400	15100	14750	14400
		55	23750	22050	20650	19300	18600	18200	17800	17400	16950	16600	16200	15850
		60	25950	24050	22500	21050	20300	19850	19400	18950	18500	18100	17700	17250
		65	28100	26100	24400	22800	22000	21500	21000	20550	20050	19600	18850	17700
		70	30250	28100	26250	24550	23700	23150	22650	22100	21600	20200		
		≥ 75	32400	30100	28150	26300	25400	24800	24250	23200				
5 m	M 8	40	14050	13550	13250	12950	12650	12350	12050	11800	11500	11250	11000	10750
		45	15800	15200	14900	14550	14200	13900	13600	13250	12950	12650	12400	12100
		50	17600	16900	16550	16200	15800	15450	15100	14750	14400	14100	13750	13450
		55	19350	18600	18200	17800	17400	17000	16600	16200	15850	15500	15150	14400
		60	21100	20300	19850	19400	18950	18500	18100	17700	17300	16450	15350	
		65	22850	22000	21500	21050	20550	20050	19650	18900	17600			
		70	24650	23700	23150	22650	22150	21600	20250					
		≥ 75	26400	25400	24850	24300	23250							

2.6.6 Point contact

Convex/curved rail – cylindrical travel wheel



Spheroidal graphite case iron travel wheel material

	DIN	Rail shape	Rail curve radius in mm
 41409244.eps	536 part 1	A 45 A 55 A 65 A 75 A 100 A 120 A 150	400 400 400 500 500 600 800

Rail shape Crane rail DIN 536, part 1	Suitable for guide roller arrangement depending on rail fastening DRS 112	125	160	200	250	315	400	500
A 45	A / C	A / C	A / C	A	A	A	–	–
A 55	A / C / D	A / C	A / C	A / C	A / C	A	–	–
A 65	A / B / C / D			A / C / D	A / C			–
A 75	–		A / B / C / D		A / C / D		A / C	–
A 100	–		–	–	–	–	A / C / D	
A 120	–		–	–	–	–	–	A / B / C / D
A 150	–		–	–	–	–	–	A / B / C / D

Rail fastening method:

A: welded
B: bolted with clamping plate to RIW-NO 17938 (see page 35)
C: bolted with clamping plate to RIW-NO 17942 (see page 35)
D: bolted with clamping plate and bolts to DIN 936 (see page 35)

$$R_{perm\,(rail)} = R_{perm\,(point)} \cdot f_{St} \cdot f_{RS}$$

$R_{perm\,(rail)}$ = Permissible wheel load for point contact on steel rails
$R_{perm\,(point)}$ = Permissible wheel load for point contact (table value, see pages 52/53)
f_{St} = Reduction factor for the rail material for point contact
f_{RS} = Reduction factor for the curve radius for point contact, see the following table

	Material	Factor f_{St} Point contact	Standard
Rail	St 70-2/E 360	1	DIN EN 10025
	St 60-2/E 335	0,44	
	St 52-3/S 355 J 2 G 3	0,38	
	St 37-2/ S 235 J R	0,01	

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Permissible wheel loads $R_{perm\ (rail)}$ are used in section 5.3 for determining the maximum permissible wheel load for a wheel block.

$$R_{perm\ (temperature)} = R_{perm\ (linear)} \cdot f_k$$

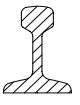
f_k = Reduction factor for temperature of driven design, see section 1.11

Comparison of $R_{perm\ (temperature)}$ with $R_{perm\ (rail)}$

Important: Use the smallest permissible value for further calculation.

Note:

Cylindrical travel wheels on curved rails are standard, concave special travel wheels on flat rails are special cases.
Travel wheel material: spheroidal graphite cast iron.

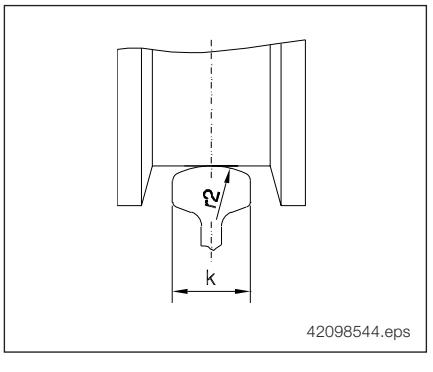
	DIN	Rail shape	Rail curve radius in mm
 41409344.eps	5901	S 10 S 14 S 18 S 20 S 30 S 33 S 41 S 49	140 160 180 200 305 225 400 300
	5902	S 24 S 33 S 41	225 225 400

Reduction factor f_{RS} for curve radius

Point contact
Convex/curved rail – cylindrical travel wheel

Flat rail – concave travel wheel

Spheroidal graphite case iron travel wheel material



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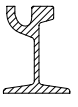
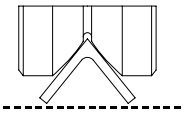
Curve radius r_2	DRS wheel block size							
in mm	112	125	160	200	250	315	400	500
> 140	-	-	-	-	-	-	-	-
≥ 140	0,68	0,53	0,42	0,37	0,29	0,26	0,24	0,22
≥ 160	0,76	0,59	0,47	0,42	0,33	0,30	0,28	0,26
≥ 180	0,84	0,66	0,52	0,46	0,37	0,34	0,31	0,29
≥ 210	0,95	0,74	0,59	0,53	0,42	0,39	0,36	0,34
≥ 225	1	0,79	0,63	0,56	0,45	0,42	0,39	0,37
≥ 300	1	0,99	0,80	0,71	0,58	0,54	0,52	0,49
≥ 305	1	1	0,81	0,72	0,59	0,55	0,52	0,50
≥ 400	1	1	1	0,90	0,73	0,70	0,67	0,64
≥ 500	1	1	1	1	0,88	0,84	0,81	0,78
≥ 600	1	1	1	1	1	0,97	0,95	0,92
≥ 625	1	1	1	1	1	1	0,98	0,95
≥ 645	1	1	1	1	1	1	1	0,98
≥ 665	1	1	1	1	1	1	1	1
≥ 790	1	1	1	1	1	1	1	1
≥ 1005	1	1	1	1	1	1	1	1
≥ 1260	1	1	1	1	1	1	1	1

	DIN	Rail shape	Rail curve radius in mm
 41408844.eps	Grooved rail	Ph 37 Ph 37a	210 225

Angular rail –
travel wheel for V rail

Rail shape
right angle



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$$R_{perm\,(rail)} = R_{perm\,(point)} \cdot f_{St} \cdot 0{,}7$$

$R_{perm\,(rail)}$ = Permissible wheel load for point contact on steel rails
$R_{perm\,(point)}$ = Permissible wheel load for point contact (table value, see pages 52/53)
f_{St} = Reduction factor for the rail material for point contact

	Material	Factor f_{St} Point contact	Standard
Rail	St 70-2/E 360	1	DIN EN 10025
	St 60-2/E 335	0,44	
	St 52-3/S 355 J 2 G 3	0,38	
	St 37-2/ S 235 J R	0,01	

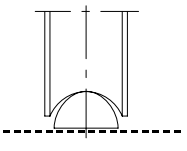
Permissible wheel loads $R_{perm\,(rail)}$ are used in section 5.3 for determining the maximum permissible wheel load for a wheel block.

$$R_{perm\,(temperature)} = R_{perm\,(linear)} \cdot f_k$$

f_k = reduction factor for temperature of driven design, see section 1.11
Comparison of $R_{perm\,(temperature)}$ with $R_{perm\,(rail)}$
Important: Use the **smallest permissible value** for further calculation.

Round rail –
travel wheel with concave tread

Rail shape
Semi-round or round profile



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Point contact - Spheroidal graphite cast iron travel wheel material

For further information, see point contact tables page 51.

$$R_{perm\,(rail)} = R_{perm\,(point)} \cdot f_{St} \cdot f_{RS}$$

$R_{perm\,(rail)}$ = Permissible wheel load for point contact for travel wheels with concave tread on steel rails
$R_{perm\,(point)}$ = Permissible wheel load for point contact for travel wheels with concave tread (table value, see pages 52/53)
f_{St} = Reduction factor for the rail material for point contact
f_{RS} = Reduction factor for the curve radius for point contact for travel wheels with concave tread, see page 51

	Material	Factor f_{St} Point contact	Standard
Rail	St 70-2/E 360	1	DIN EN 10025
	St 60-2/E 335	0,44	
	St 52-3/S 355 J 2 G 3	0,38	
	St 37-2/ S 235 J R	0,01	

Permissible wheel loads $R_{perm\,(rail)}$ are used in section 5.3 for determining the maximum permissible wheel load for a wheel block.

$$R_{perm\,(temperature)} = R_{perm\,(linear)} \cdot f_k$$

f_k = reduction factor for temperature for driven design, see section 1.11
Comparison of $R_{perm\,(temperature)}$ with $R_{perm\,(rail)}$
Important: Use the **smallest permissible value** for further calculation.

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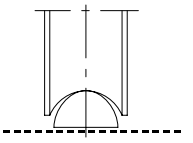
Reduction factor for rail radius f_{RS}

Point contact
Spheroidal graphite cast iron material

Curve radius R_S in mm	DRS wheel block size							
	112	125	160	200	250	315	400	500
> 10	0,44							
> 11	0,49							
> 12	0,54							
> 13	0,58							
> 14	0,63	0,43						
> 15	0,68	0,46	0,42					
> 16	0,72	0,50	0,45					
> 17	0,76	0,53	0,48	0,42				
> 18	0,80	0,56	0,50	0,45				
> 19	0,85	0,58	0,54	0,48				
> 20	0,88	0,61	0,57	0,50				
> 21	0,92	0,64	0,60	0,53	0,43			
> 22	0,96	0,67	0,63	0,56	0,46			
> 23	0,99	0,69	0,65	0,58	0,48	0,43		
> 24		0,71	0,68	0,61	0,50	0,45		
> 25		0,74	0,70	0,63	0,52	0,67		
> 26		0,77	0,73	0,66	0,54	0,49	0,45	
> 27		0,79	0,75	0,68	0,56	0,51	0,47	
> 28		0,81	0,78	0,71	0,58	0,53	0,48	
> 29		0,84	0,80	0,73	0,60	0,55	0,50	
> 30		0,86	0,82	0,75	0,62	0,57	0,52	
> 31		0,88	0,85	0,78	0,64	0,59	0,54	
> 32		0,90	0,87	0,80	0,66	0,60	0,56	
> 33		0,93	0,89	0,81	0,68	0,62	0,58	0,53
> 34		0,95	0,91	0,84	0,70	0,64	0,60	0,55
> 35		0,97	0,94	0,86	0,71	0,66	0,62	0,57
> 36		0,99	0,96	0,88	0,73	0,68	0,64	0,59
> 37			0,98	0,90	0,75	0,70	0,65	0,60
> 38			0,99	0,92	0,77	0,71	0,67	0,62
> 39				0,94	0,8	0,73	0,69	0,64
> 40				0,96	0,82	0,75	0,71	0,66
> 41				0,98	0,83	0,76	0,73	0,68
> 42					0,85	0,78	0,74	0,69
> 43					0,87	0,80	0,76	0,71
> 44					0,88	0,81	0,78	0,72
> 45					0,90	0,83	0,80	0,75
> 46					0,91	0,85	0,81	0,76
> 47					0,93	0,86	0,83	0,78
> 48					0,95	0,88	0,85	0,80
> 49					0,96	0,89	0,86	0,81
> 50					0,98	0,91	0,88	0,83
> 51					0,99	0,93	0,89	0,85
> 52						0,94	0,91	0,86
> 53						0,96	0,93	0,88
> 54						0,97	0,94	0,90
> 55						0,99	0,96	0,91
> 56			1				0,97	0,93
> 57							0,99	0,94
> 58								0,96
> 59								0,98
> 60								0,99
> 61								



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A check of the horizontal forces which may be transmitted is recommended. The ratio of max. horizontal forces to min. wheel loads must be considered.

Travel wheel tread is determined as 1,1 · R_S. Requirement: The permissible horizontal force (see section 1.10) must not exceed the min. wheel load.

Point contact
Spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (see section 1.11 for further temperature ranges)
Rail material St 70/E 360

DRS 112 Curve radius ≥ 225

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3									2700	2540	2430	2316
1 Am	M 4	2750					2700	2540	2420	2310	2160	2000	1847
2 m	M 5			2700	2540	2420	2310	2160	2000	1840	1710	1590	1466
3 m	M 6	2540	2420	2310	2160	2000	1840	1710	1580	1460	1360	1260	1160
4 m	M 7	2170	2000	1850	1720	1590	1470	1360	1260	1160	1080	1000	928
5 m	M 8	1720	1590	1470	1370	1270	1170	1080	1000	930	860	800	739

DRS 125 Curve radius ≥ 305

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3									3970	3680	3420	3153
1 Am	M 4	4210					3970	3680	3410	3150	2920	2710	2502
2 m	M 5			3970	3680	3410	3150	2920	2700	2500	2320	2150	1986
3 m	M 6	3680	3390	3150	2920	2700	2500	2320	2150	1980	1840	1710	1576
4 m	M 7	2940	2700	2510	2330	2160	1990	1850	1710	1580	1470	1360	1258
5 m	M 8	2340	2150	2000	1850	1720	1580	1470	1360	1260	1170	1080	1001

DRS 160 Curve radius ≥ 400

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3										6810	6370	6006
1 Am	M 4	6860						6810	6350	6000	5570	5170	4767
2 m	M 5				6760	6350	6000	5570	5160	4760	4420	4100	3784
3 m	M 6	6020	5730	5580	5360	5080	4760	4420	4090	3780	3510	3260	3003
4 m	M 7	4800	4570	4450	4280	4050	3800	3530	3260	3010	2800	2600	2396
5 m	M 8	3820	3640	3540	3400	3220	3020	2810	2600	2400	2230	2070	1907

DRS 200 Curve radius ≥ 500

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3											9670	8906
1 Am	M 4	10000							9640	8900	8260	7670	7069
2 m	M 5				9940	9500	8900	8260	7650	7060	6560	6090	5611
3 m	M 6	8930	8500	8130	7890	7540	7060	6560	6070	5610	5200	4830	4453
4 m	M 7	7120	6780	6480	6290	6010	5640	5230	4840	4470	4150	3850	3553
5 m	M 8	5670	5390	5160	5010	4780	4480	4160	3850	3560	3300	3070	2828

Point contact
Spheroidal graphite cast iron travel wheel material
Temperature range –20 °C to +40 °C (see section 1.11 for further temperature ranges)
Rail material St 70/E 360

DRS 250 Curve radius ≥ 600

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3											15020	14050
1 Am	M 4			16000					15020	14060	13080	12200	11400
2 m	M 5					15020	14060	13080	12200	11420	10620	9910	9250
3 m	M 6		15020	14140	13180	12200	11420	10620	9910	9380	8630	8100	7550
4 m	M 7	13080	12200	11420	10620	9910	9280	8630	8100	7580	7050	6600	6150
5 m	M 8	10620	9910	9280	8630	8100	7580	7070	6600	6170	5740	5360	5000

DRS 315 Curve radius ≥ 625

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3												
1 Am	M 4				22000							21050	19900
2 m	M 5								21000	19900	19050	18200	17300
3 m	M 6					21000	19900	19050	18200	17350	16600	15850	15050
4 m	M 7		21000	20000	19100	18250	17400	16650	15900	15150	14500	13750	12850
5 m	M 8	19150	18200	17400	16650	15900	15150	14500	13800	12900	12000	11200	10450

DRS 400 Curve radius ≥ 645

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3												
1 Am	M 4				30000							28550	26500
2 m	M 5								28450	26500	24800	23200	21500
3 m	M 6					28450	26500	24800	23150	21550	20150	18850	17450
4 m	M 7		28500	26650	24950	23250	21650	20250	18900	17600	16450	15400	14250
5 m	M 8	24950	23200	21700	20300	18950	17650	16500	15400	14300	13400	12550	11600

DRS 500 Curve radius ≥ 665

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3												
1 Am	M 4				40000						37500	35000	32800
2 m	M 5							37500	35000	32600	30450	28450	26650
3 m	M 6				37750	35000	32600	30500	28450	26450	24750	23100	21650
4 m	M 7	37700	35050	32800	30850	28600	26600	24900	23200	21600	20200	18850	17700
5 m	M 8	30700	28550	26700	25100	23250	21650	20250	18900	17600	16450	15350	14400

2.6.7 Travel wheels with Hydropur tyre

Basis for selection:

- Level track
- Track width > travel wheel width
- 40 % cyclical duty factor (travel time)
- Permissible ambient temperature for continuous operation 0° C ... +40° C
- Permissible skewing angle 2 ‰

Permissible wheel loads $R_{perm\ (rail)}$ in kg for Hydropur travel wheels DRS 112, 125, 160, 200

Group of mechanisms FEM/ISO		Travel wheel type	DRS wheel block size	Permissible wheel load in kg				
				Travel speed in m/min				
				up to 40	up to 63	up to 80	up to 125	up to 160
1 Bm	M 3	F	**112**	590	560	430	280	200
			125	790	750	580	370	270
			160	1180	1120	870	560	410
			200	1700	1610	1250	810	590
1 Am	M 4		**112**	443	420	323	210	150
			125	593	563	435	278	203
			160	885	840	653	420	308
			200	1275	1208	938	608	443
2 m	M 5		**112**	332	315	242	158	113
			125	444	422	326	208	152
			160	664	630	489	315	231
			200	956	906	703	456	332
3 m	M 6		**112**	249	236	181	118	84
			125	333	316	245	156	114
			160	498	473	367	236	173
			200	717	679	527	342	249

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2.6.8 Polyamide PA6G travel wheels

Basis for selection:

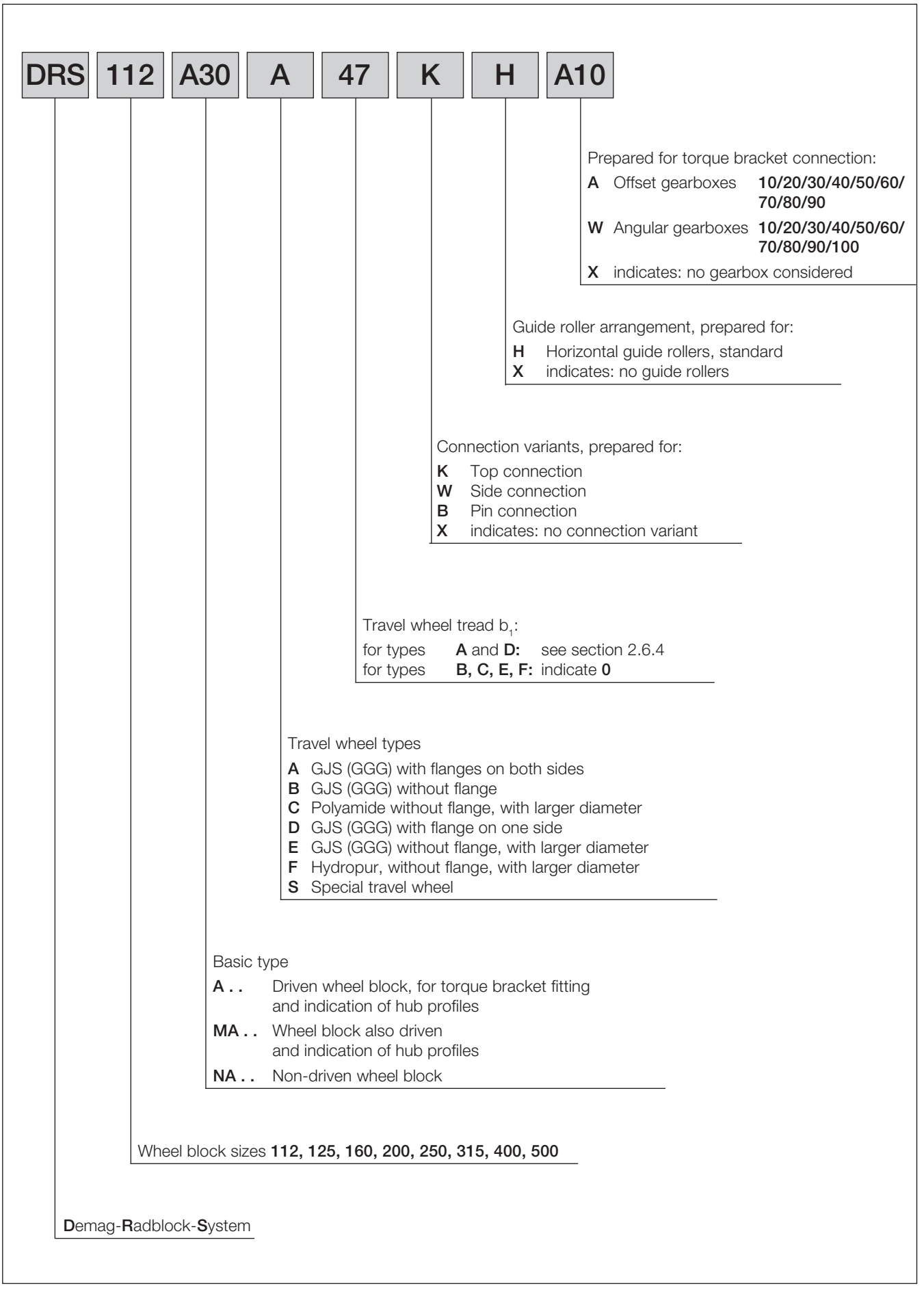
- Flat steel rails
- 40 % cyclical duty factor (travel time)
- Permissible ambient temperature for continuous operation 0° C ... +40° C
- Permissible skewing angle 2 ‰

Permissible wheel loads $R_{perm\ (rail)}$ in kg for polyamide travel wheels DRS 112, 125, 160, 200

Group of mechanisms FEM/ISO		Travel wheel type	DRS wheel block size	Permissible wheel load in kg				
				Travel speed in m/min				
				up to 40	up to 63	up to 80	up to 125	up to 160
1 Bm	M 3	C	**112**	750	713	563	375	263
			125	1000	950	750	500	350
			160	1700	1600	1200	800	600
			200	2700	2500	2000	1300	900
1 Am	M 4		**112**	563	534	422	281	197
			125	750	713	563	375	263
			160	1275	1200	900	600	450
			200	2025	1875	1500	975	675
2 m	M 5		**112**	422	401	316	211	148
			125	563	534	422	281	197
			160	956	900	675	450	338
			200	1519	1406	1125	731	506
3 m	M 6		**112**	316	301	237	158	111
			125	422	401	316	211	148
			160	717	675	506	338	253
			200	1139	1055	844	548	380

2.7 Selection

2.7.1 Type designation key (example) for basic wheel blocks



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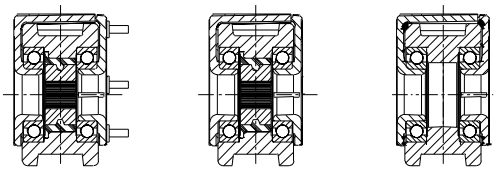
DRS 112 – 200 basic types

A MA NA



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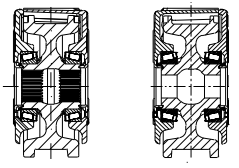
DRS 250 – 500 basic types

A/MA NA



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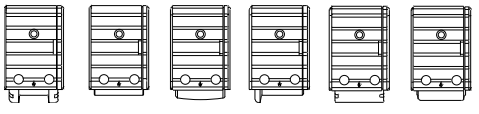
Hub profile see section 2.3

DRS 112 – 200 travel wheel variants

A B C D E F



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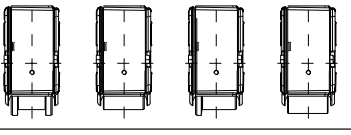
DRS 250 – 500 travel wheel variants

A B D E



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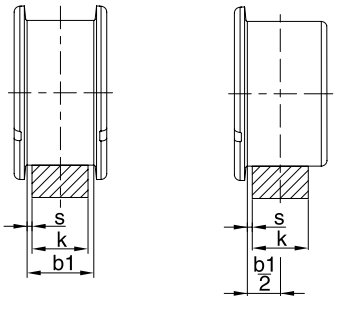
Travel wheel tread

A D



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Travel wheel diameter	Travel wheel width	Travel wheel type				Distance s per side s 1)		Rail width
		A			D			
		Travel wheel tread b1 2)						
		from	to 3)	Standard	Standard	min.	max.	k
112	80	60	62	**47, 60**	**47**	1	5	40, 45, 50, 55, 60
125	80	60	62	**47, 60**	**47, 60**	1	5	40, 45, 50, 55, 60
160	89	65	67	**47, 60, 65**	**47, 65**	1	5	40, 45, 50, 55, 60, 65
200	101	67	75	**65, (75 3))**	**65**	1	5	50, 55, 60, 70
250	110	77	-	**52, 65, 75**	**65, 75**	1	5	50, 55, 60, 70, 75
315	130	90	-	**80, 90**	**80, 90**	1	5	60, 70 75, 80, 90
400	155	110	-	**80, 90, 110**	**80, 110**	1	5	65, 70, 75, 80, 90, 100
500	170	110	-	**90, 110**	**90, 110**	1	5	70, 75, 80, 90, 100

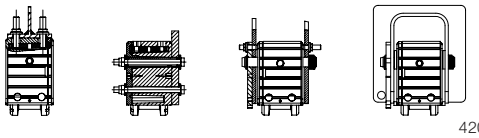
1) Tolerance class 2 to VDI 3576
2) DRS 112 – 200 available in steps of 1 mm
3) Treads and flanges hardened, flanges without wear indicators

short delivery times

DRS 112 – 200 connection variants

K W B

Box section girder End connection



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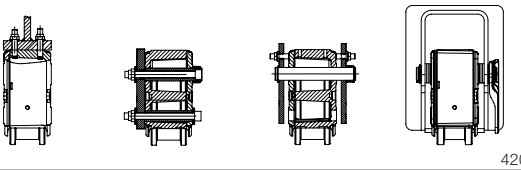
DRS 250 – 500 connection variants

K W B

Box section girder End connection DRS 250



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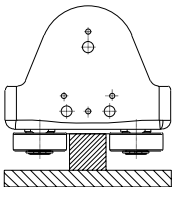
DRS 112 – 200 roller guide arrangements



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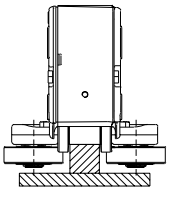
DRS 250 – 500 roller guide arrangements



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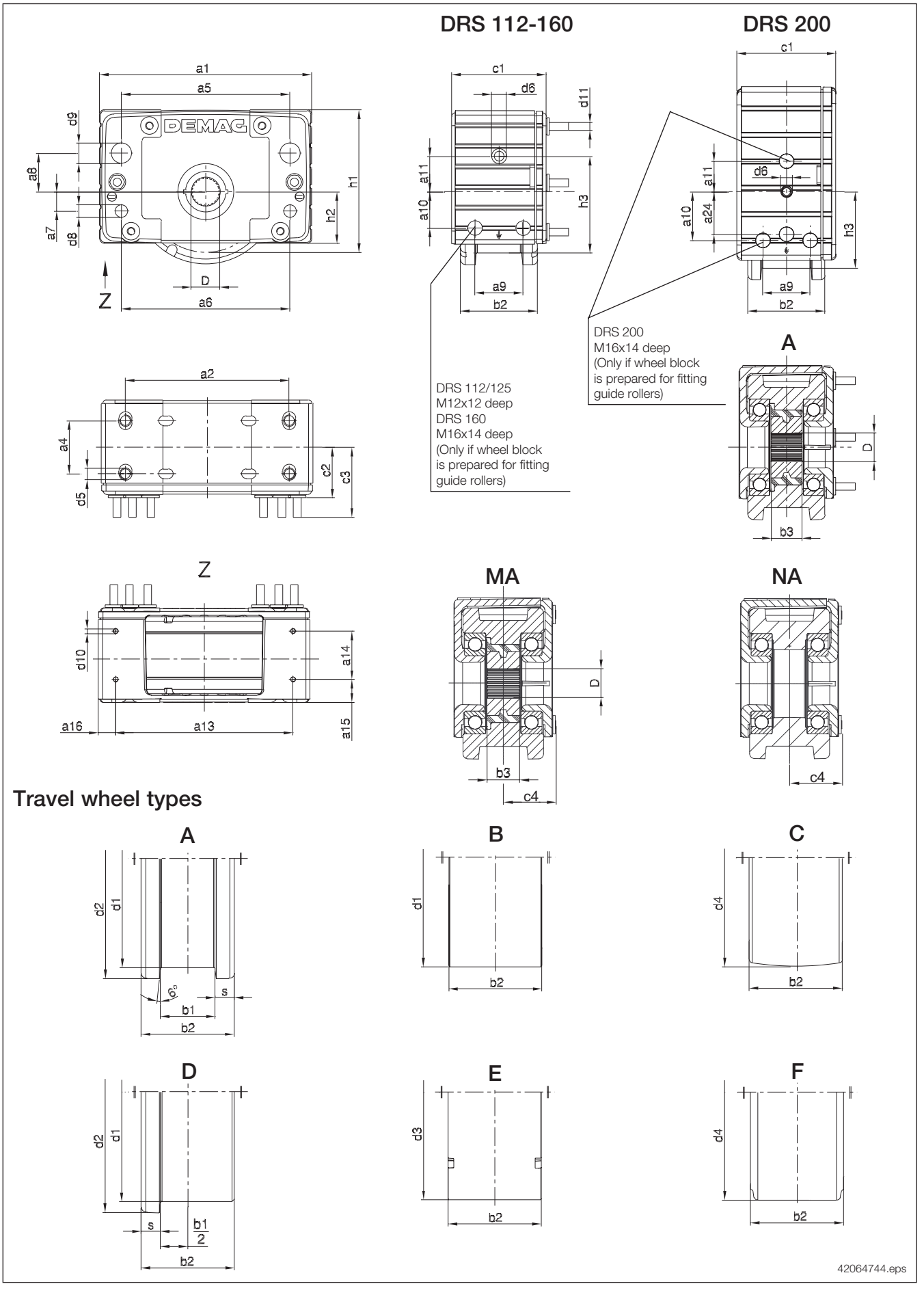
3 Demag DRS wheel block system Data and dimensions

3.1 Data and dimensions DRS 112 – 200



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DRS wheel block dimensions

DRS wheel block size	Splined hub profile DIN 5480 1) D	Dimensions in mm									
		a1	a2	a4	a5 ± 0,02	a6 ± 0,1	a7 ± 0,1	a8 ± 0,02	a9	a10	a11
112	N 30	190	145	45 $^{+4}_{-7}$	145	145	30	40	40	30	24
125	N 30 N 35	220	170	55 $^{+4}_{-7}$	175	175	20	40	50	37	37,5
160	N 35 N 45	275	220	55 $^{+3}_{-5}$	220	220	25	55	54	47,5	20
200	N 45 N 50	340	275	65 $^{+3}_{-5}$	275	275	35	75	62	64	40

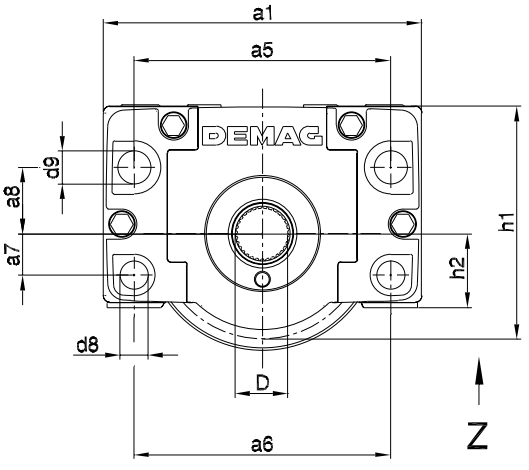
DRS wheel block size	Dimensions in mm														
	a13	a14	a15	a16	a24	b1 max	b1 2)	b2	b3	c1	c2	c3	c4	d1 – 0,2	d2
112	160	40	28	15	–	60	62	80	36	96	51	70,5	–	112	132
125	184	50	24	18	–	60	62	80	33	98	52	73	52,5	125	150
160	–	–	–	–	–	65	67	89	33	110	59	84	–	160	188
200	–	–	–	–	56	67	75	101	36	130	69	93,3	–	200	230

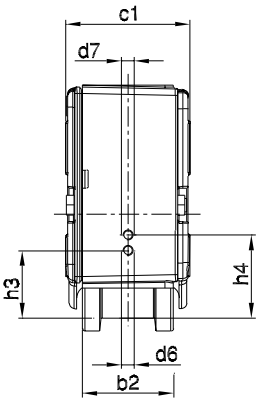
DRS wheel block size	Dimensions in mm											
	d3 – 0,2	d4	d5	d6	d8	d9 F 8	d10	d11	h1 3)	h2	h3 3)	s
112	126	130	M12	M12	10,5	18,5	4,9x8,5 deep	M8	131	47	80	10
125	145	140	M12	M12	13	21	4,8x5 deep	M8	147,5	53,5	100	10
160	183	180	M16	M12	17	30	–	M10	187	70	100	12
200	226	225	M16	M12	20	35	–	M10	238	90	100	18

DRS wheel block size	Max. weight of wheel block in kg Travel wheel type					
	A	B	C	D	E	F
112	7,4	6,6	5,3	7,1	8,1	7,8
125	9,9	8,7	6,3	9,3	11,5	8,4
160	18,3	16,1	17	17,2	20,1	15,1
200	35,7	32,5	23,6	34,1	41,6	29,2

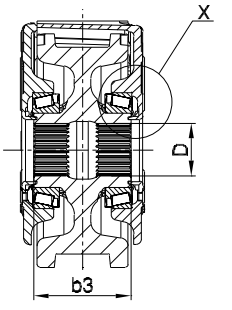
1) Note: See combinations in section 2.3.
2) Treads and flanges hardened, flanges without wear indicators
3) With reference to diameter d1

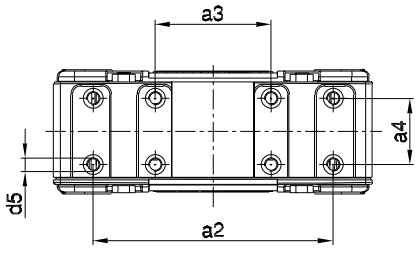
3.2 Data and dimensions DRS 250 – 500



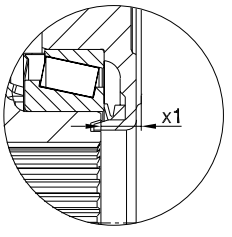


A/MA

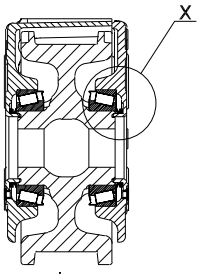




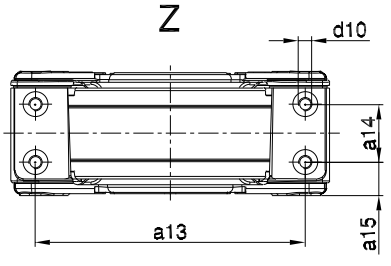
x



NA

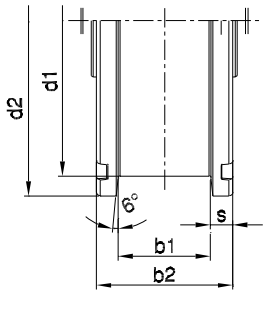


Z

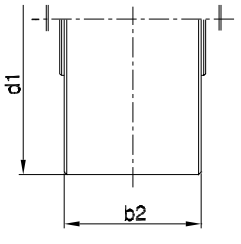


Travel wheel types

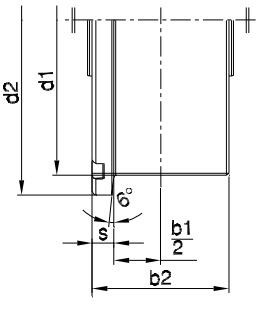
A



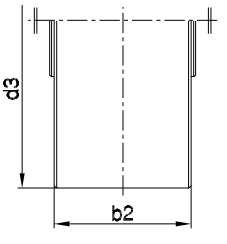
B



D



E



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DRS wheel block size	Splined hub profile DIN 5480 [1] D	Dimensions in mm									
		a1	a2 ± 0,2	a3 ± 0,2	a4 ± 0,2	a5 ± 0,04	a6 ± 0,04	a7 ± 0,02	a8 ± 0,02	a13 ± 0,4	a14 ± 0,2
250	N 50 N 65	385	290	140	80	310	310	50	80	326	70
315	N 65 N 75	470	360	180	100	370	370	70	80	405	80
400	N 75 N 90	580	440	210	120	450	450	95	130	501	100
500	N90 N110	700	620	480	125	580	580	110	160	600	110

DRS wheel block size	Dimensions in mm												
	a15 ± 0,2	b1 max	b1 [2]	b2	b3	c1	d1 – 0,2	d2	d3 – 0,2	d5	d6	d7	d8
250	40	77	80	110	117,5	150	250	282	270	8 x M16	M12	–	34 F8
315	50	90	96	130	147	180	315	350	340	8xM16	M12	M20	40 F8
400	55	110	-	155	172	210	400	440	440	8xM20	M12	M20	31 H13
500	65	110	-	170	195	240	500	545	545	8xM20	M12	M20	31 H13

DRS wheel block size	Dimensions in mm								Max. weight of wheel block in kg			
	d9 F 8	d10	h1 [3]	h2	h3 [3]	h4 [3]	s min	x1	Travel wheel type			
									A	B	D	E
250	40	M16 20 deep	281	89	100	–	17,5	16,3	63	57	58	65
315	50	M20 20 deep	349,5	114	100	130	20	16,5	121	115	118	127
400	65	M24 20 deep	440	144	100	130	22,5	19	214	196	205	232
500	70	M24 25 deep	566	183	100	130	30	22,5	373	351	362	397

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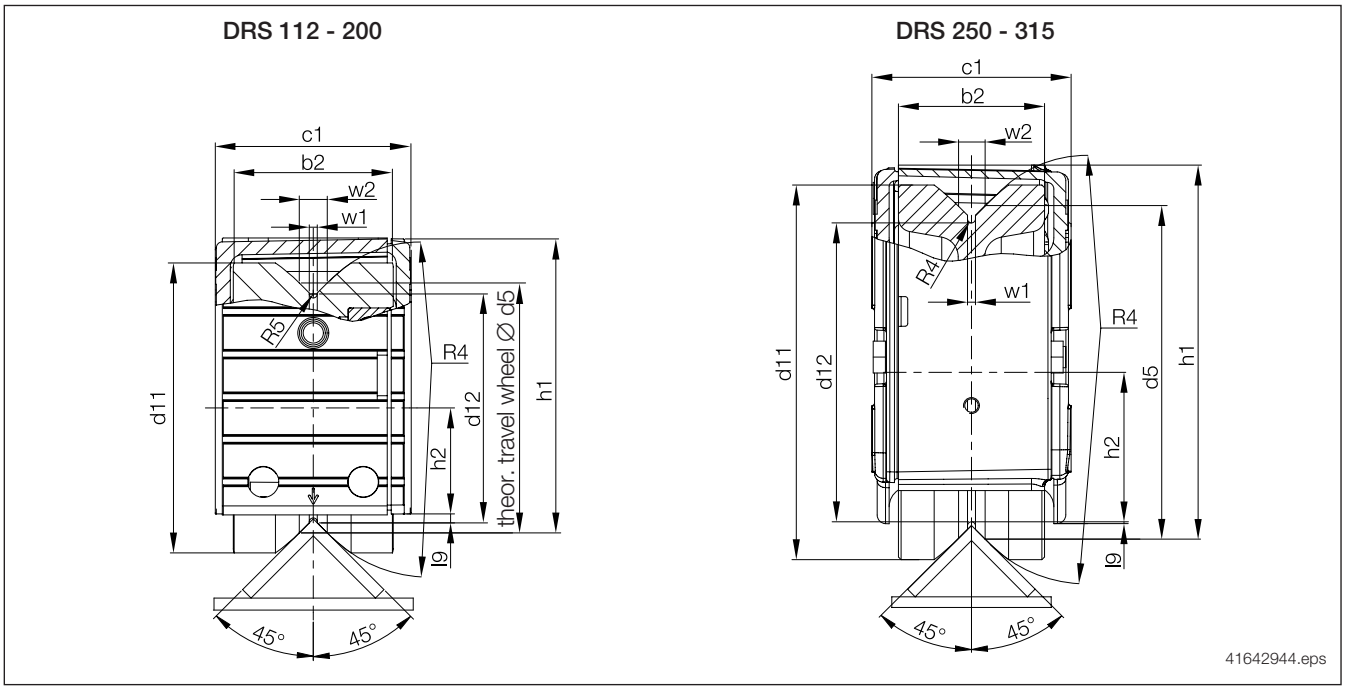
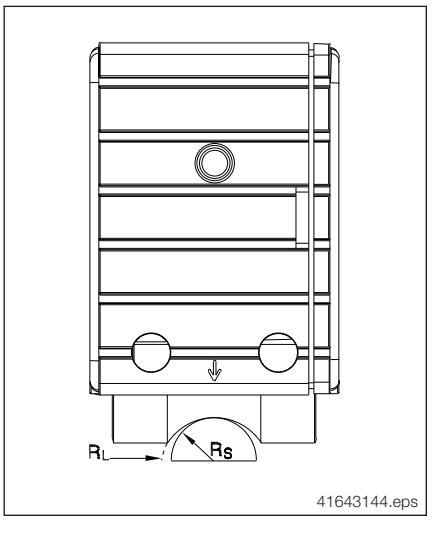
1) Note: See combinations in section 2.3.
2) Treads and flanges hardened, flanges without wear indicators
3) With reference to diameter d1

3.3.1 Travel wheel for V rail



Wheel block	b2	c1	d5	d11	d12	h1	h2	l9	R4	R5	w1	w2
DRS 112	80	96	112	126	99	131	47	9	89	2	4	14
DRS 125	80	98	125	145	114	147,5	53,5	9	89	2	4	14
DRS 160	89	110	160	183	146	187	70	10	113	3	6	16
DRS 200	101	130	200	226	175	238	90	10	141	3	6	18
DRS 250	110	150	250	282	225	281	89	23,5	178	3	6	20
DRS 315	130	180	315	350	290	349,5	114	61	223	3	6	20

3.3.2 Travel wheel with concave tread



Travel wheels for guided travel on roand or semi-roand rails may be turned for any rail radii.
The travel wheel tread (R_L) is specified as 1,1 times the rail radius (R_S).
The max. horizontal forces H_{max} must not exceed the given minimum wheel loads R_{min} (see section 2.6.6).

Other dimensions identical as for standard wheel block.

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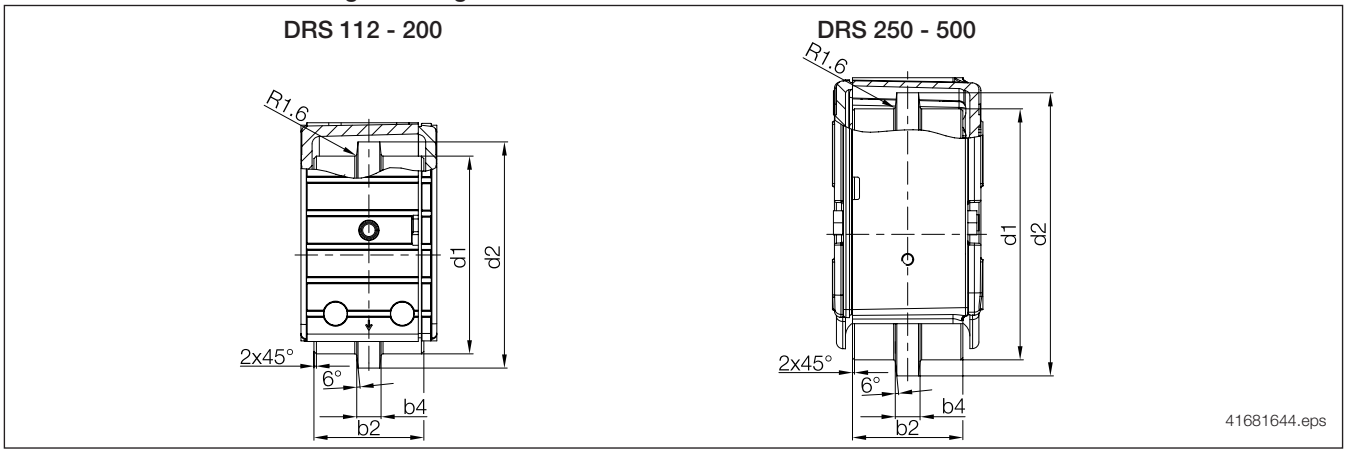
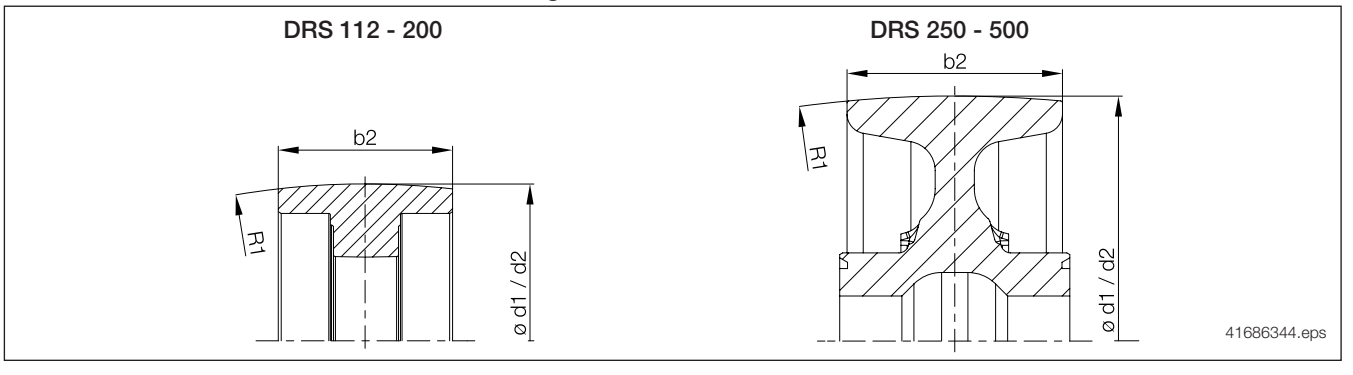
3.3.3 Travel wheel with middle guide flange



Dimensions	Wheel block							
in mm	DRS 112	DRS 125	DRS 160	DRS 200	DRS 250	DRS 315	DRS 400	DRS 500
b2	80	80	89	101	110	130	155	170
b4 max.	35	35	40	45	50	60	70	80
d1	112	125	160	200	250	315	400	500
d2 max.	126	145	183	226	282	350	440	545

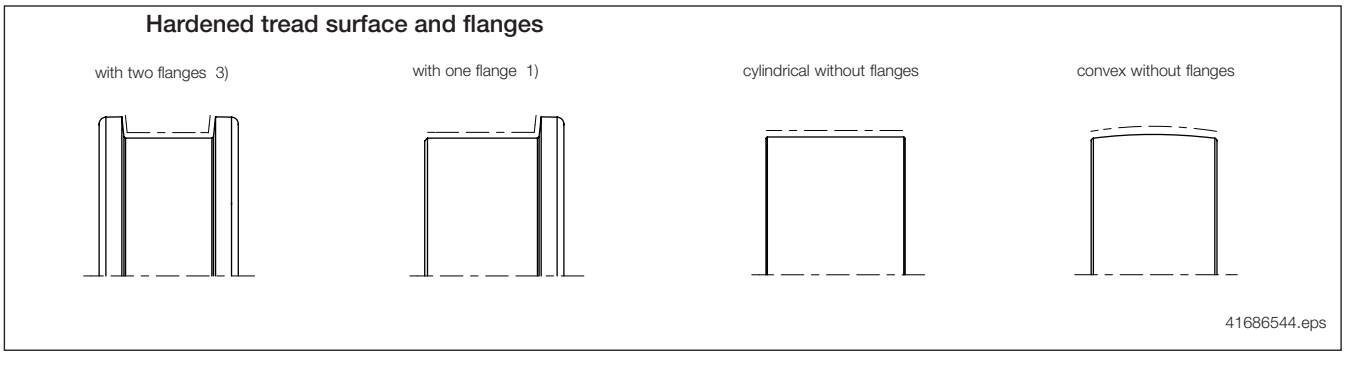
3.3.4 Travel wheel with convex tread with no flanges



Dimensions	Wheel block							
in mm	DRS 112	DRS 125	DRS 160	DRS 200	DRS 250 [2]	DRS 315 [2]	DRS 400 [2]	DRS 500 [2]
b2	80	80	89	101	110	130	155	170
d1/d2	112/126	125/145	160/183	200/226	250/270	315/340	400/440	500/545
R1	225	305	400	500	600	625	645	665

3.3.5 Hardened travel wheels inductively hardened 56 ± 2 HRC

Note: DRS 112 – 200 do not feature wear indicators

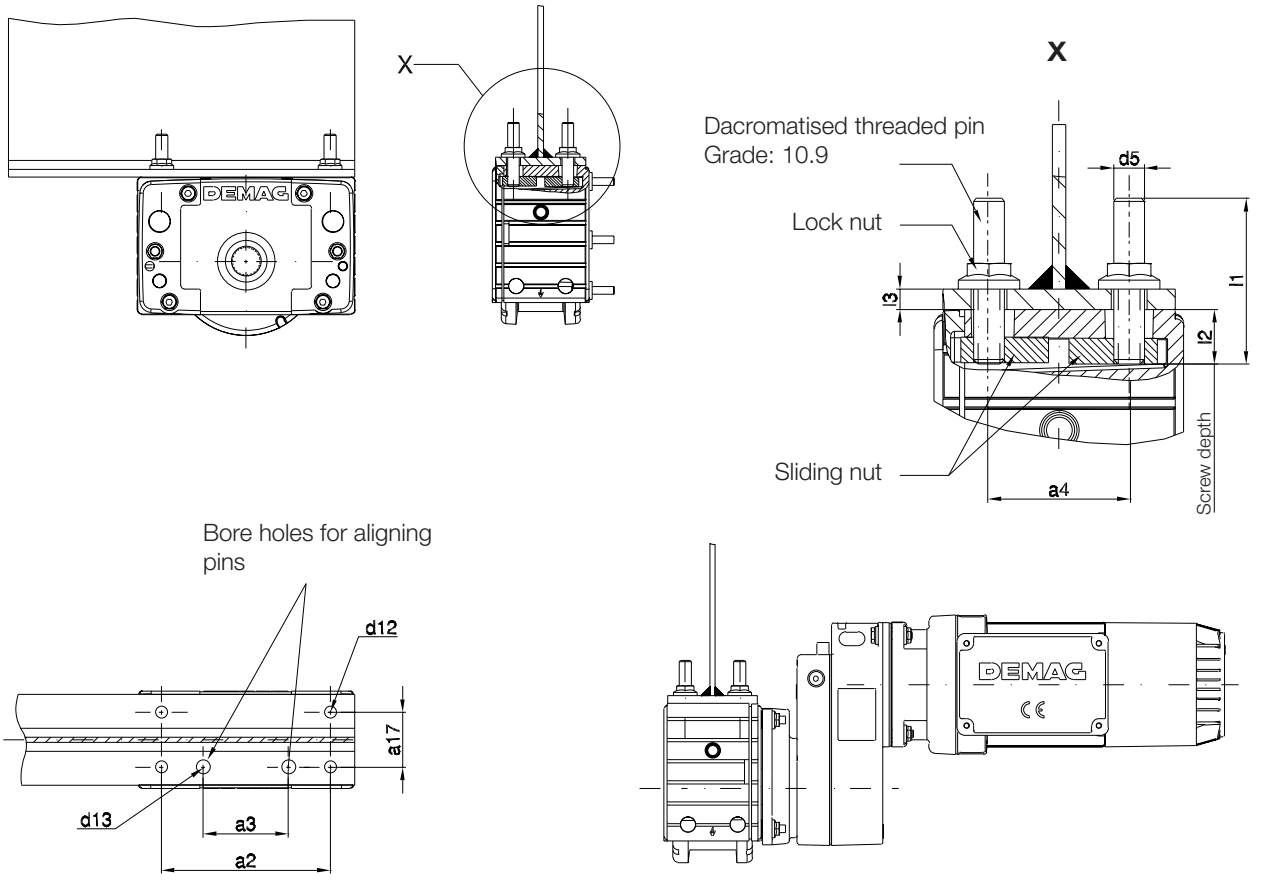


1) Types available from stock for DRS 250 with tread b1= 75 in basic design A65 and NA

2) Only available in driven basic design for production reasons.

3) Type available from stock for DRS 200 b1=75 in basic design A and NA

3.4 DRS 112 – 200 top connection



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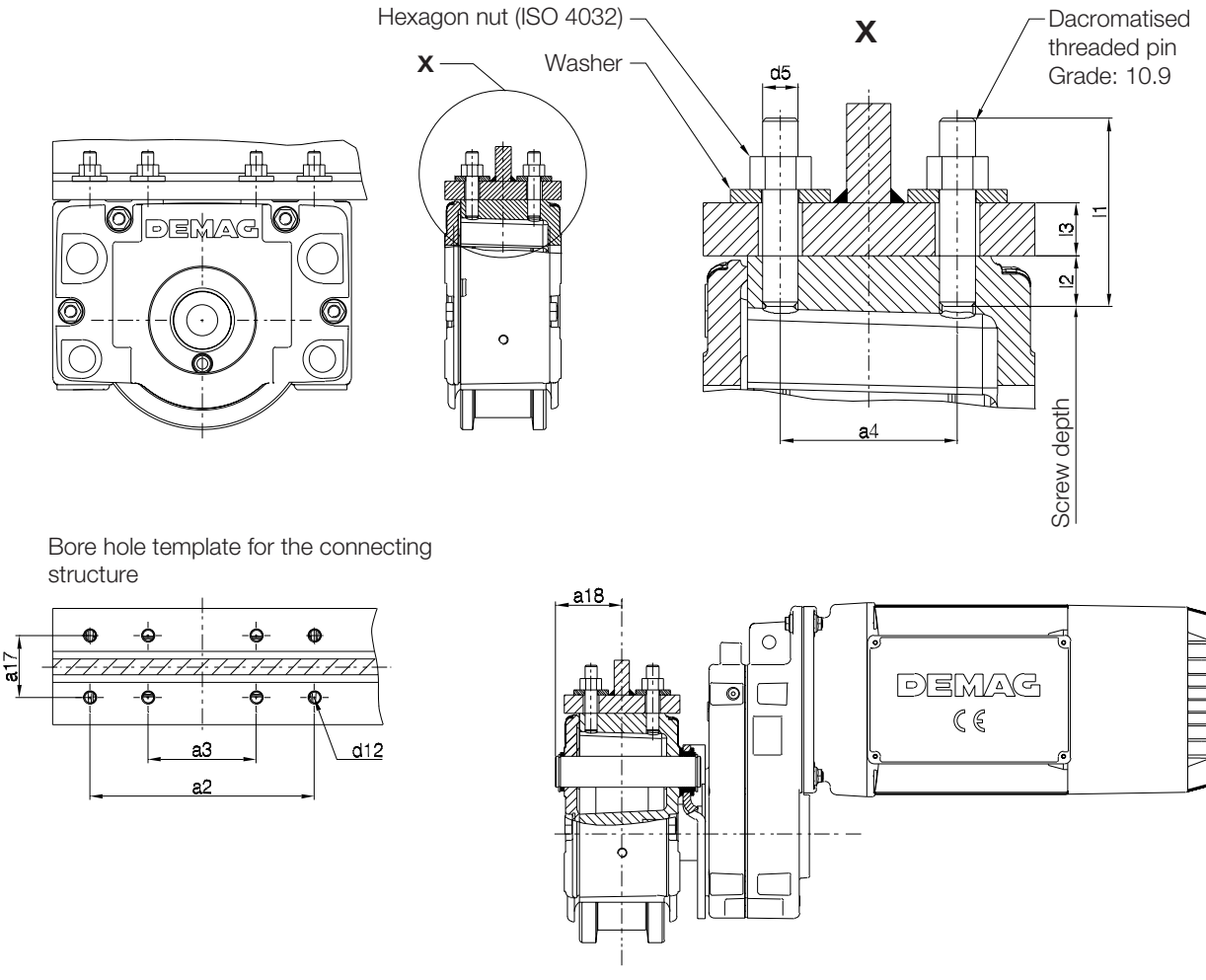
DRS wheel block size	Part no. 1)	Dimensions in mm									
		a2	a3	a4	a17	d5	d12	d13	l1	l2 min-max	l3 min-max
112	**75362044**	145	70	45^{+4}_{-7}	45	M12	14	14,5	65	18,5-19	8-25
125	**75362044**	170	86	55^{+4}_{-7}	55	M12	14		65	22,5-23	8-25
160	**75252044**	220	118	55^{+3}_{-5}	55	M16	18		75	24,5-25	15-25
200	**75252044**	275	175	65^{+3}_{-5}	65	M16	18		75	28,5-29	15-25

1) Part no. includes threaded pins and lock nut

2033523a.p65/010407

3.4 DRS 250 – 500 top connection



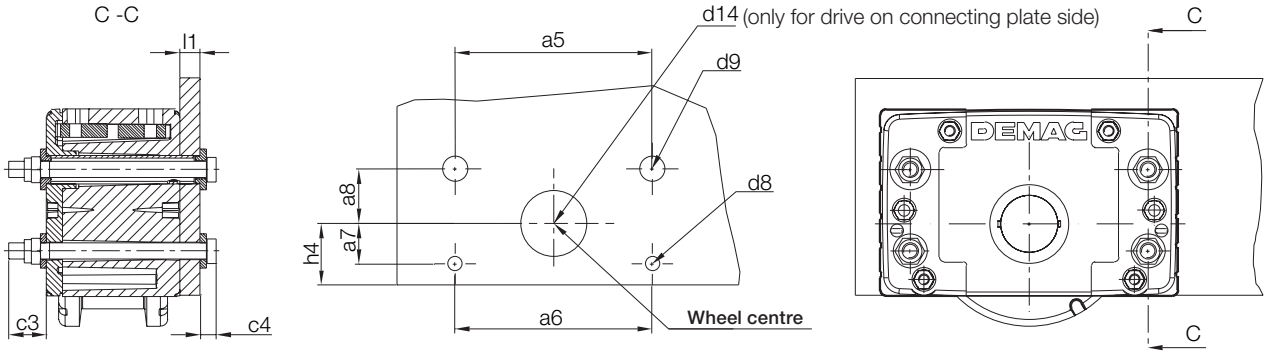
DRS wheel block size	Part no. 1)	Dimensions in mm									
		a2	a3	a4 ± 0,2	a17	a18	d5	d12	l1	l2 min-max	l3 min-max
250	**75332044**	290	140	80	80	90	M16	20,5	85	21-23	15-29
315	**75402044**	360	180	100	100	110	M16	20,5	100	25-27	15-39
400	**75432044**	440	210	120	120	126	M20	25	100	28-30	15-30
500	**75462044**	620	480	125	125	137	M20	26	120	40-60	20-40

1) Part no. includes threaded pins, lock nut, washers and Loctite

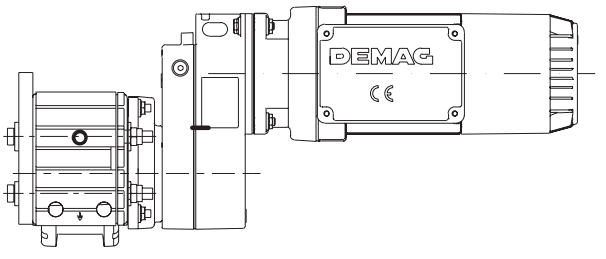
3.5 DRS 112 – 200 side connection

MA/NA

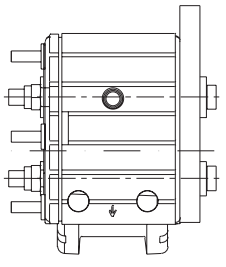
Bore hole template



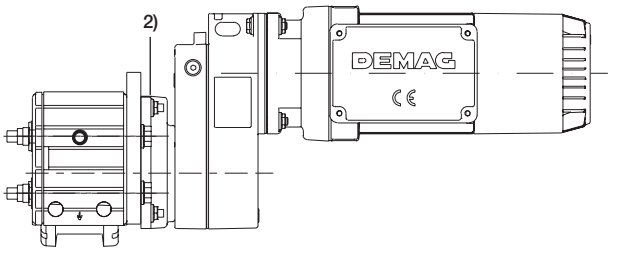
Drive on wheel block side (W1)



A



Drive on connecting plate side (W2)
(wheel block only in MA basic design)



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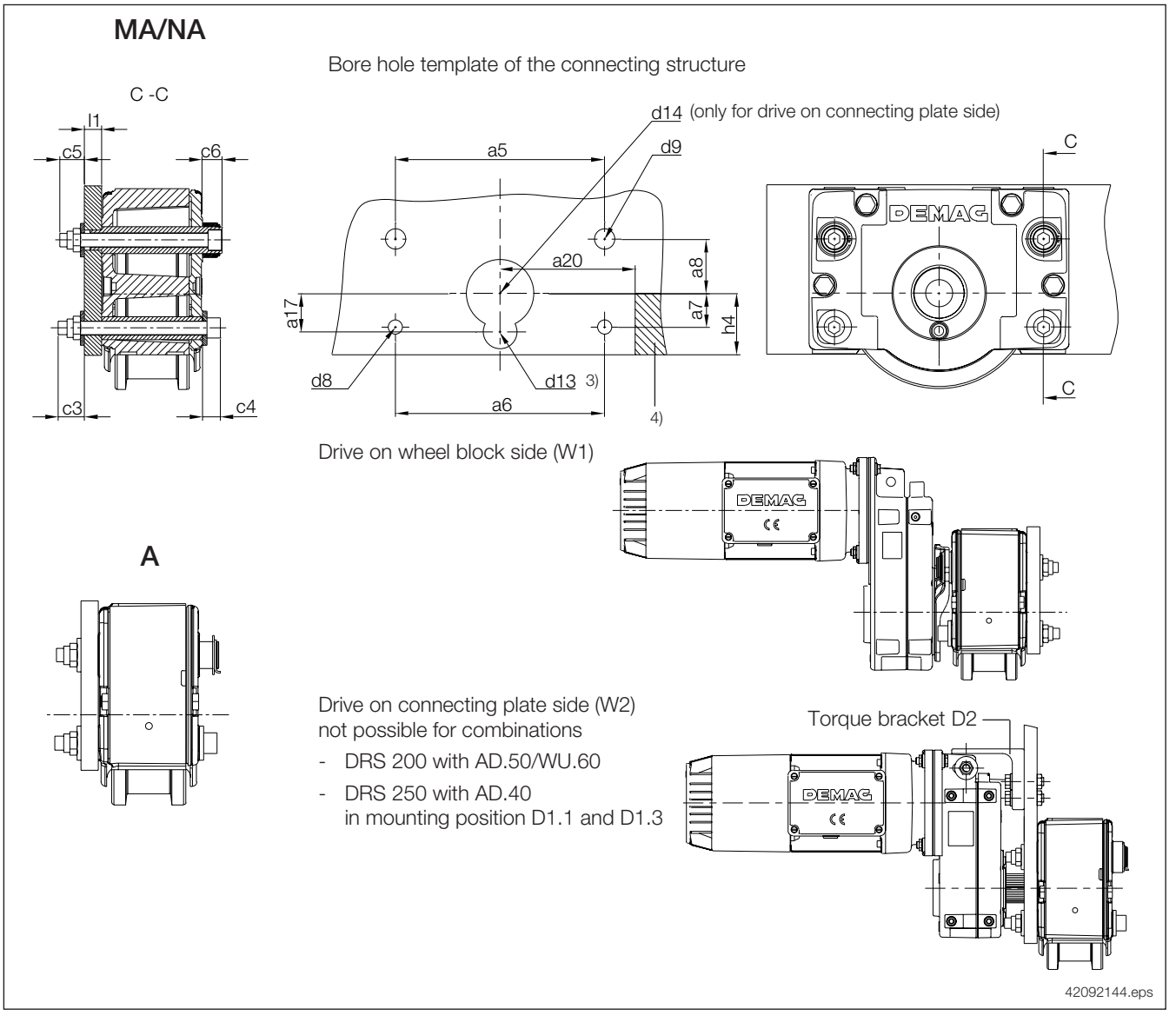
DRS wheel block size	Part no. 1)	Dimensions in mm a5 ± 0,1	a6 ± 0,1	a7 ± 0,1	a8 ± 0,1	c3 min-max	c4	d8	d9 D9	d14	h4	l1 min-max
112	**75362244**	145	145	30	40	20-23	10,4	10,5	18,5	50	47	12-15
125	**75222244**	175	175	20	40	24,5-27,5	12	13	21	60	53,5	15-18
160	**75252244**	220	220	25	55	35,5-41,5	14,5	16,5	30	80	70	14-20
200	**75302244**	275	275	35	75	38,5-43,5	19	20,5	35		90	20-25

1) Part no. includes collared sleeve and dacromatised bolted fastening parts
2) Torque bracket for pin connection

2033523a.p65/010407

3.5 DRS 250 – 500 side connection (DRS 200 with AD. 50/WU. 60 gearbox)



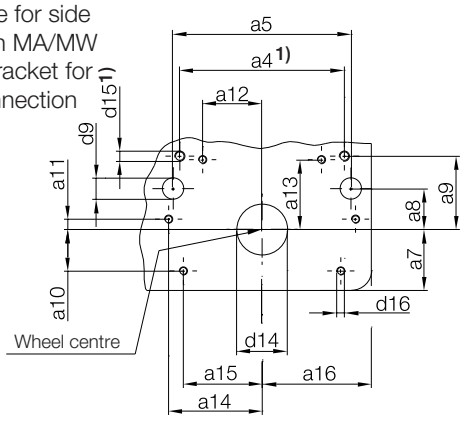
DRS wheel block size	Part no.		Dimensions in mm															
			a5 ± 0,05	a6 ± 0,1	a7 ± 0,1	a8 ± 0,1	a17	a20	c3 min-max	c4	c5 min-max	c6	d8	d9 H13	d13	d14	h4	l1 min-max
200	MA/NA	75302244 1)	275 ± 0,1	275	35	75	–	–	38,5-43,5	19	38,5-43,5	33	20,5	35 D9	–	80	90	20-25
	A	75302644 5)							39-44		33-38							
250	MA/NA A	75332644 1) 75332244 2)	310	310	50	80	57	192	39-44	26	37-42	29	21	30	50	100	83	20-25
315	MA/NA A	75402644 1) 75402244 2)	370	370	70	80	69	235	37-47	32	34-44	37	25	35	50	120	108	25-35
400	MA/NA A	75432644 1) 75432244 2)	450	450	95	130	75	290	45-50	40	44-49	42	31	45	50	150	138	30-35
500	MA/NA A	75462644 1) 75462244 2)	580	580 ± 0,05	110 ± 0,05	160 ± 0,05	85	345	50-60	40	45-55	49	31	50	50	165	177	30-40

1) Part no. includes pins, spacer sleeve, retaining elements and dacromatised bolted fastening parts
2) Part no. includes pins, retaining elements and dacromatised bolted fastening parts
3) Only required for relubrication
4) Recess only for fitting guide roller arrangement
5) Part no. includes collared sleeves, adapter sleeves, retaining elements and dacromatised bolted fastening parts

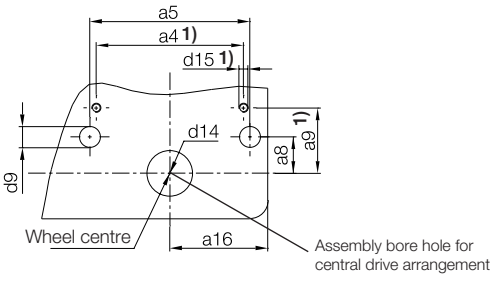
3.6 DRS 112 – 200 pin connection

Bore hole template

Drive side for side plate with MA/MW torque bracket for drive connection



Non-driven side for side plate without torque bracket



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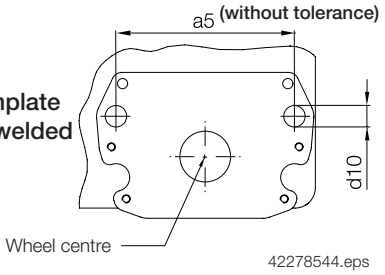
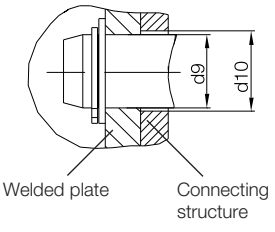
Bore hole template for side with welded plate

Alignable pin connection

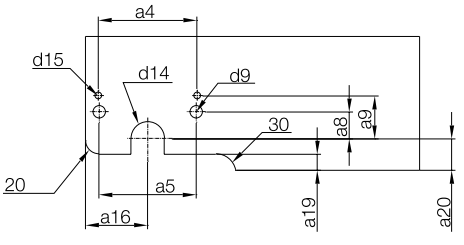


42278544.eps



41752544.eps

Bore hole template for installation in hollow profile section to DIN 59410/59411 with welded plate



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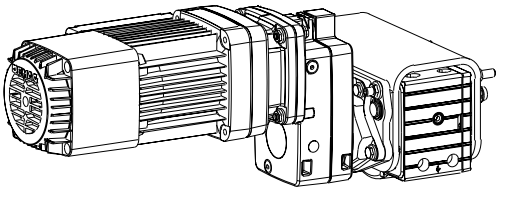

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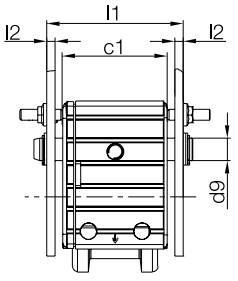
DRS wheel block size	Dimensions in mm											
	a4 1)	a5 ± 0,05	a7	a8 ± 0,1	a9 1)	a10 ± 0,1	a11 ± 0,1	a12 ± 0,1	a13 ± 0,1	a14 ± 0,1	a15 ± 0,1	a16
112	148	145	52	40	64	10	–	50	60	–	79	93
125	162	175	60	40	72	41	10	58,5	68,5	92	77,5	108
160	206	220	70	55	90	56	12	75	90	110	97,5	135
200	266	275	90	75	118	70	10	105	115	140	120	168

1) See section 3.8 for use of threaded pins or distance elements

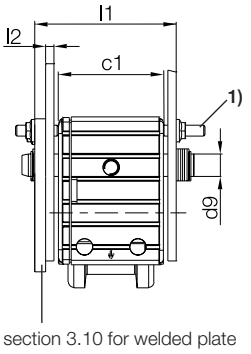
2033523a.p65/010407

3.6 DRS 112 – 200 pin connection

without welded plate

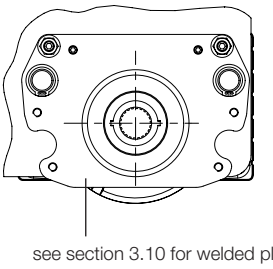


with welded plate:
suitable for aligning pin sets (L) or bolting MA./MW torque brackets.



see section 3.10 for welded plate

After alignment:
see operating instructions
214 276 44 for welding



see section 3.10 for welded plate

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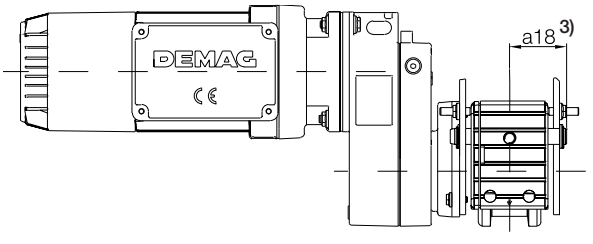

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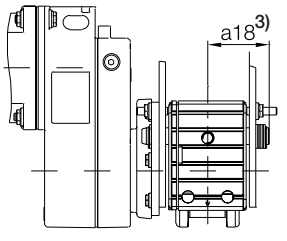

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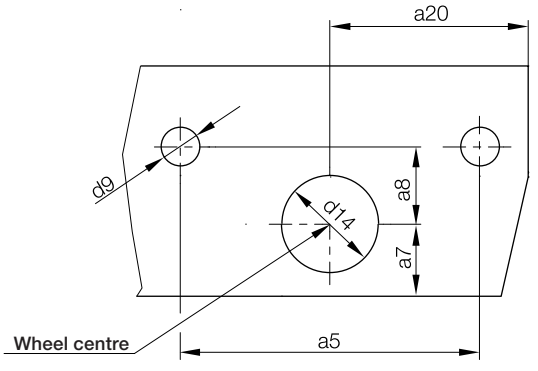
Dimensions in mm												DRS
a18	c1	d9	d10	d14	d15	d16	l1 2)		l2	Hollow profile section to DIN			wheel block
3)		D9/h8			1)		min	max	min		a19	a20	size
75	96	18,5	20	50	M10	M8	119,5	127,5	8	200 x 120 x 8	24	47	**112**
							129,2	137,2					
74	98	21	23	60	M10	M8	119,0	127,0	8	200 x 120 x 8	24	54	**125**
							128,2	140,2					
86	110	30	32	80	M12	M10	138,0	150,0	10	260 x 140 x 10	30	70	**160**
							150,2	160,2					
103	130	35	38	80	M12	M10	170,0	182,0	10	260 x 180 x 10	30	90	**200**
							182,2	194,2					

1) See section 3.8 for use of threaded pins or distance elements
2) Check l_1 dimension, see section 3.9 pin set
3) See section 3.9 pin set

3.6 Pin connection
DRS 200 AD . 50/WU . 60 gearbox

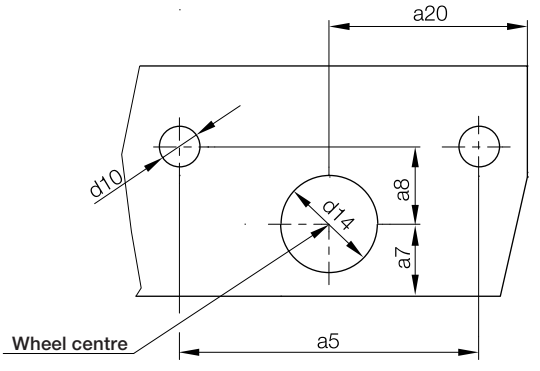
Pin connection B

Bore hole template for A

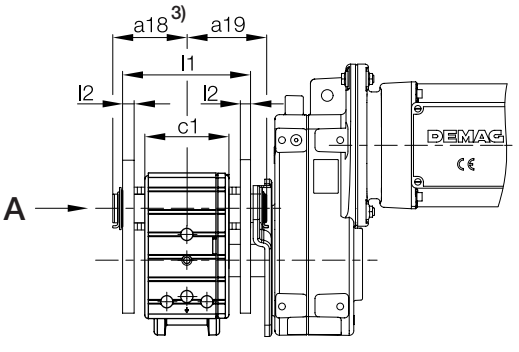


Pin connection B

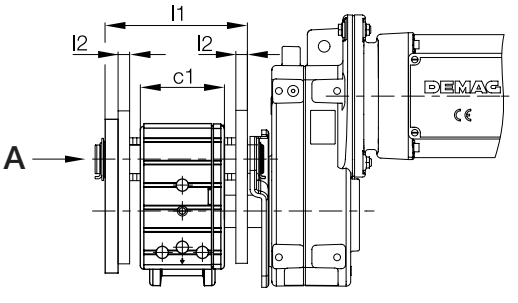
Bore hole template for A (welded plate side)



without welded plate



with welded plate



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DRS	Dimensions in mm											
wheel block size	a5 ± 0,05	a7	a8	a18	a19	a20	c1	d9 D9	d10	d14	l1 2) max.	l2 min.
200	275	90	75	108,5	127	168	130	35	38	80	194	10

1) See section 3.8 for use of threaded pins or distance elements
2) Check l_1 dimension, see section 3.9 pin set
3) See section 3.9 pin set

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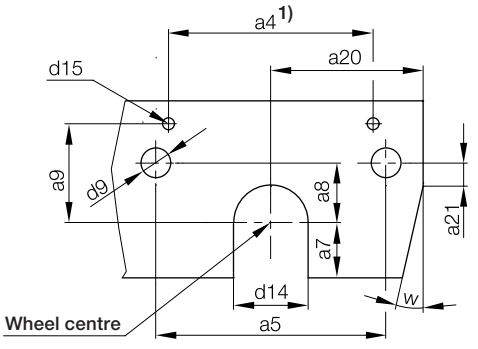
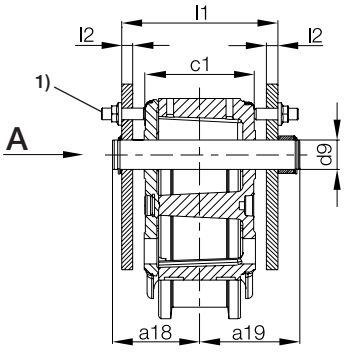
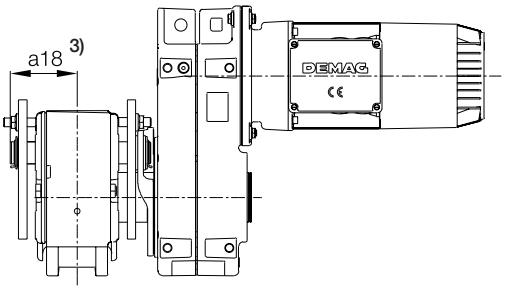
3.6 DRS 250-500 pin connection

Bore hole template for A

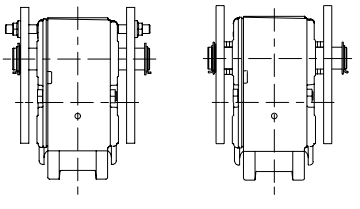


MA/NA





Threaded pins **Spacer plate**



When fitting guide rollers, dimensions a20, a21 and w must be complied with

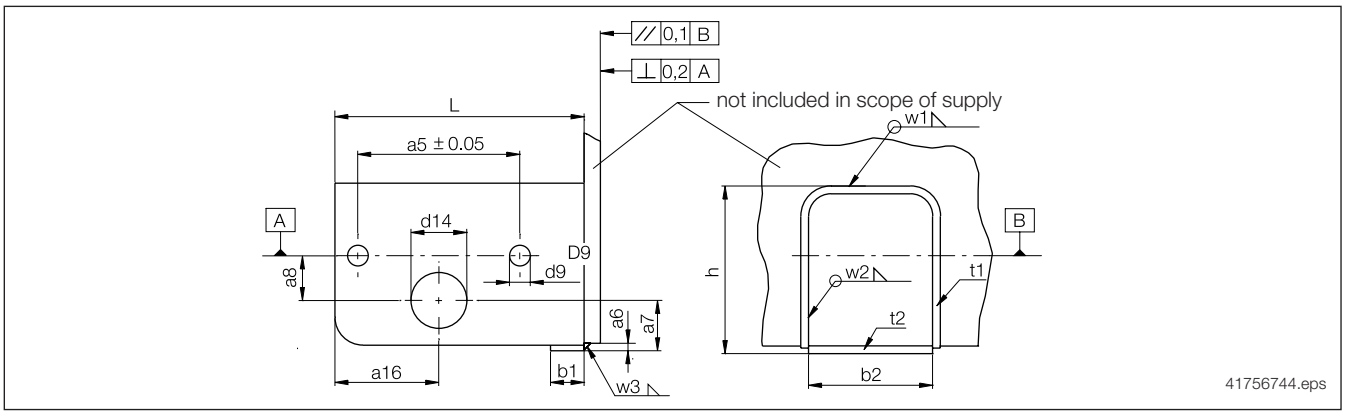
42091844.eps

DRS wheel block size	Dimensions in mm															
	a4	a5 ± 0,05	a7	a8	a9	a18	a19	a20	a21	c1	d9 D9	d14	d15	l1 2) max	l2 min	w
250	310	310	95	80	135	118 120	134 132	200	10	150	40	100	M16	210	15	15°
315	360	370	120	80	155	139 142	162 159	250	15	180	50	120	M16	250	18	15°
400	450	450	150	130	210	160 162	185 183	320	50	210	65	150	M20	285	20	15°
500	580	580	190	160	250	179 180	206 205	390	70	234	70	165	M20	320	23	15°

1) See section 3.8 for use of threaded pins or distance elements
2) Check l_1 dimension, see section 3.9 pin set
3) See section 3.9 pin set

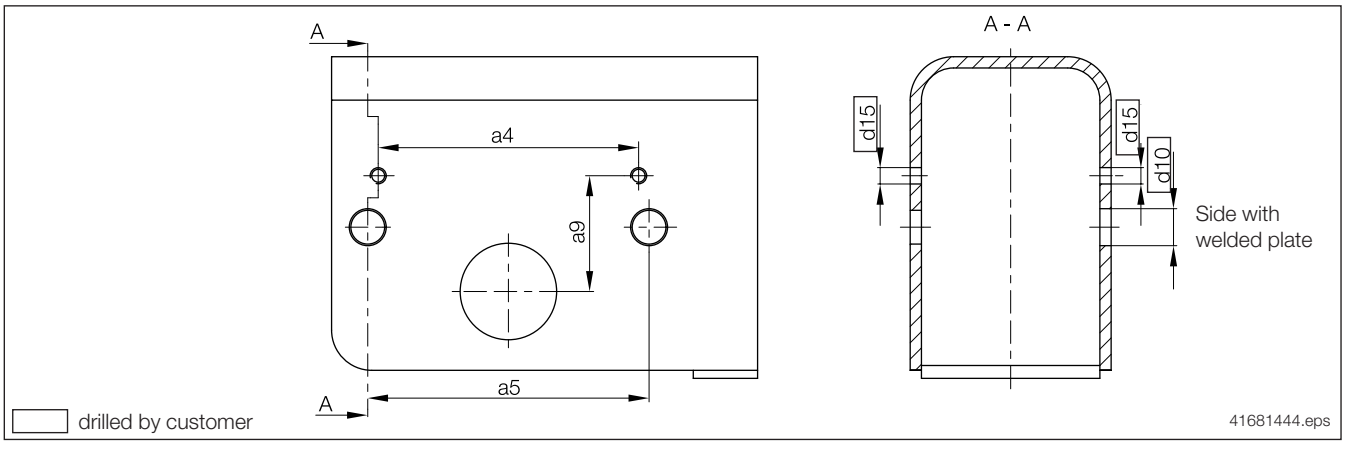
3.7 End connection

DRS 112 – 200 end connection



DRS wheel block size	Basic design	Bestell-Nr.	Dimensions in mm															Options		
			a5	a6	a7	a8	a16	d9	d14	b1	b2	h	l	t1	t2	w1 1)	w2 1)	w3 1)	Welded plate 2)	Pin set	Spacer plate set
112	A	753 714 44	145	7	45	40	93	18,5	50	30	111	150	223	7	7	3	4	4	753 829 44	753 738 44	752 139 44
	NA/MA																		–	753 737 44	
125	A	752 314 44	175	8	54	40	110	21,0	60	40	111	200	265	7	8	3	4	4	752 429 44	752 338 44	752 140 44
	NA/MA																		–	752 337 44	
160	A	752 614 44	220	10	70	55	140	30,0	80	50	129	250	330	8	10	4	4	5	752 729 44	752 638 44	752 141 44
	NA/MA																		–	752 637 44	
200	A	753 114 44	275	10	90	75	170	35,0	80	50	154	300	395	8	10	4	4	5	753 229 44	753 138 44	752 142 44
	NA/MA																		–	753 137 44	

Bore hole template for alignable end connection and axial securing arrangement with threaded pins (by the customer)



DRS wheel block size	Dimensions in mm				
	a4	a6	a9	d10	d15
112	148	145	64	20	M 10
125	162	175	72	23	
160	206	220	90	32	M 12
200	266	275	118	38	

1) After aligning and tacking, first weld on the inside and then the outside.
Welded connections to tolerance class DIN 8570 BF assessment group DIN EN 25817 C

2) Required to fit the torque bracket.

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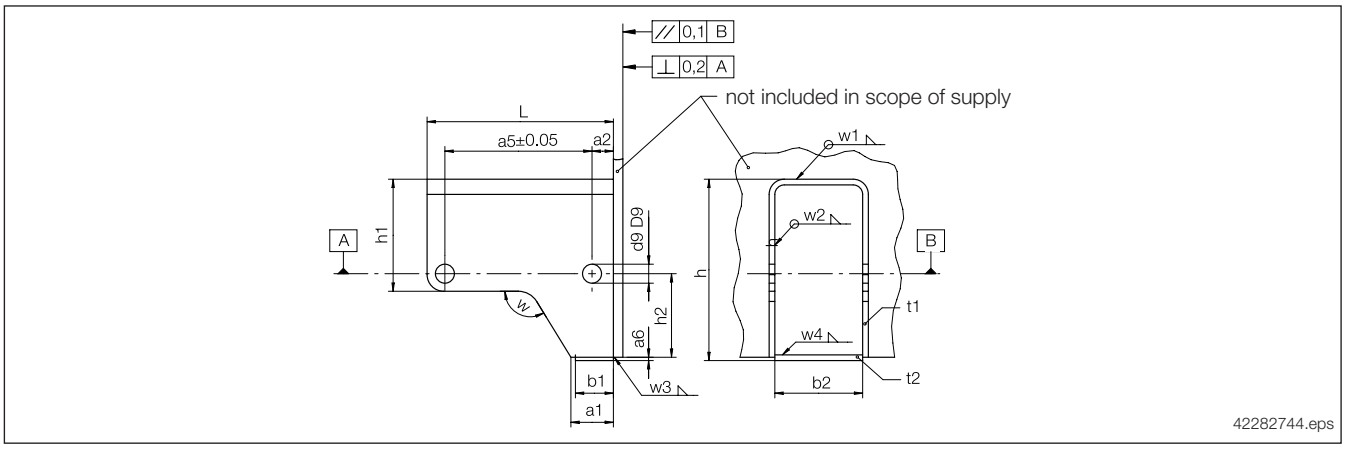
DRS 250 end connection



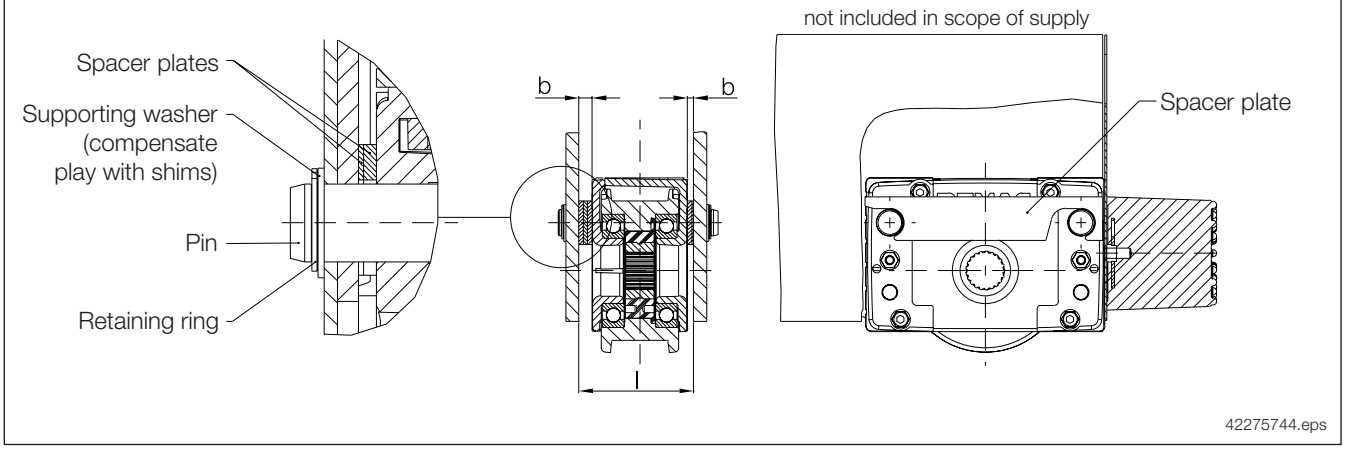
DRS wheel block size	Basic design	Part no.	Dimensions in mm																	Options	
			a1	a2	a5	a6	b1	b2	d9	h	h1	h2	L	t1	t2	w	w1 1)	w2 1)	w3 1)	w4 1)	Pin set	Spacer plate set
250	A	753 414 44	90	45	310	7	80	185	40	382	236	176	393	12	12	121°	4	4	5	5	753 438 44	752 143 44
	NA/MA																				753 437 44	

1) After aligning and tacking, first weld on the inside and then the outside.
Welded connections to tolerance class DIN 8570 BF assessment group DIN EN 25817 C

3.8 Axial retaining arrangement with track gauge adjustment

Spacer plates

The track gauge can be changed using interchangeable distance elements.
Standard assignments and maximum adjustment are shown in the table.



DRS	Part no.	Dimensions in mm			Set per DRS consisting of
		l_{max}	b_{max}	Max. adjustment range	Number and thickness
112	**752 139 44**	111	7,5	± 7	2 x 2mm + 2 x 3mm + 2 x 5mm
125	**752 140 44**	114	8	± 7,5	2 x 2mm + 2 x 3mm + 2 x 5mm
160	**752 141 44**	130	10	± 9,5	3 x 2mm + 2 x 3mm + 2 x 5mm
200	**752 142 44**	162	16	± 15,5	4 x 2mm + 2 x 3mm + 4 x 5mm
250	**752 143 44**	180	15	± 14,5	4 x 2mm + 2 x 3mm + 4 x 5mm
315	**752 144 44**	214	17	± 16,5	5 x 2mm + 2 x 3mm + 4 x 5mm
400	**752 145 44**	245	17	± 16,5	5 x 2mm + 2 x 3mm + 4 x 5mm
500	**752 146 44**	274	17	± 16,5	5 x 2mm + 2 x 3mm + 4 x 5mm

Threaded pins

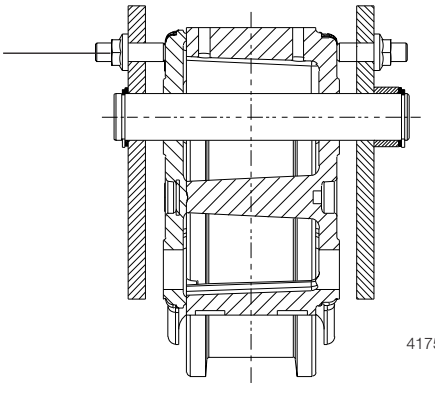
The dacromatised threaded pins are used to align the alignable pin connection and then to fix the wheel block in the axial direction.

DRS	Part no. Set 1)	Threaded pin Grade: 45 H
112 / 125	**752 147 44**	M10 x 40
160 / 200 2)	**752 148 44**	M12 x 50
250 / 315	**752 937 44**	M16 x 60
400	**752 938 44**	M20 x 75
500	**752 929 44**	M20 x 85

1) Part no. includes per DRS:
4 threaded pins and 4 lock nuts
2) DRS 200 with AD50/WU60 gearbox not possible, only the set of spacer plates has to be used

Tightening torque nut:

M10: 60 Nm
M12: 104 Nm
M16: 250 Nm
M20: 490 Nm



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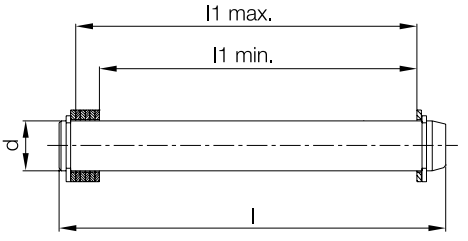
3.9 Pin set



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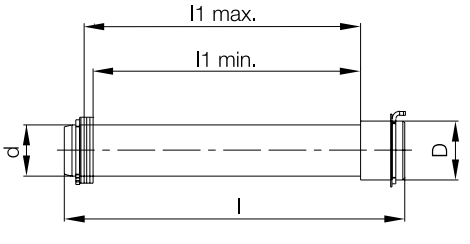
DRS wheel block size	Part no.	Type	Weight kg	Materials DIN EN 10083	Surface protection	Dimensions in mm										
						d D9 / h8	l	l1 min.	l1 max.	Washers 1	Washers 2	Washers 2,5	Washers 3	Washers 3,5	Spacer sleeve	Shaft retaining rings 4x DIN 471
112	753 737 44	S	0,6	42CrMo4+QT	Pin surface Dacromet coated grade B Minimum coat thickness 0,008 mm	18,5	143,5	119,5	127,5	4	8	–	–	–	–	18 x 1,5
	753 738 44	L	0,7	36NiCrMo16+QT			153	129,2	137,2							
125	752 337 44	S	0,8	42CrMo4+QT		21	143,5	119,0	127	4	8	–	–	–	–	20 x 1,75
	752 338 44	L	0,9	36NiCrMo16+QT			161	128,2	140,2		12					
160	752 637 44	S	2,0	42CrMo4+QT		30	168	138,0	150	4	12	–	–	–	–	30 x 2
	752 638 44	L	2,1	42CrMo4+QT			178	150,2	160,2		10					
200	753 137 44	S	3,2	42CrMo4+QT		35	202	170,0	182	4	12	–	–	–	–	35 x 2,5
	753 138 44	L	3,4	42CrMo4+QT			214	182,2	194,2							
250	753 437 44	L	5,5	42CrMo4+QT		40	252	194	210	8	–	14	–	–	2 x 21	40 x 2,5
	753 438 44 1)	L	5,3	42CrMo4+QT								16			–	
315	754 137 44	L	10,1	36NiCrMo16+QT		50	301	231	250	8	–	–	14	–	2 x 27,5	50 x 3
	754 138 44 1)	L	9,8										16		–	
400	754 437 44	L	19,9	C45+QT		65	345	262	285	10	–	–	–	14	2 x 32	65 x 4
	754 438 44 1)	L	19,3											16	–	
500	754 737 44	L	25,5			70	385	291	320	10	–	–	–	16	2 x 35,5	70 x 4
	754 738 44 1)	L	24,8											18	–	

DRS 200 pin set for AD50 / WU60 gearbox



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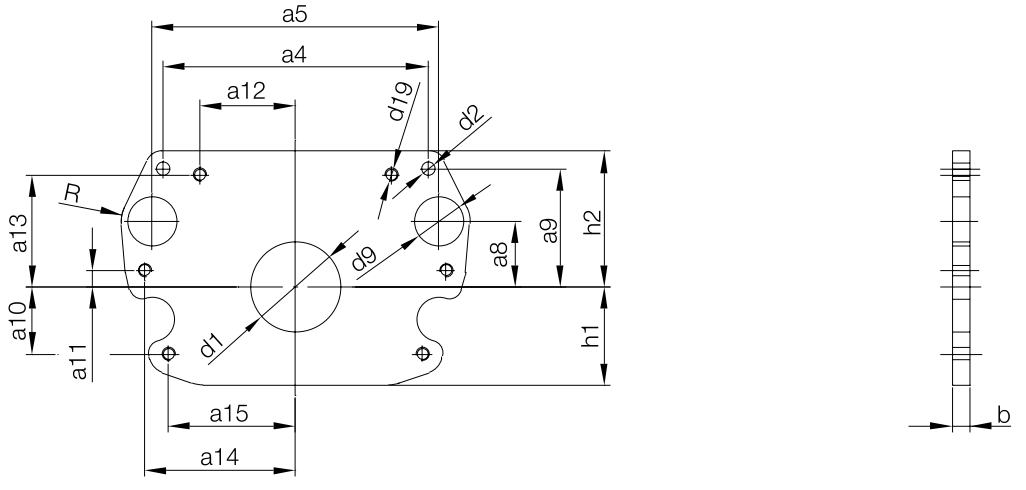
DRS wheel block size	Part no.	Type	Weight kg	Materials DIN EN 10083	Surface protection	Dimensions in mm								
						d D9 / h8	D	l	l1 min.	l1 max.	Washers 1	Washers 2	Shaft retaining rings 2x DIN 471
200	752 947 44 1)	L	3,9	42CrMo4+QT	Pin surface Dacromet coated grade B Min. coat thickness 0,008 mm	35	40	235,5	170	194	2 x Ø40 2 x Ø35	24 x Ø35	Ø35 x 2,5 Ø40 x 2,5

1) Pin set for the driven type.

3.10 Welded plate



Material: S 355 J 2 G 3 (St 52)

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DRS wheel block size	Part no.	a4	a5	a8	a9	a10	a11	a12	a13	a14
112	**753 829 44**	148	145	40	64	10	–	50,0	60,0	–
125	**752 429 44**	162	175	40	72	41	10	58,5	68,5	92,0
160	**752 729 44**	206	220	55	90	56	12	75,0	90,0	110,0
200	**753 229 44**	266	275	75	118	70	10	105,0	115,0	140

DRS wheel block size	a15	R	h1	h2	d1	d2	d9 D9 / h8	d19	b
112	79,0	17,5	53	75	90	12	18,5	4 x M8	10
125	77,5	19,0	60	83	90	12	21,0	6 x M8	10
160	97,5	26,0	75	107	120	14	30,0	6 x M10	12
200	120,0	30,0	88	134	120	14	35,0	6 x M10	12

Dimension B has to be considered when selecting the pin.

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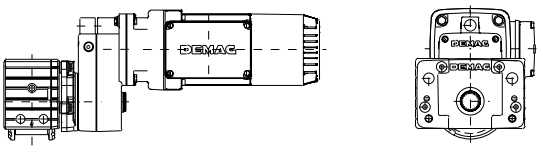
3.11 Individual drive unit, consisting of:

a) Offset gearbox with journal shafts: Torque bracket set (3), corresponding to connection variant

b) Offset gearbox with hollow shaft: Torque bracket set (3), corresponding to connection variant and splined shaft set (2)

With journal shaft



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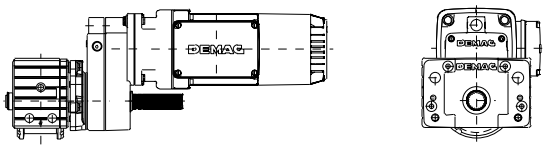
With splined shaft



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DRS wheel block size	Travel wheel hub profile	Toothed hub profile for journal or hollow shafts AM. and AD. offset gearboxes									Individual drive unit Journal shafts 1)		Individual drive unit Splined shaft set 2)
		10	20	30	40	50	60	70	80	90	K / W1	B / W2	K / W1, W2 / B
112	N30	N30									30 (11)	30 (11)	–
	N30		N30								–	–	860 090 46
125	N30	N30									30	31	–
	N35		N35								35(11)	35(11)	–
	N35			N35							–	–	860 190 46
160	N35		N35								35	36	–
	N45			N45							45 (11)	45 (11)	–
	N45				N45						–	–	860 290 46
200	N45			N45							45	46	–
	N50				N50						50 (11)	50 (11)	–
	N50					N50					–	–	860 390 46
250	N50				N50						50	51	–
	N65					N65					65 (11)	66 (22)	–
	N65						N65				–	–	860 490 46
315	N65					N65					66	66	–
	N75						N75				75 (11)	76 (22)	–
	N75							N75			–	–	860 590 46
400	N75						N75				76	76	–
	N90							N90			90 (11)	91 (22)	–
	N90								N90		–	–	860 690 46
500	N90							N90			91	91	–
	N110								N110		110	111	–
	N110									N110	–	–	860 790 46

Offset gearbox with hollow shaft

1) Output drive shaft code for individual drive unit, (..) output drive shaft code for central drive unit
2) Part no. includes splined shaft, spacer rings and axial retaining elements

K = Top connection
W = W1 (side connection with drive on wheel block side)
W2 (side connection with drive on connecting plate side)
B = Pin connection

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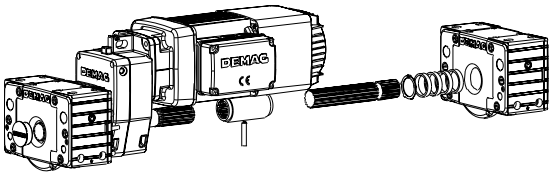
3.11 Central drive unit inside arrangement (ZI), consisting of:

a) Offset gearbox with journal shafts on both sides : Set of torque brackets corresponding to connection variant (3) and set of central shafts (5) consisting of: splined shaft (2) and connecting shaft G

b) Offset gearbox with hollow shaft: Set of torque brackets corresponding to connection variant (3) and set of central shafts (6) consisting of: splined shaft (2), coupling (4) and connecting shaft G

With journal shaft



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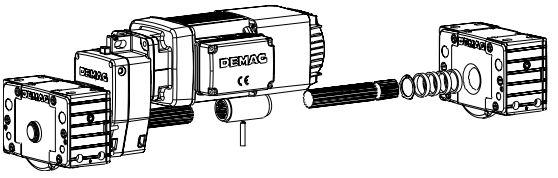
With splined shaft



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Set part no.					Central shaft set part no.				
Torque bracket for connection variants 3)				Couupling 4)	Connecting shafts (G) for track gauge				
K	W1	B / W2	B	K1 (K3)	1000	1400	2240	2800	3150
753 796 44	753 796 44	753 797 44	753 798 44 8)	752 150 44	860 001 46 5)	860 002 46 5)	860 003 46 5)	860 004 46 5)	860 005 46 5)
753 796 44	753 796 44	753 797 44	753 798 44 8)		860 011 46 6)	860 012 46 6)	860 013 46 6)	860 014 46 6)	860 015 46 6)
752 396 44	752 396 44	752 397 44	752 398 44 8)		7)				
752 396 44	752 396 44	752 397 44	752 398 44 8)	752 152 44	860 101 46 5)	860 102 46 5)	860 103 46 5)	860 104 46 5)	860 105 46 5)
752 391 44	752 391 44	752 394 44	752 395 44 8)		860 111 46 6)	860 112 46 6)	860 113 46 6)	860 114 46 6)	860 115 46 6)
752 696 44	752 696 44	752 697 44	752 697 44		7)				
752 691 44	752 691 44	752 694 44	752 694 44	752 154 44	860 201 46 5)	860 202 46 5)	860 203 46 5)	860 204 46 5)	860 205 46 5)
752 691 44	752 691 44	752 694 44	752 694 44		860 211 46 6)	860212 46 6)	860 213 46 6)	860 214 46 6)	860 215 46 6)
753 190 44	753 190 44	753 192 44	753 192 44		7)				
753 190 44	753 190 44	753 192 44	753 192 44	752 156 44	860 301 46 5)	860 302 46 5)	860 303 46 5)	860 304 46 5)	860 305 46 5)
753 191 44	753 193 44	753 193 44	753 193 44		860 311 46 6)	860 312 46 6)	860 313 46 6)	860 314 46 6)	860 315 46 6)
753 490 44	753 570 44	753 570 44	753 570 44		7)				
753 491 44	753 571 44	753 571 44	753 571 44	752 950 44	860 401 46 5)	860 402 46 5)	860 403 46 5)	860 404 46 6)	860 405 46 5)
753 492 44	753 572 44	753 572 44	753 572 44		860 411 46 6)	860 412 46 6)	860 413 46 6)	860 414 46 6)	860 415 46 6)
754 190 44	754 270 44	754 270 44	754 270 44		7)				
754 191 44	754 271 44	754 271 44	754 271 44	752 952 44	860 501 46 5)	860 502 46 5)	860 503 46 5)	860 504 46 5)	860 505 46 5)
754 192 44	754 272 44	754 272 44	754 272 44		860 511 46 6)	860 512 46 6)	860 513 46 6)	860 514 46 6)	860 515 46 6)
754 490 44	754 570 44	754 570 44	754 570 44		7)				
754 491 44	754 571 44	754 571 44	754 571 44	752 954 44	860 601 46 5)	860 602 46 5)	860 603 46 5)	860 604 46 5)	860 605 46 5)
754 492 44	754 572 44	754 572 44	754 572 44		860 611 46 6)	860 612 46 6)	860 613 44 6)	860 614 46 6)	860 615 46 6)
754 790 44	754 870 44	754 870 44	754 870 44		7)				
754 791 44	754 871 44	754 871 44	754 871 44	752 844 44	8)				
754 792 44	754 872 44	754 872 44	754 872 44		8)				

3) Part no. includes depending on torque bracket type, bolted fastening parts to the gearbox and retaining elements
4) Part no. includes coupling and heavy-duty roll pin
5) Part no. includes connecting shaft G, shims and axial retaining elements, coupling K1
6) Part no. includes splined shaft (2) with retaining elements, connecting shaft G with shims and axial retaining elements, coupling K1
7) Currently not planned
8) Chapter 3.11.1

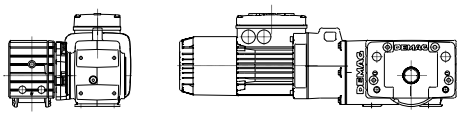
K = Top connection
W = W1 (side connection with drive on wheel block side)
W2 (side connection with drive on connecting plate side)
B = Pin connection

3.11 Individual drive unit, consisting of:

a) Angular gearbox with journal shafts: Torque bracket set (3), corresponding to connection variant

b) Angular gearbox with hollow shaft: Torque bracket set (3), corresponding to connection variant and splined shaft set (2)

With journal shaft



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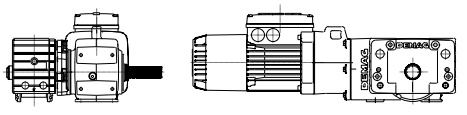
With splined shaft



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DRS wheel block size	Travel wheel hub profile	Splined hub profile for journal or hollow shafts WUE/WUK angular gearbox										Individual drive unit		
												Journal shafts 1)		Splined shaft set 2)
		10	20	30	40	50	60	70	80	90	100	K / W1	B / W2	K / W1, W2 / B
112	N30	N30										30 (11)	30 (11)	–
	N30		N30									–	–	860 095 46
125	N30	N30										30	31	–
	N35		N35									35(11)	35(11)	–
	N35			N35								–	–	860 195 46
160	N35		N35									35	36	–
	N45			N45								45 (11)	45 (11)	–
	N45				N45							–	–	860 295 46
200	N45			N45								45	46	–
	N50				N50							50 (11)	50 (11)	–
	N50					N50						–	–	860 390 46
	N50						N50					–	–	860 390 46
250	N50				N50							51	51	–
	N50					N50						–	–	7)
	N65					N65						65 (11)	66 (22)	–
	N50						N50					–	–	7)
	N65						N65					65 (11)	66 (22)	–
	N65							N65				–	–	860 495 46
315	N65					N65						66	66	–
	N65						N65					66 (11)	66 (22)	–
	N75							N75				75 (11)	76 (22)	–
	N75								N75			–	–	860 595 46
400	N75							N75				76	76	–
	N90								N90			90	91	–
	N90									N90		–	–	860 695 46
500	N90								N90			91	91	–
	N110									N110		110	111	–
	N110										N110	–	–	860 795 46

Angular gearbox with hollow shaft

1) Output drive shaft code for individual drive unit, (..) output drive shaft code for central drive unit
2) Part no. includes splined shaft, spacer rings and axial retaining elements
7) Currently not planned

K = Top connection
W = W1 (side connection with drive on wheel block side)
W2 (side connection with drive on connecting plate side)
B = Pin connection

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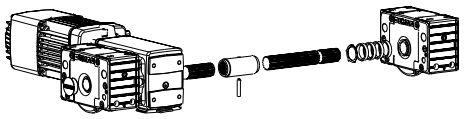
3.11 Central drive unit inside arrangement (ZI), consisting of:

a) Angular gearbox with journal shafts on both sides: Torque bracket set (3), corresponding to connection variant, central shaft set (5) consisting of: coupling set (4) and connecting shaft G

b) Angular gearbox with hollow shaft: Torque bracket set (3), corresponding to connection variant, central shaft set (6) consisting of: splined shaft set (2), coupling set (4) and connecting shaft G

With journal shaft



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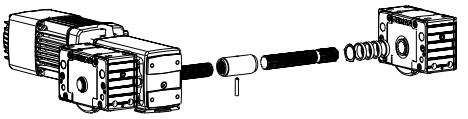
With splined shaft



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Set part no.					Central shaft set part no.				
Torque bracket for connection variants 3)				Coupling 4)	Connecting shafts (G) for track gauge				
K	W1	B / W2	B	K1 (K3)	1000	1400	2240	2800	3150
753 890 44	753 890 44	753 892 44	753 893 44 8)	752 150 44	860 021 46 5)	860 022 46 5)	860 023 46 5)	860 024 46 5)	860 025 46 5)
753 891 44	753 891 44	753 894 44	753 895 44 8)		860 031 46 6)	860 032 46 6)	860 03346 6)	860 034 46 6)	860 035 46 6)
752 490 44	752 490 44	752 492 44	752 493 44 8)		7)				
752 491 44	752 491 44	752 494 44	752 495 44 8)	752 152 44	860 121 46 5)	860 122 46 5)	860 123 46 5)	860 124 46 5)	860 125 46 5)
752 491 44	752 491 44	752 494 44	752 495 44 8)		860 131 46 6)	860 132 46 6)	860 133 46 6)	860 134 46 6)	860 135 46 6)
752 790 44	752 790 44	752 792 44	752 792 44		7)				
752 790 44	752 790 44	752 792 44	752 792 44	752 154 44	860 221 46 5)	860 222 46 5)	860 223 46 5)	860 224 46 5)	860 225 46 5)
752 791 44	752 791 44	753 794 44	752 794 44		860 231 46 6)	860 232 46 6)	860 233 46 6)	860 234 46 6)	860 235 46 6)
753 290 44	753 290 44	753 293 44	753 293 44		7)				
753 291 44	753 291 44	753 294 44	753 294 44	752 156 44	860 321 46 5)	860 322 46 5)	860 323 46 5)	860 324 46 5)	860 325 46 5)
753 292 44	753 292 44	753 295 44	753 295 44		860 331 46 6)	860 332 46 6)	860 333 46 6)	860 334 46 6)	860 335 46 6)
753 296 46	753 297 44	753 297 44	753 297 44		860 331 46 6)	860 332 46 6)	860 333 46 6)	860 334 46 6)	860 335 46 6)
753 590 44	753 580 44	753 580 44	753 580 44		7)				
753 591 44	753 581 44	753 581 44	753 581 44		7)				
753 591 44	753 581 44	753 581 44	753 581 44	752 950 44	860 421 46 5)	860 422 46 5)	860 423 46 5)	860 424 46 5)	860 425 46 5)
753 592 44	753 582 44	753 582 44	753 582 44	752 156 44	7)				
753 592 44	753 582 44	753 582 44	753 582 44	752 950 44	860 421 46 5)	860 422 46 5)	860 423 46 5)	860 424 46 5)	860 425 46 5)
753 593 44	753 583 44	753 583 44	753 583 44		860 431 46 6)	860 432 46 6)	860 433 46 6)	860 434 46 6)	860 435 46 6)
754 290 44	754 280 44	754 280 44	754 280 44		7)				
754 291 44	754 281 44	754 281 44	754 281 44		7)				
754 292 44	754 282 44	754 282 44	754 282 44	752 952 44	860 521 46 5)	860 522 46 5)	860 523 46 5)	860 524 46 5)	860 525 46 5)
754 293 44	754 283 44	754 283 44	754 283 44		860 531 46 6)	860 532 46 6)	860 533 46 6)	860 534 46 6)	860 535 46 6)
754 590 44	754 580 44	754 580 44	754 580 44		7)				
754 591 44	754 581 44	754 581 44	754 581 44	752 954 44	860 621 46 5)	860 622 46 5)	860 623 46 5)	860 624 46 5)	860 625 46 5)
754 592 44	754 582 44	754 582 44	754 582 44		860 631 46 6)	860 632 46 6)	860 633 46 6)	860 634 46 6)	860 635 46 6)
754 890 44	754 880 44	754 880 44	754 880 44		7)				
754 891 44	754 881 44	754 881 44	754 881 44	752 844 44	8)				
754 892 44	754 882 44	754 882 44	754 882 44		8)				

3) Part no. includes depending on torque bracket type, bolted fastening parts to the gearbox and retaining elements

4) Part no. includes coupling and heavy-duty roll pin

5) Part no. includes connecting shaft G, shims and axial retaining elements, coupling K1

6) Part no. includes splined shaft (2) with retaining elements, connecting shaft G with shims and axial retaining elements, coupling K1

7) Currently not planned

8) Chapter 3.11.1

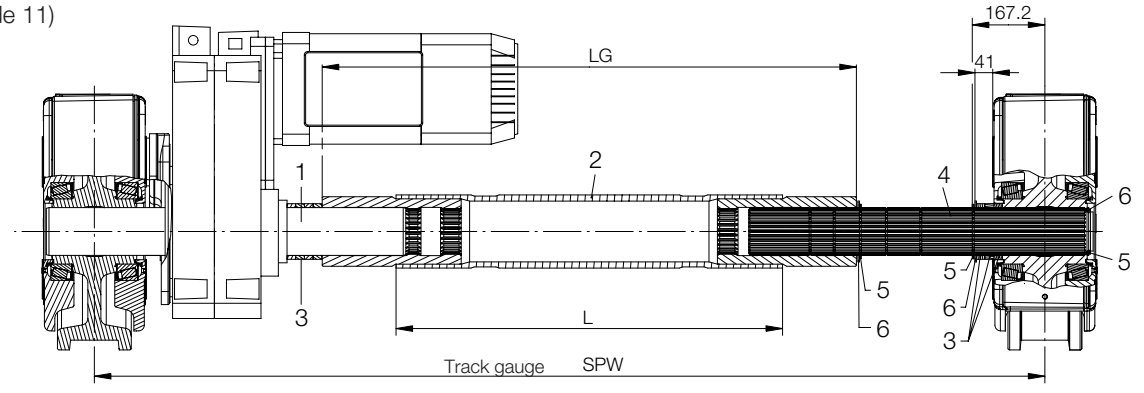
K = Top connection

W = W1 (side connection with drive on wheel block side)
W2 (side connection with drive on connecting plate side)

B = Pin connection

3.11.1 Central drive unit inside arrangement (ZI) DRS 500

with ADE80 offset gearbox
(shaft code 11)



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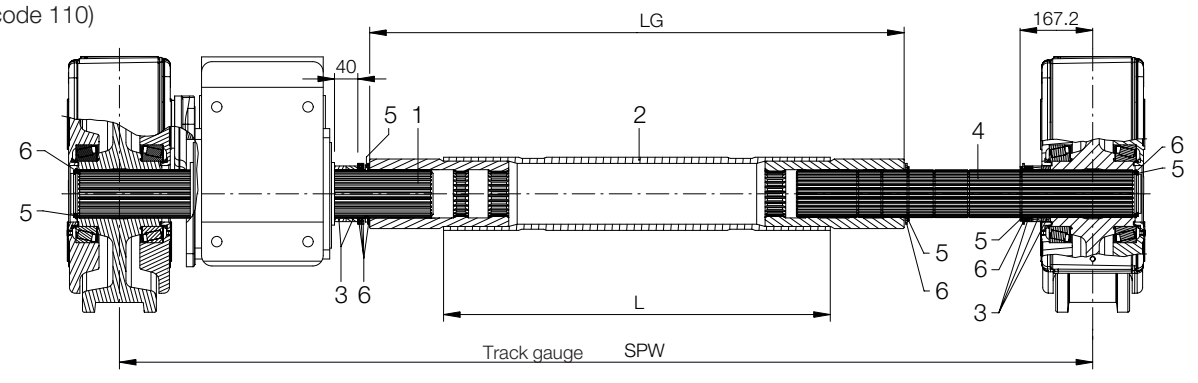
with WUK100 angular gearbox
(shaft code 110)



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Item	Designation
1	Gearbox side journal shaft for ADE80/WUE90 gearbox or hollow shaft for AUK90/WUK100 gearbox
2	Intermediate hollow shaft (tube with K3 couplings welded in)
3	Distance rings
4	MA drive shaft
5	Retaining ring
6	Thrust washer

Track gauge SPW	Gearbox		Set part no.1)	LG	Dimensions (mm)
	Type	Output shaft code			L
2085 to 3150	ADE80	11	860 703 46	L+(2x170)	Spw-1350
	ADE80	22	860 704 46		
	AUK90	110	860 713 46		
	WUE90	11	860 723 46		
	WUE90	22	860 724 46		
	WUK100	110	860 733 46		

1) Consists of intermediate hollow shaft (2), drive shaft (1)(4), distance rings (3) and retaining elements (5/6)

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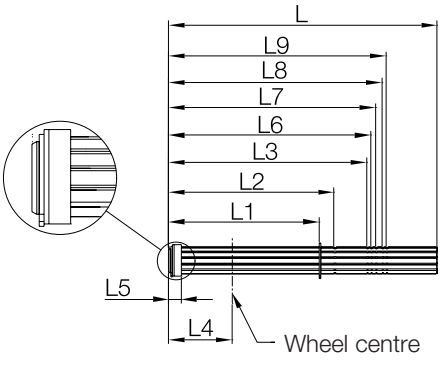
3.12 Splined shaft type A



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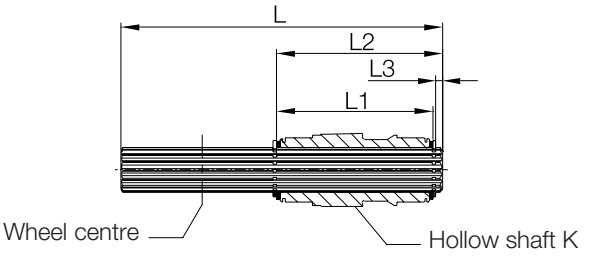
DRS wheel block size	Shaft profile DIN 5480	Gearbox size	Part no.	Dimensions in mm									
				L	L1	L2	L3	L4	L5	L6	L7	L8	L9
112	W30	AMK20	860 090 46	308	205	216	226	33	15	–			
		WUK20	860 095 46	348	259	269	279	33	15				
125	W35	AMK30	860 190 46	332	224	234	244	31,4	15				
		WUK30	860 195 46	382	285	295	305	31,4	15				
160	W45	AMK40	860 290 46	379	258	271	283	34,5	17,5				
		WUK40	860 295 46	444	333	346	356	34,5	17,5				
200	W50	ADK50 WUK50/60	860 390 46	501	281	309	370	36	17,5	377	386	398	405
250	W65	ADK60	860 490 46	488,5	356	393	–	70	10,5	–			
		WUK70	860 495 46	578	464	500	–	70	10,5				
315	W75	ADK70	860 590 46	587	445	489	–	86,5	13				
		WUK80	860 595 46	682	509	553	–	86,5	13				
400	W90	ADK80	860 690 46	675	518	565	–	99,5	13,5				
		WUK90	860 695 46	749	581	625	–	99,5	13,5				
500	W110	ADK90	860 790 46	793	594	646,5	–	111	13,5				
		WUK100	860 795 46	750	685	737	–	111	13,5				

3.13 Splined shaft type DFW

DFW shafts can only be used with certain motor/gearbox combinations.
Please check with the manufacturer before using these shafts.



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DRS wheel block size	Shaft profile DIN 5480	Gearbox size	Part no.	Dimensions in mm			
				L	L1	L2	L3
112	W30	AMK 20	752 031 44	225	102	107,5	3,5
125	W35	AMK 30	752 033 44	250	121	129	5
160	W45	AMK 40	752 035 44	305	139,5	147	
200	W50	ADK 50	752 03744	327	164,5	172,5	
250	W65	ADK 60	752 831 44	433	194,5	204	6
315	W75	ADK 70	752 833 44 1)	512	240,5	254	
400	W90	ADK 80	752 835 44 1)		274	288,5	

 1) Delivery period on request

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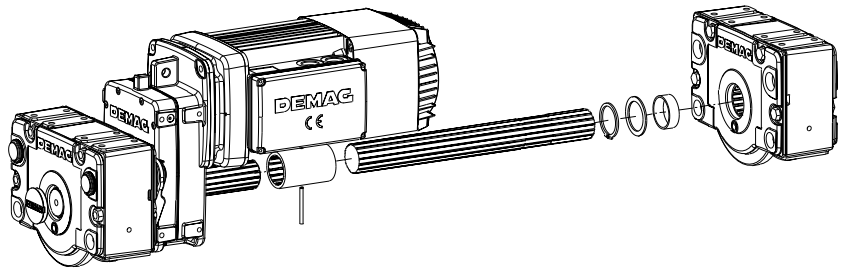
3.14 Connecting shaft type G



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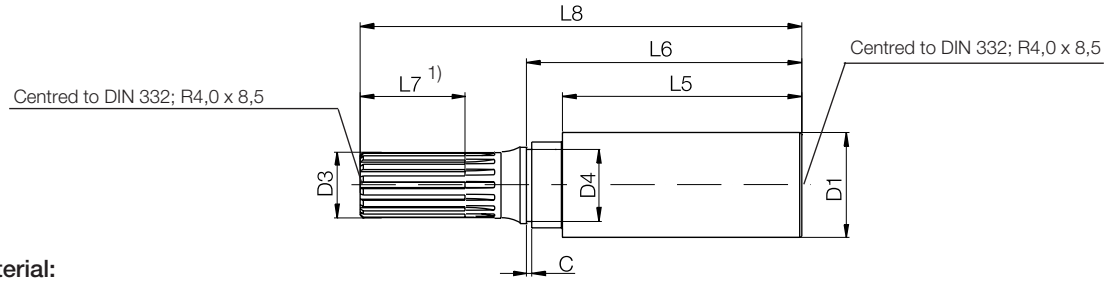
DRS wheel block size	Shaft profile	Gearbox size	Track gauge in mm	A offset gearbox				W angular gearbox			
				Part no.	Dimensions in mm			Part no.	Dimensions in mm		
					L	L1	L2		L	L1	L2
112	W30	A 10/20 W 10/20	1000	752 060 44	740	48	100	752 040 44	700	48	100
			1400	752 062 44	1140			752 042 44	1100		
			2240	752 064 44	1980			752 044 44	1940		
			2800	752 066 44	2540			752 046 44	2500		
			3150	752 068 44	2890			752 048 44	2850		
125	W35	A 20/30 W 20/30	1000	752 070 44	715	48	98	752 120 44	665	48	98
			1400	752 072 44	1115			752 122 44	1065		
			2240	752 074 44	1955			752 124 44	1905		
			2800	752 076 44	2515			752 126 44	2465		
			3150	752 078 44	2865			752 128 44	2815		
160	W45	A 30/40 W 30/40	1000	752 080 44	670	106	–	752 160 44	605	106	–
			1400	752 082 44	1070			752 162 44	1005		
			2240	752 084 44	1910			752 164 44	1845		
			2800	752 086 44	2470			752 166 44	2405		
			3150	752 088 44	2820			752 168 44	2755		
200	W50	A 40/50 [1] W 40/50/60[1]	1000	752 090 44	630	122	–	752 170 44	550	122	–
			1400	752 092 44	1030			752 172 44	950		
			2240	752 094 44	1870			752 174 44	1790		
			2800	752 096 44	2430			752 176 44	2350		
			3150	752 098 44	2780			752 178 44	2700		
250	W65	A 50/60 W 50/60/70	1000	752 860 44	582	98	167	752 970 44	490	98	167
			1400	752 862 44	982			752 972 44	890		
			2240	752 864 44	1822			752 974 44	1730		
			2800	752 866 44	2382			752 976 44	2290		
			3150	752 868 44	2732			752 978 44	2640		
315	W75	A 60/70 W 70/80	1000	752 870 44	500	116	196	752 960 44	395	116	196
			1400	752 872 44	900			752 962 44	795		
			2240	752 874 44	1740			752 964 44	1635		
			2800	752 876 44	2300			752 966 44	2195		
			3150	752 878 44	2650			752 968 44	2545		
400	W90	A 70/80 W 80/90	1000	752 880 44	400	102,5	171	752 940 44	330	129	249
			1400	752 882 44	800			752 942 44	730		
			2240	752 884 44	1640			752 944 44	1570		
			2800	752 886 44	2200			752 946 44	2130		
			3150	752 888 44	2550			752 948 44	2480		
500	–	–	–	–	–	–	–	–	–	–	–

1) For standard central drive arrangement the shafts for the angular gearbox have to be used here.

3.15 Universal shaft F

DRS 112 – 200



Material:
S 355 J2 G3
to DIN/EN 10025

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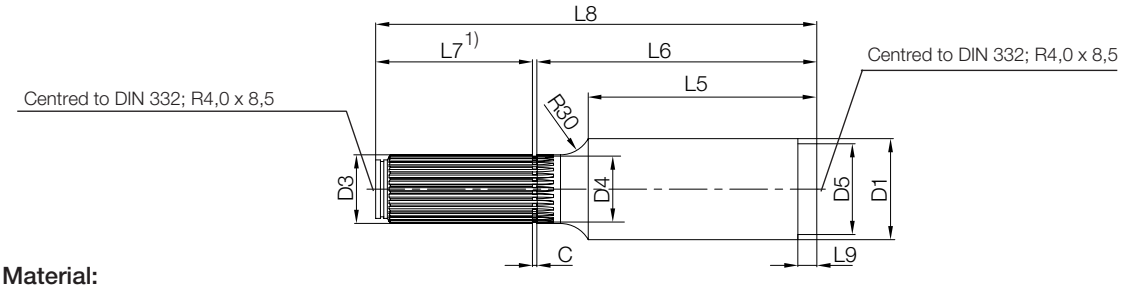
DRS wheel block size	Splined hub profile DIN 5480 D3	Part no.	Material	Dimensions in mm						
				D1 f8	D4 h12	C H13	L5	L6	L7	L8
112	W30x1,25x22x6g	**753 824 44**	S355J2G3	45	32,5	2,65	95	112	55	196
125	W35x2x16x6g	**752 424 44**		55	37,5	2,65	125	144	55	231
160	W45x2x21x6g	**752 724 44**		65	47	3,15	160	181,5	55	273
200	W50x2x24x6g	**753 224 44**		75	57	3,15	220	241,5	75	358

DRS 250 – 500



Material:
S 355 J2 G3
to DIN/EN 10025

41756646.eps

DRS wheel block size	Splined hub profile DIN 5480 D3	Part no.	Material	Dimensions in mm								
				D1 h8	D4 h12	D5	C H13	L5	L6	L7	L8	L9
250	W65x2x31x6g	**753 524 44**	S355J2G3	95	61,5	95	4,15	215	263,4	147,5	415	0
315	W75x3x24x6g	**754 224 44**		110	74,6	110		260	311,9	180	496	0
400	W90x3x28x6g	**754 524 44**		135	86,5	120,3		300	355,4	205,5	565	25
500	W110x3x35x6g	**754 824 44**		165	105	120,3		380	441,4	234,5	680	25

1) Useful spline length

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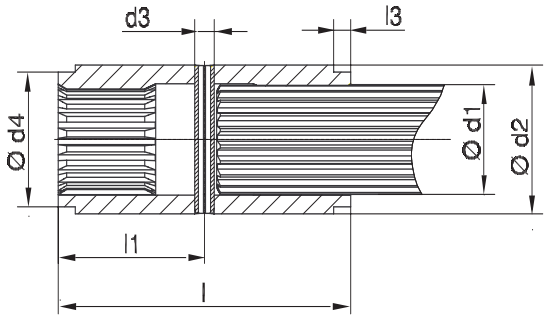
3.16 Coupling K1 DRS 112 – 400



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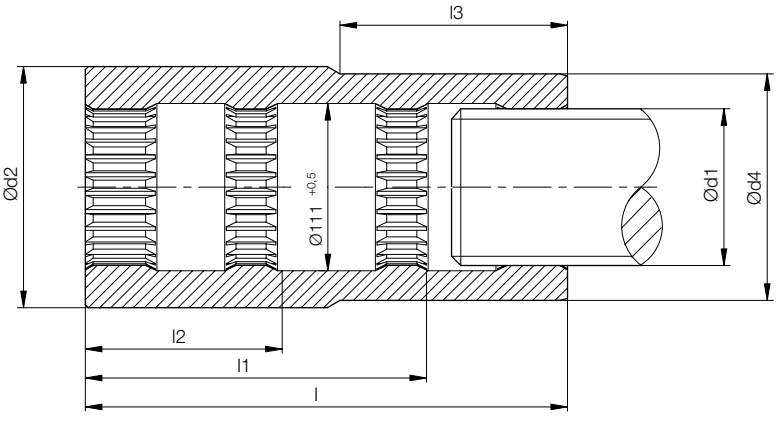
DRS wheel block size	Gearbox size A../W..	Splined hub profile DIN 5480 D	Dimensions in mm							Weight kg	Part no. 1)
			d1 H11	d2	d3 H13	d4	l	l1	l3		
112	**10/20**	N 30	29,75	40,3 h11	8	34	80	40	7	0,31	752 150 44
125	**20/30**	N 35	34,6	48 h11	8	43,2	100	50	7	0,81	752 152 44
160	**30/40**	N 45	44,6	60 h8	8	54,7	120	60	7	1,32	752 154 44
200	**40/50/60**	N 50	49,6	65 h11	8	59,4	125	62,5	7	1,7	752 156 44
250	**50/60/70**	N 65	64,6	80 h9	8	–	125	62,5	–	1,8	752 950 44
315	**60/70/80**	N 75	74,6	95 h11	8	–	145	72,5	–	3,4	752 952 44
400	**70/80/90**	N 90	89,6	115 h11	8	–	170	85	–	5,9	752 954 44

Coupling K3 DRS 500



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DRS wheel block size	Gearbox size A../W..	Splined hub profile DIN 5480 D	Dimensions in mm							Weight kg	Part no.
			d1 H11	d2	d4	l	l1	l2 2)	l3		
500	**90/100**	N110	109,4	160	150,3d9	320	227,5	127,5	151	27	752 844 44

1) Part no. includes: coupling K1 and heavy-duty roll pin
2) Min. fitting depth for shaft

3.17 Universal shaft F

Calculation

Force on the universal shaft

Pin connection

Side connection

Top connection

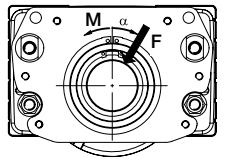

Fig. 1

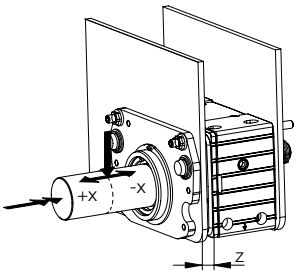

Fig. 2

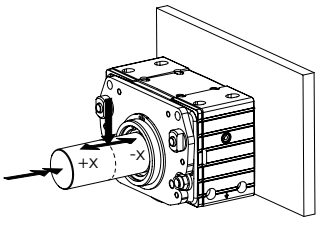

Fig. 3

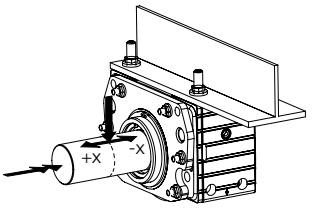

Fig. 4

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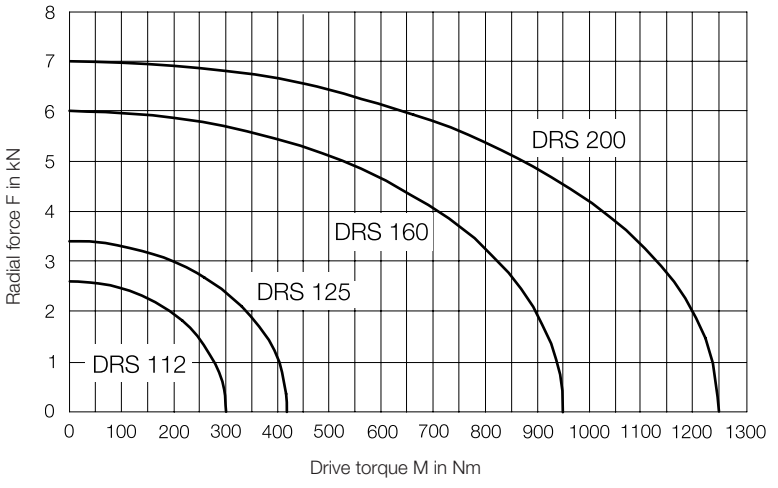
Force-torque diagram for DRS 112 – 200 universal shaft



Force-torque diagram for DRS 250 – 500 universal shaft

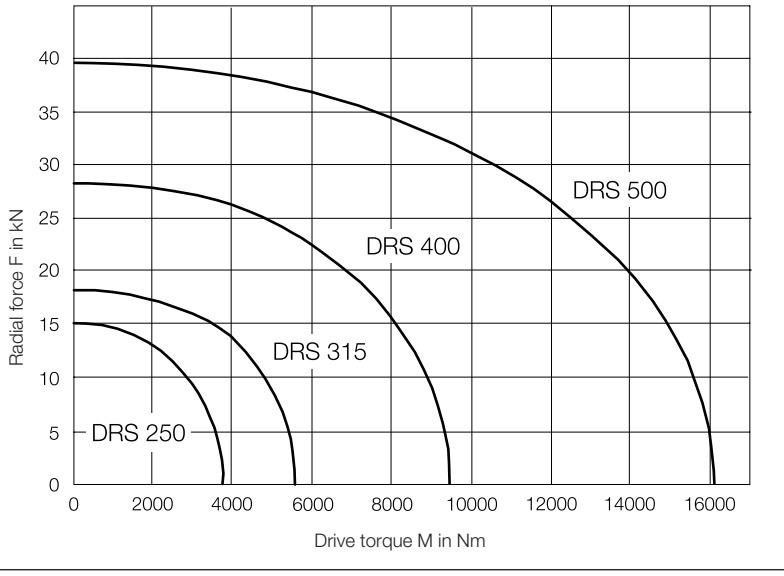


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Table 1

DRS	H_F	H_{DRS}	Factor K with x = 0 mm z = 0 mm
112	54,5	58	0,940
125	63,5	59	1,076
160	86	66	1,303
200	119	76	1,566
250	162,5	75	2,167
315	190	90	2,112
400	211	105	2,009
500	259	120	2,158

Table 2

Permissible distance between DRS wall and bearing plate rear side (see pin connection fig. 2)

DRS	z in mm
112	24 ≥ z ≥ 0
125	26 ≥ z ≥ 0
160	28 ≥ z ≥ 0
200	38 ≥ z ≥ 0

Calculate the permissible universal shaft force (only applies for reduction at x > 0 mm, otherwise direct $F_{(M)}$ from diagram)

$$F_{perm.}(DRS, x) = F(M) \cdot \frac{H_F}{H_F + x}$$

$F_{perm.}$ (DRS,x) = Permissible force in N on the DRS universal shaft depending on the wheel block size and variable x

F (M) = Universal shaft force in N according to the diagram

H_F = Constant depending on the wheel block size

x = Variable when force F is displaced from the centre of the universal shaft shoulder (see fig. 2 – 4)

Calculate the permissible remaining load capacity of the wheel block Factor K (DRS, x, z) is given in table 1 (values for x = 0 mm and z = 0 mm)

$$F_{perm.}(DRS, x, z) = F(M) \cdot \frac{H_F + x}{H_{DRS} + z}$$

K (DRS,x,z) = Factor for the force ratios on the universal shaft of the DRS depending on the wheel block size and variables x and z (see table 1)

H_F = Constant depending on the wheel block size

x = Variable for displacement of force F from the centre of the universal shaft shoulder (see fig. 2 – 4)

z = Variable for additional distance between bearing plate and wheel block, e. g. for pin connection (see fig. 2 – 4)

$$R_{perm.}(DRS, x, z) = R_{perm.\,(catalogue)} - \frac{F \cdot K(DRS, x, z) \cdot \cos(0{,}8 \cdot \alpha)}{9{,}81}$$

$R_{perm.}$ (DRS,x,z) = Permissible residual load capacity of the wheel block for universal shaft application in kg

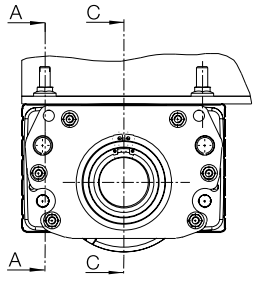
$R_{perm.\,(catalogue)}$ = Permissible load capacity of the wheel block in kg according to the catalogue (without universal shaft)

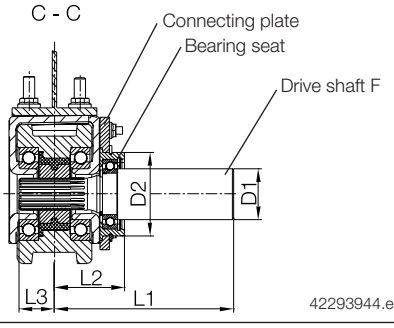
K (DRS,x,z) = Factor for the force ratios on the universal shaft of the DRS depending on the wheel block size and variables x and z

α = Angle deviation of the universal shaft force [$0° \leq \alpha \leq 90°$] (see fig. 1)

Universal shaft F dimensions for DRS 112 – 200

Top connection K (basic wheel block type A)





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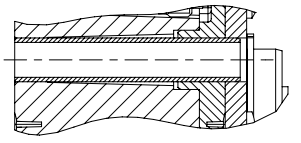

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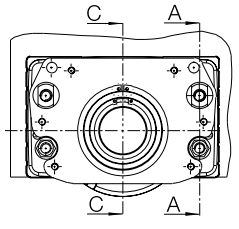
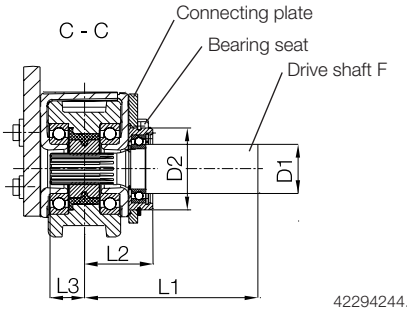
Section A-A

Connecting plate centred using roll pins.

Side connection W (basic wheel block type MA)





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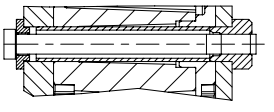

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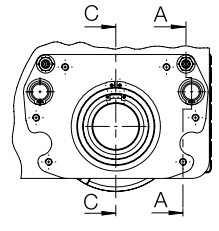
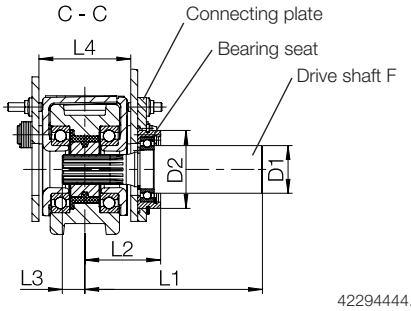
Section A-A

Connecting plate centred using adapter nut.

Pin connection B (basic wheel block type MA)





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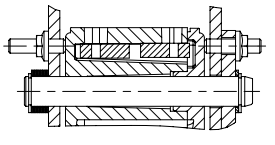

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Section A-A

Connecting plate centred using pins.

DRS wheel block size	Shaft profile DIN 5480	Connection variant	Part no. [2]	Dimensions in mm					
				D1 f8	D2	L1	L2	L3	L4 max.
112	W 30	K	753 820 44	45	90	160	72	36	–
		W	753 821 44						
		B [1]	753 822 44			178	88	18	127
125	W 35	K	752 420 44	55		193	76	38	–
		W	752 421 44						
		B [1]	752 422 44			209	92	22	130
160	W 45	K	752 720 44	65	120	235	85	38	–
		W	752 721 44						
		B [1]	752 722 44			254	104	20	148
200	W 50	K	753 220 44 [3]	75		305	95	53	–
		W	753 221 44						
		B [1]	753 222 44			331	121	27	182

1) Dimensions L1, L2 and L3 vary depending on dimension L4
2) Part no. includes drive shaft, connecting plate, bearing sleeve with corresponding mounting parts
3) Specify A40 offset gearbox for wheel block type code

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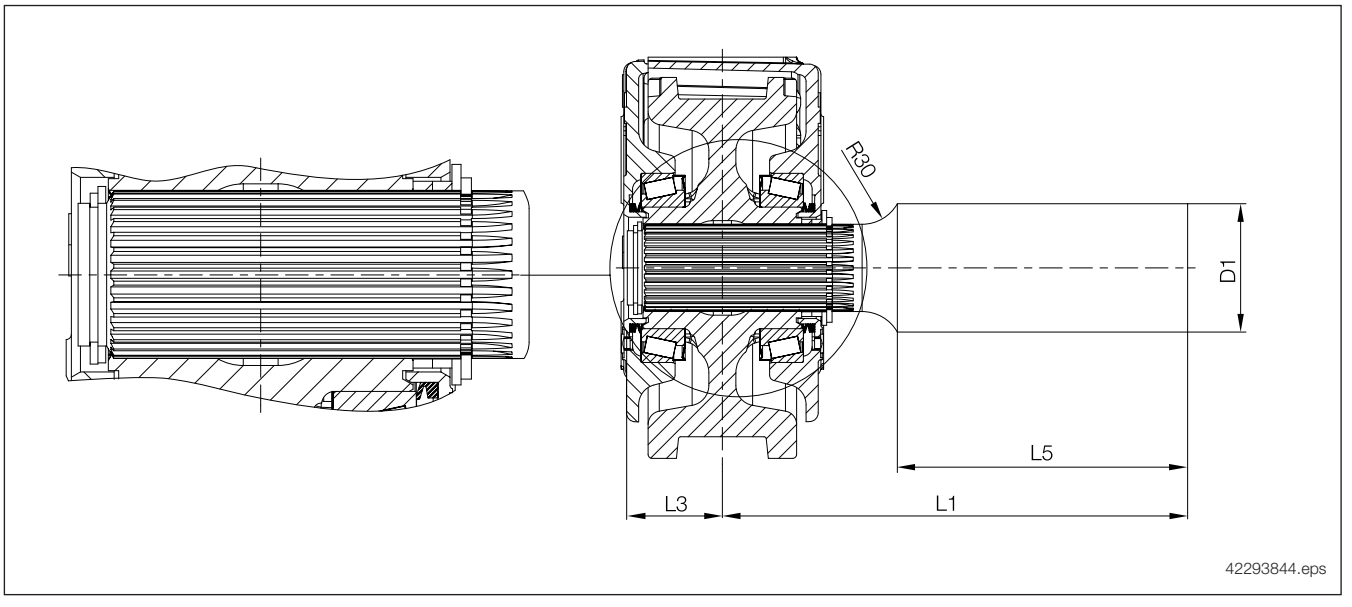
Universal shaft F dimensions for DRS 250 – 500

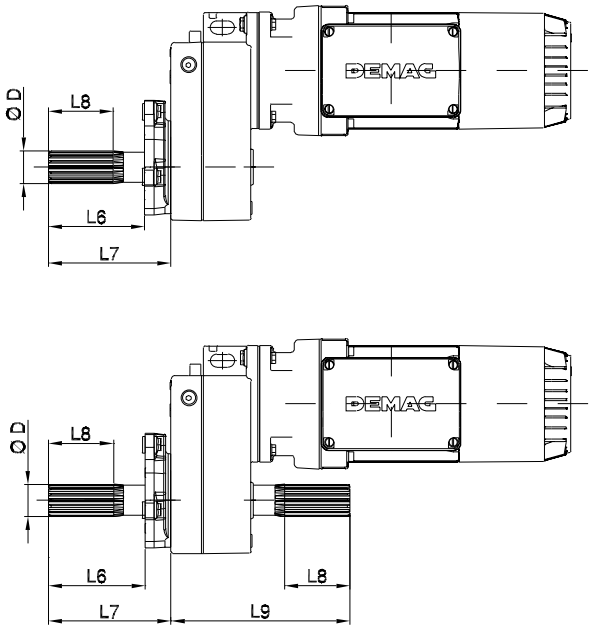


DRS wheel block size	Shaft profile DIN 5480 D1	Connecting variant	Part no.	Dimensions in mm			
				D1 f8	L1	L3	L5
250	W 65	K, W, B	753 524 44	95	345	70	215
315	W 75		754 224 44	110	410	86	260
400	W 90		754 524 44	135	466	99	300
500	W 110		754 824 44	165	569	111	380

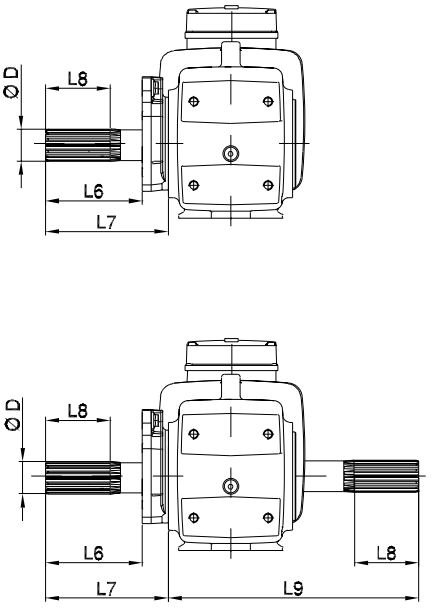
3.18 Involute solid shaft for DRS 112 – 200

Journal shaft

A offset gearbox



W angular gearbox



Splined shaft see page 82

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DRS	Individual drive unit	Splined shaft profile	DRS connection variant						
			K / W1	B / W2	K / W1	B / W2	K / W1	B / W2	K / W1 B / W2
wheel block	Gearbox	DIN 5480	Dimensions in mm						
size	size	D	L6		L7		L8		L9
112	AME 10	W 30x1,25x22 6g	93	93	123	123	70	70	196,5
	WUE 10	W 30x1,25x22 6g	93	93	123	123	70	70	237,5
125	AME 10	W 30x1,25x22 6g	88	100	123	135	70	80	—
	AME 20	W 35x2x16 6g	93	93	130	130	70	70	215
	WUE 10	W 30x1,25x22 6g	88	100	123	135	70	80	—
	WUE 20	W 35x2x16 6g	95	95	130	130	70	70	265
160	AME 20	W 35x2x16 6g	85	125	130	160	70	90	—
	AME 30	W 45x2x21 6g	106	106	151	151	85	85	244
	WUE 20	W 35x2x16 6g	85	125	130	160	70	90	—
	WUE 30	W 45x2x21 6g	85	85	151	151	85	85	305
200	AME 30	W 45x2x21 6g	106	135	151	180	85	100	—
	AME 40	W 50x2x24 6g	125	125	170	170	120	120	278
	WUE 30	W 45x2x21 6g	106	135	151	180	85	100	—
	WUE 40	W 50x2x24 6g	125	125	170	170	120	120	353

See model code in geared travel motors 203 355 44, volume 2 for shaft code and design overview

K = Top connection

W = W1 (side connection with drive on wheel block side)
W2 (side connection with drive on connecting plate side)

B = Pin connection
Standard, using welded plate, end connection, DFW

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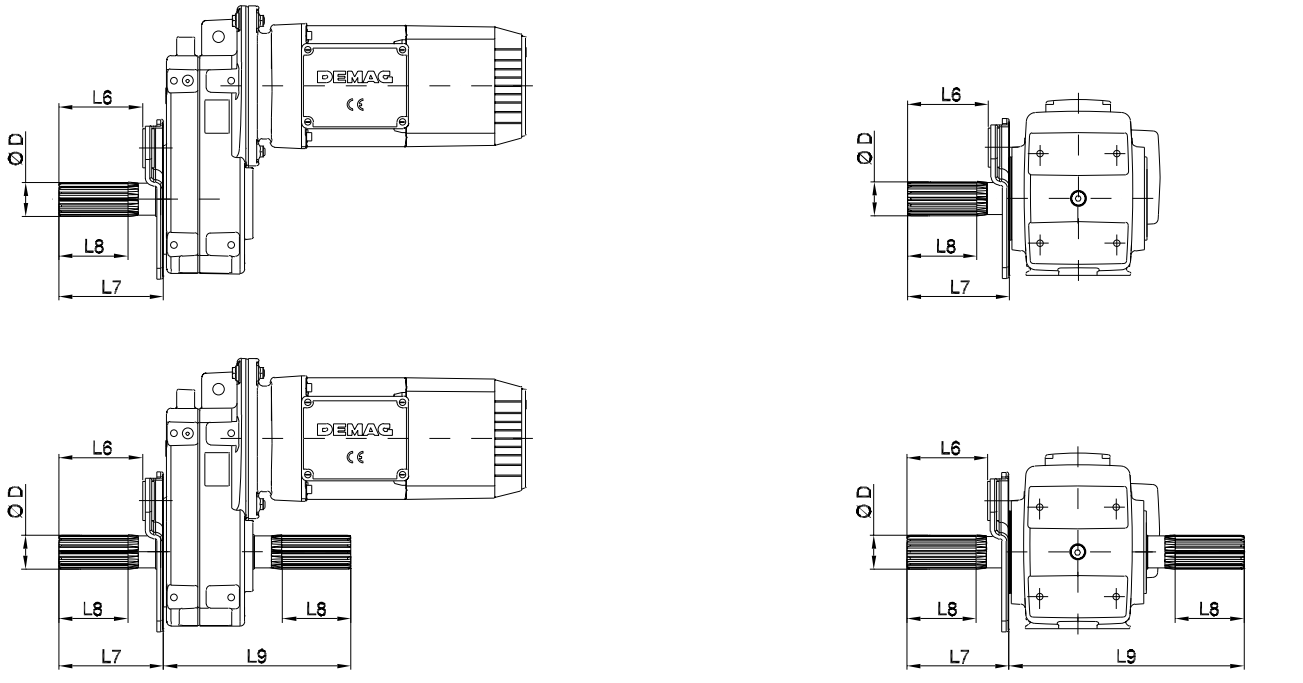
3.18 Involute solid shaft for DRS 250 – 500

Journal shaft

A offset gearbox

W angular gearbox



Splined shaft see page 82

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DRS wheel block size	Individual drive unit Gearbox size	Splined shaft profile DIN 5480 D	DRS connection variant K / W1	B / W2	K / W1	B / W2	K / W1	B / W2	K / W1	B / W2
			Dimensions in mm							
			L6		L7		L8		L9	
250	ADE 40	W 50x2x24 6g	144	166	177	199	130	150	—	—
	ADE 50	W 65x2x31 6g	144	181	177	214	138	174	312	347
	WUE 40	W 50x2x24 6g	147	147	180	180	130	130	—	—
	WUE 50	W 65x2x31 6g	140	181	173	214	128	174	381	422
	WUE 60	W 65x2x31 6g	137	181	170	214	125	174	401	445
315	ADE 50	W 65x2x31 6g	174	174	214	214	185	185	—	—
	ADE 60	W 75x3x24 6g	174	210	214	250	170	205	375	411
	WUE 50	W 65x2x31 6g	181	181	214	214	174	174	—	—
	WUE 60	W 65x2x31 6g	181	181	214	214	174	174	—	—
	WUE 70	W 75x3x24 6g	174	210	214	250	170	206	484	520
400	ADE 60	W 75x3x24 6g	201	201	250	250	205	205	—	—
	ADE 70	W 90x3x28 6g	203	237	252	286	200	245	462	496
	WUE 70	W 75x3x24 6g	201	201	250	250	206	206	—	—
	WUE 80	W 90x3,0x28 6g	203	237	252	286	200	230	527	564
500	ADE 70	W 90x3,0x28 6g	232	232	286	286	200	230	—	—
	ADE 80	W 110x3,0x35 6g	231	271	285	325	220	260	—	—
	WUE 80	W 90x3,0x28 6g	232	232	286	286	200	230	—	—
	WUE 90	W 110x3,0x35 6g	231	271	285	325	220	260	—	—

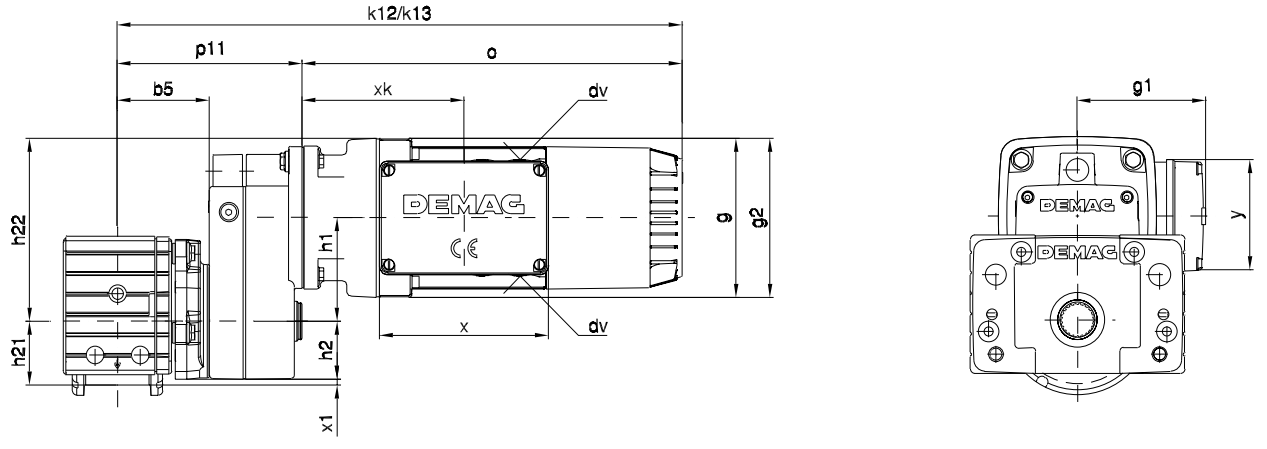
See model code in geared travel motors catalogue 203 150 44 for shaft code and design overview

K = Top connection W = W1 (side connection with drive on wheel block side) B = Pin connection

W2 (side connection with drive on connecting plate side) Standard, using welded plate, end connection, DFW

3.19 DRS 112 – 200 wheel block with offset gearbox and ZBF/ZBA motor

A 10 - A 40 2 and 3-stage direct input



For travel wheel types E, C and F see section 3.1

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DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12 2-stage DD	k13 3-stage TD	p11	b5	o	g	g1	g2	h1	h2	h21	h22	x	xk	x1	y	dv
112	AME 10	63A/71A	63A/B/71A/B	501	–	165	81	336	140	124	140	91,5	51	56	161,5	153	142	+5	103	4 x M20
		80A	80A/B/90A	557	–			392	157	134	157				170		155			4 x M25
	AMK 20	63A/71A	63A/B/71A/B	512		176	81	336	140	124	140	104	57,5	56	174		142	–2 (+5)		4 x M20
		80A	80A/B/90A	568				392	157	134	157				182,5		155			4 x M25
		90B/100A	90B/100A/B	612	–			436	196	152	196				202	179	167		133	2 x M25 2 x M32
125	AME 10	63A/71A	63A/B/71A/B	507	–	171	87	336	140	124	140	91,5	51	62,5	161,5	153	142	+12	103	4 x M20
		80A	80A/B/90A	563	–			392	157	134	157				170		155			4 x M25
	AME 20	63A/71A	63A/B/71A/B	518		182	87	336	140	124	140	104	57,5	62,5	174		142			4 x M20
		80A	80A/B/90A	574				392	157	134	157				182,5		155	+5		4 x M25
		90B/100A	90B/100A/B	618	–			436	196	152	196				202	168	167			2 x M25 2 x M32
	AMK 30	63A/71A	63A/B/71A/B	527		191	88	336	140	124	160	129	75	62,5	209	153	142	–13		4 x M20
		80A	80/90A	583				392	157	134	157				207,5		155			4 x M25
		90B/100A	90B/100A/B	627				436	196	152	196				227	168	167		133	2 x M25 2 x M32
		112A	112A	769	–			578	260	185	260				259	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
160	AME 20	63A/71A	63A/B/71A/B	534		198	103	336	140	124	140	104	57,5	80	174	153	142	+23	103	4 x M20
		80A	80A/B/90A	590				392	157	134	157				182,5		155			4 x M25
		90B/100A	90B/100A/B	634	–			436	196	152	196				202	168	167			2 x M25 2 x M32
	AME 30	63A/71A	63A/B/71A/B	543		207	104	336	140	124	160	129	75	80	209	153	142	+5		4 x M20
		80A	80A/B/90A	599				392	157	134	157				207,5		155			4 x M25
		90B/100A	90B/100A/B	643				436	196	152	196				227	168	167		133	2 x M25 2 x M32
		112A	112A	785	–			578	260	185	260				259	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
	AMK 40	63A/71A	63A/B/71A/B	552		216	104	336	140	124	160	148	90	80	228	153	142	–10 (+5)	103	4 x M20
		80A	80A/B/90A	608				392	157	134	157				226,5		155			4 x M25
		90B/100A	90B/100A/B	652				436	196	152	196				246	168	167		133	2 x M25 2 x M32
		112A	112A	794	–			578	260	185	260				278	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	

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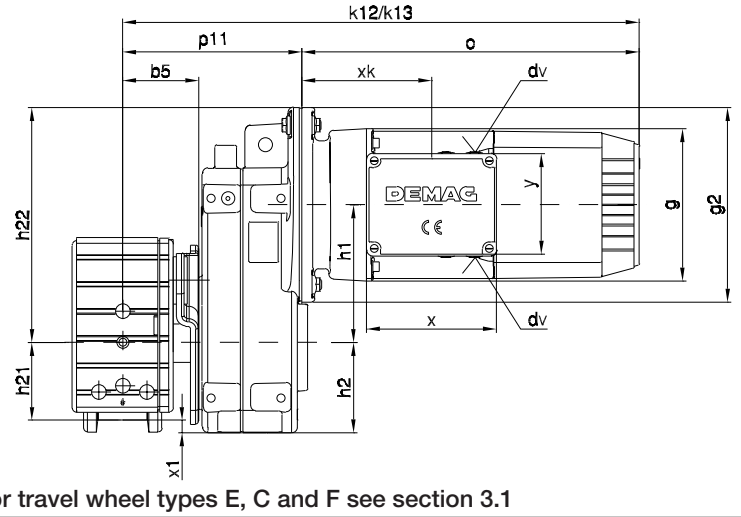
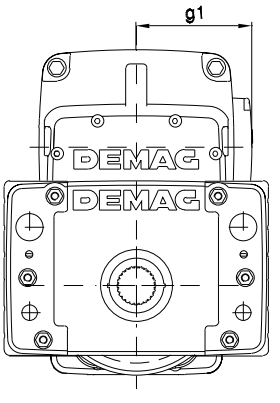
3.19 DRS 112 – 200 wheel block with offset gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12 2-stage DD	k13 3-stage TD	p11	b5	o	g	g1	g2	h1	h2	h21	h22	x	xk	x1	y	dv
200	AME 30	63A/71A	63A/B/71A/B	553		217	114	336	140	124	160	129	75	100	209	153	142	+25	103	4 x M20
		80A	80A/B/90A	609				392	157	134	157				207,5		155			4 x M25
		90B/100A	90B/100A/B	653				436	196	152	196				227	167	167		133	2 x M25 2 x M32
		112A	112A	795	–			578	260	185	260				259	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
	AME 40	63A/71A	63A/B/71A/B	562		226	114	336	140	124	140	148	90	100	218	153	142	+10 (+15)	103	4 x M20
		80A	80A/B/90A	618				392	157	134	157				226,5		155			4 x M25
		90B/100A	90B/100A/B	662				436	196	152	196				246	167	167		133	2 x M25 2 x M32
		112A	112A	804				578	260	185	260				278	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	

A 50 2 and 3-stage direct input



System end shield



For travel wheel types E, C and F see section 3.1

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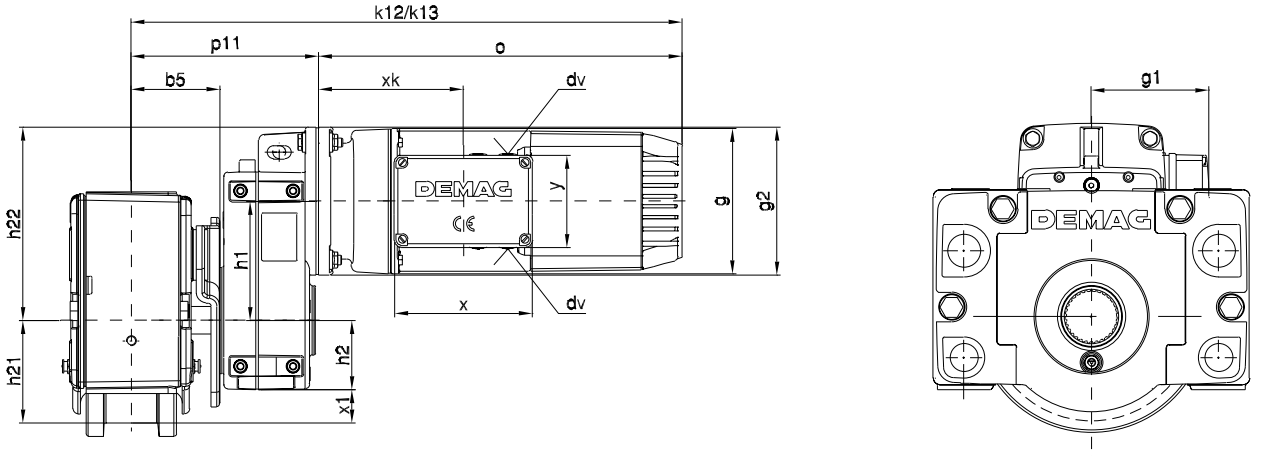
DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12 2-stage DD	k13 3-stage TD	p11	b5	o	g	g1	g2	h1	h2	h21	h22	x	xk	x1	y	dv
200	ADK 50	80A	80A/B/90A	622		230	98	392	157	134	250	178	115	100	303	153	155	-15 (+15)	103	4 x M25
		90B/100A	90B/100A/B	666				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	808				578	260	185	260				308	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	917				687	314	269	276				335		236			

(...) Torque bracket obstacle edge

3.20 DRS 250 – 500 wheel block with offset gearbox and ZBF/ZBA motor

A 40 - A 90 2 and 3-stage direct input



For travel wheel types E, C and F see section 3.2

42096644.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12 2-stage DD	k13 3-stage TD	p11	b5	o	g	g1	g2	h1	h2	h21	h22	x	xk	x1	y	dv
250	ADE 40	63A/71A	63A/B/71A/B	556		220	108	336	140	124	160	148	90	125	218	153	142	+35 (+20)	103	4 x M20
		80A	80A/B/90A	612				392	157	134	157				226,5		155			4 x M25
		90B/100A	90B/100A/B	656				436	196	152	196				246	168	167		133	2 x M25 2 x M32
		112A	112A	798				578	260	185	260				278	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
	ADE 50	80A	80A/B/90A	632		240	108	392	157	134	250	178	115	125	303	153	155	+10 (+20)	103	4 x M25
		90B/100A	90B/100A/B	676				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	818				578	260	185	260				308	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	927				687	314	269	276				335		236			
	ADK 60	80A	80A/B/90A	656		265	108	392	157	134	250	218	140	125	343	153	155	–15 (+20)	103	4 x M25
		90B/100A	90B/100A/B	700				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	842				578	260	185	260				348	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	953				687	314	269	276				375		236			
315	ADE 50	80A	80A/B/90A	654		262	130	392	157	134	250	178	115	157,5	303	153	155	+43 (+29)	103	4 x M25
		90B/100A	90B/100A/B	698				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	840				578	260	185	260				308	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	949				687	314	269	276				335		236			
	ADE 60	80A	80A/B/90A	679		287	130	392	157	134	250	218	140	157,5	343	153	155	+12 (+17)	103	4 x M25
		90B/100A	90B/100A/B	723				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	865				578	260	185	260				348	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	974				687	314	269	276				375		236			

(...) Torque bracket obstacle edge

2033523b.p65/010407

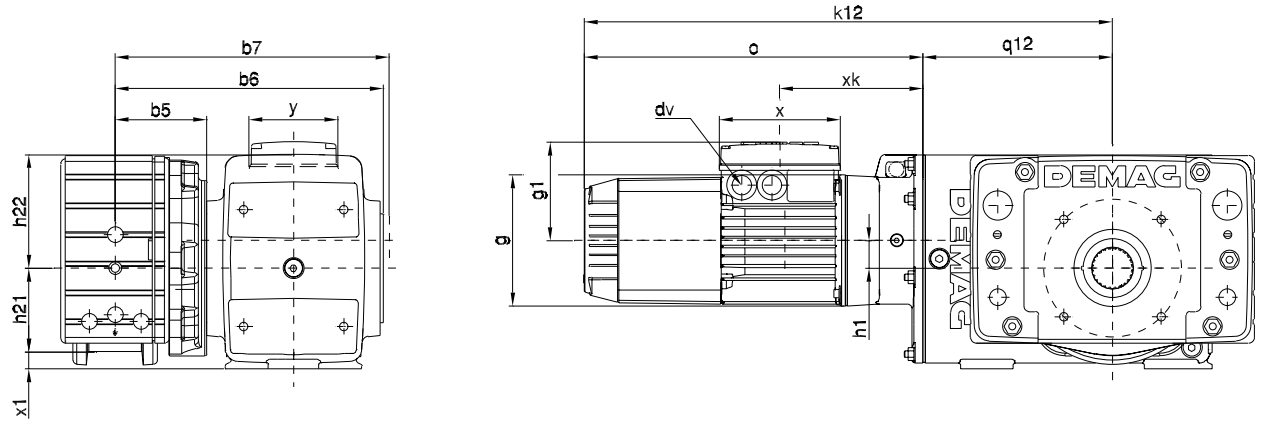
3.20 DRS 250 – 500 wheel block with offset gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12 2-stage DD	k13 3-stage TD	p11	b5	o	g	g1	g2	h1	h2	h21	h22	x	xk	x1	y	dv
315	ADK 70	80A	80A/B/90A	724		322,5	130	401	157	134	205	272	165	157,5	374,5	153	164	–8 (+29)	103	4 x M25
		90B/100A	90B/100A	768				445	196	152						168	176		133	2 x M25 2 x M32
		112A	112A	910				587	260	185	240				402	273	231		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1019				696	314	269	276				429		245			
400	ADE 60	80A	80A/B/90A	703		311	154	392	157	134	250	218	140	200	343	153	155	+60 (+55)	103	4 x M25
		90B/100A	90B/100A	747				436	196	152						168	167		133	2 x M25 2 x M32
		112A	112A	889				578	260	185	260				348	273	222		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	998				687	314	269	276				375		236			
	ADE 70	80A	80A/B/90A	748		346,5	154	401	157	134	205	272	165	200	374,5	153	164	+35 (+55)	103	4 x M25
		90B/100A	90B/100A	792				445	196	152						168	176		133	2 x M25 2 x M32
		112A	112A	934				587	260	185	240				402	273	231		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1043				696	314	269	276				429		245			
	ADK 80	80A	80A/B/90A	769		373	154	396	157	134	240	328	201	200	448	153	159	–1 (+55)	103	4 x M25
		90B/100A	90B/100A	813				440	196	152						168	171		133	2 x M25 2 x M32
		112A	112A	955				582	260	185	260				458	273	226		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1064				691	314	269	276				485		240			
		–	180B/200A/B	1191				818	394	311	347				525		249			
		–	225A/B	1238				865	440	332	373				548		259			
500	ADE 70	80A	80A/B/90A	768		366,5	174	401	157	134	205	272	165	250	374,5	153	164	+85 (+82)	103	4 x M25
		90B/100A	90B/100A	812				445	196	152						168	176		133	2 x M25 2 x M32
		112A	112A	954				587	260	185	240				402	273	231		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1063				696	314	269	276				429		245			
	ADE 80	80A	80A/B/90A	789		393	174	396	157	134	240	328	201	250	448	153	159	+49 (+82)	103	4 x M25
		90B/100A	90B/100A	833				440	196	152						168	171		133	2 x M25 2 x M32
		112A	112A	975				582	260	185	260				458	273	226		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1084				691	314	269	276				485		240			
		–	180B/200A/B	1211				818	394	311	347				525		249			
		–	225A/B	1258				865	440	332	373				548		259			
	AUK 90	90B/100A	90B/100A	856		419	174	437	196	152	280	395	240	250	535	168	168	+10 (+82)	133	2 x M25 2 x M32
		112A	112A	998				579	260	185						273	223		173	2 x M40 2 x M50
		132A/B	132A/B/C																	
		–	160A/B/180A	1107				688	314	269	276				552		237			
		–	180B/200A/B	1234				815	394	311	347				592		246			
		–	225A/B	1281				862	440	332	373				615		256			

(...) Torque bracket obstacle edge

3.21 DRS 112 – 200 wheel block with angular gearbox and ZBF/ZBA motor

W 10 - W 50 2-stage direct input



For travel wheel types E, C and F see section 3.1

41673844.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
112	WU. 10	63A/71A	63A/B/71A/B	489	138	81	198	207	351	140	124	21,3	56	101	153	157	–9 (–18)	103	4 x M20
		80A	80A/B/90A	545				215	407	157	134					170			4 x M25
	WU. 20	63A/71A	63A/B/71A/B	505	153,5	81	218	216	351	140	124	24,5	56	110		157	–24		4 x M20
		80A	80A/B/90A	561				225	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	606				244	452	196	152			123	168	183		133	2 x M25 2 x M32
125	WU. 10	63A/71A	63A/B/71A/B	489	138	87	204	215	351	140	124	21,3	62,5	101	153	157	-3 (–13)	103	4 x M20
		80A	80A/B/90A	545				223	407	157	134					170			4 x M25
	WU. 20	63A/71A	63A/B/71A/B	505	153,5	87	224	224	351	140	124	24,5	62,5	110		157	–18		4 x M20
		80A	80A/B/90A	561				233	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	606				252	452	196	152			123	168	183		133	2 x M25 2 x M32
	WU. 30	63A/71A	63A/B/71A/B	525	174	88	245	234	351	140	124	27,5	62,5	104	153	157	–28	103	4 x M20
		80A	80A/B/90A	581				243	407	157	134			106		170			4 x M25
		90B/100A	90B/100A/B	626				262	452	196	152			126	168	183		133	2 x M25 2 x M32
160	WU. 20	63A/71A	63A/B/71A/B	505	153,5	103	240	241	351	140	124	24,5	80	110	153	157	0 (–2)	103	4 x M20
		80A	80A/B/90A	561				250	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	606				269	452	196	152			123	168	183		133	2 x M25 2 x M32
	WU. 30	63A/71A	63A/B/71A/B	525	174	104	261	252	351	140	124	27,5	80	104	153	157	–10	103	4 x M20
		80A	80A/B/90A	581				260	407	157	134			106		170			4 x M25
		90B/100A	90B/100A/B	626				279	452	196	152			126	168	183		133	2 x M25 2 x M32
	WU. 40	63A/71A	63A/B/71A/B	545	194	104	290,5	267	351	140	124	28,6	80	112	153	157	–25	103	4 x M20
		80A	80A/B/90A	601				274	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	646				294	452	196	152			127	168	183		133	2 x M25 2 x M32
		112A	112A	788				326	594	260	185			159	273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
200	WU. 30	63A/71A	63A/B/71A/B	525	174	114	271	261	351	140	124	27,5	100	104	153	157	+10 (–5)	103	4 x M20
		80A	80A/B/90A	581				270	407	157	134			106		170			4 x M25
		90B/100A	90B/100A/B	626				289	452	196	152			126	168	183		133	2 x M32 2 x M40

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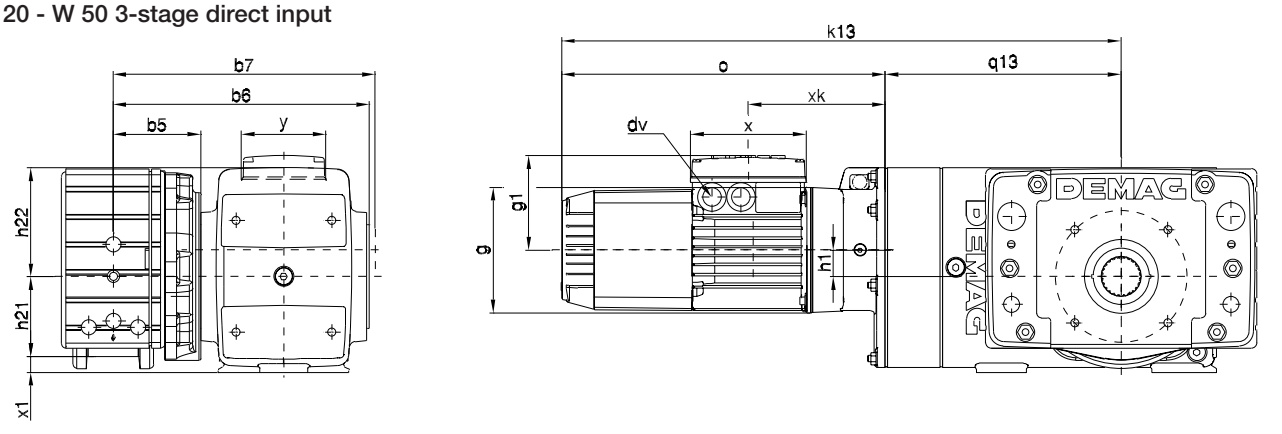
3.21 DRS 112 – 200 wheel block with angular gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
200	WU. 40	63A/71A	63A/B/71A/B	545	194	114	300,5	276	351	140	124	28,6	100	112	153	157	–5	103	4 x M20
		80A	80A/B/90A	601				284	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	646				304	452	196	152			127	168	183		133	2 x M25 2 x M32
		112A	112A	788				336	594	260	185			159	273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
	WU. 50	80A	80A/B/90A	634	227	114	325,5	316	407	157	134	33,3	100	136	153	170	-20		4 x M25
		90B/100A	90B/100A/B	679				348	452	196	152			139	168	183		133	2 x M25 2 x M32
		112A	112A	821				375	594	260	185			163	273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																

3.22 DRS 112 – 200 wheel block with angular gearbox and ZBF/ZBA motor

W 20 - W 50 3-stage direct input



For travel wheel types E, C and F see section 3.1

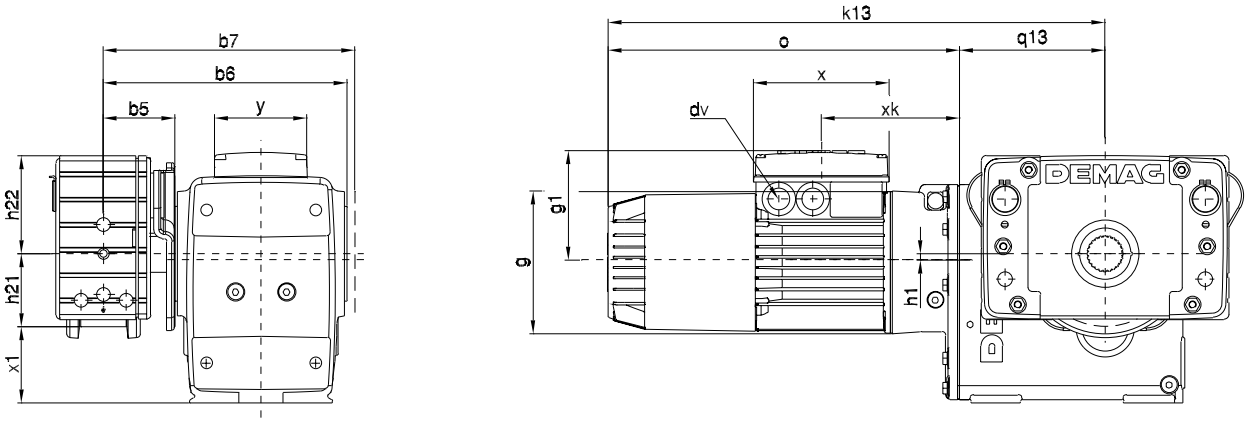
41674044.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
112	WU. 20	63A/71A	63A/B/71A/B	567	215,5	81	218	216	351	140	124	24,5	56	110	153	157	–24	103	4 x M20
		80A	80A/B/90A	623				225	407	157	134					170			4 x M25
125	WU. 20	63A/71A	63A/B/71A/B	567	215,5	87	224	224	351	140	124	24,5	62,5	110		157	–18		4 x M20
		80A	80A/B/90A	623				233	407	157	134					170			4 x M25
	WU. 30	63A/71A	63A/B/71A/B	587	236	88	245	234	351	140	124	27,5	62,5	104		157	–28		4 x M20
		80A	80A/B/90A	643				243	407	157	134			106		170			4 x M25
160	WU. 20	63A/71A	63A/B/71A/B	567	215,5	103	240	241	351	140	124	24,5	80	110		157	0 (–2)		4 x M20
		80A	80A/B/90A	623				250	407	157	134					170			4 x M25
	WU. 30	63A/71A	63A/B/71A/B	587	236	104	261	252	351	140	124	27,5	80	104		157	–10		4 x M20
		80A	80A/B/90A	643				260	407	157	134			106		170			4 x M25
	WU. 40	63A/71A	63A/B/71A/B	615	264	104	290,5	267	351	140	124	28,6	80	112		157	–25		4 x M20
		80A	80A/B/90A	671				274	407	157	134					170			4 x M25
200	WU. 30	63A/71A	63A/B/71A/B	587	236	114	271	261	351	140	124	27,5	100	104		157	+10 (–5)		4 x M20
		80A	80A/B/90A	643				270	407	157	134			106		170			4 x M25
	WU. 40	63A/71A	63A/B/71A/B	615	264	114	300,5	276	351	140	124	28,6	100	112		157	–5		4 x M20
		80A	80A/B/90A	671				284	407	157	134					170			4 x M25
	WU. 50	80A	80A/B/90A	704	297	114	325,5	297	407	157	134	33,3	100	136		170	–20		
		90B/100A	90B/100A/B	749				316	452	196	152				168	183		133	2 x M25 2 x M32

(...) Torque bracket obstacle edge

3.23 DRS 200 wheel block with angular gearbox and ZBF/ZBA motor

W 60 3-stage direct input



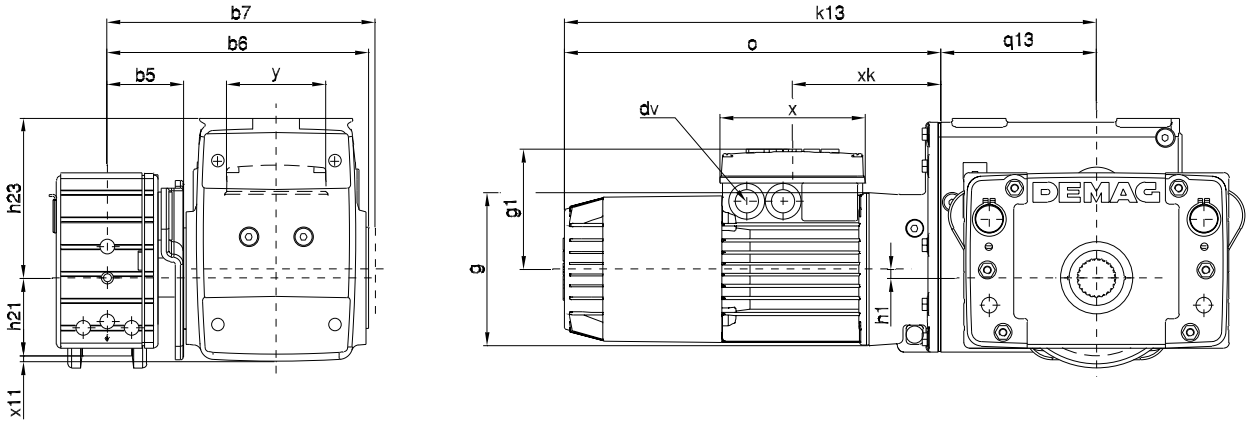
For travel wheel types E, C and F see section 3.1

42200044.eps

DRS wheel block	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
200	WU. 60	80A	80A/B/90A	604	203	98	331,5	292	401	157	134	11,5	100	138	153	164	–105	103	4 x M25
		90B/100A	90B/100A/B	648				311	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	790				343	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				370	696	314	269					245			2 x M40 2 x M50

W 60 3-stage direct input

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.1

42200045.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
200	WU. 60	80A	80A/B/90A	604	203	98	331,5	292	401	157	134	11,5	100	205	153	164	–7	103	4 x M25
		90B/100A	90B/100A/B	648				311	445	196	152				168	176	–7	133	2 x M25 2 x M32
		112A	112A	790				343	587	260	185				273	231	–18,5	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				370	696	314	269					245	–45,5		2 x M40 2 x M50

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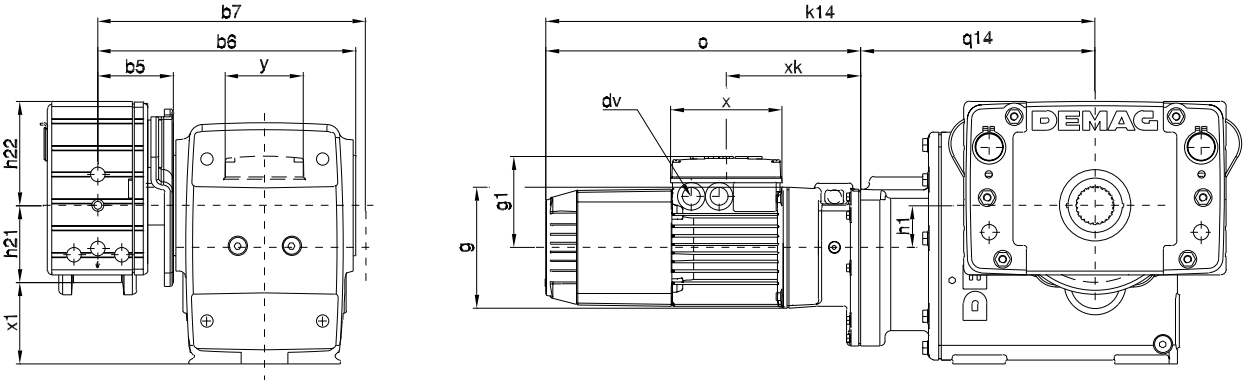
3.24 DRS 200 wheel block with angular gearbox and ZBF/ZBA motor

W 60 4-stage direct input



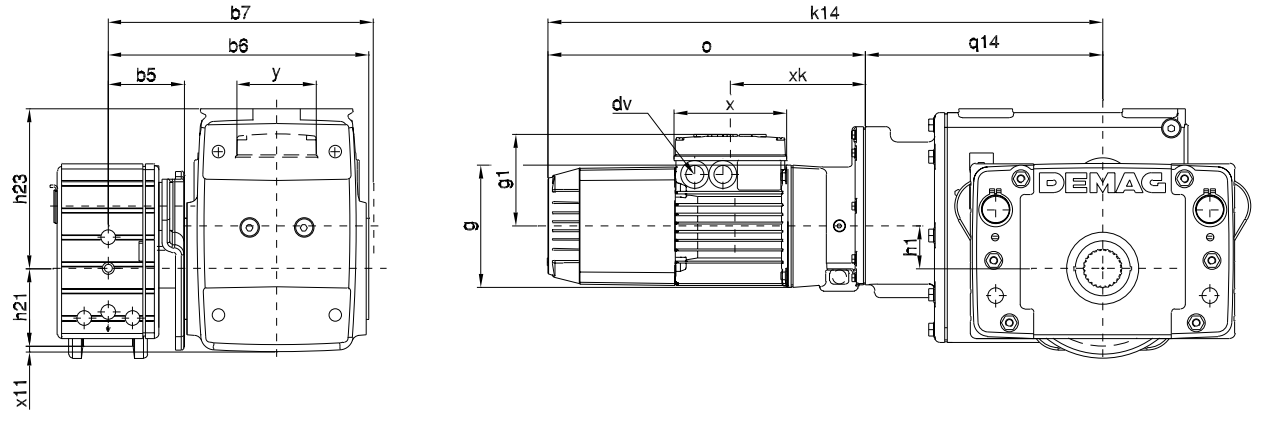
For travel wheel types E, C and F see section 3.1

42200144.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
200	WU. 60	63A/71A	63A/B/71A/B	658	307	98	331,5	283	351	140	124	54,5	100	138	153	157	–105	103	4 x M20
		80A	80A/B/90A	714				292	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	759				311	452	196	152				168	183		133	2 x M25 2 x M32

W 60 4-stage direct input

Note: This model offers greater ground clearance



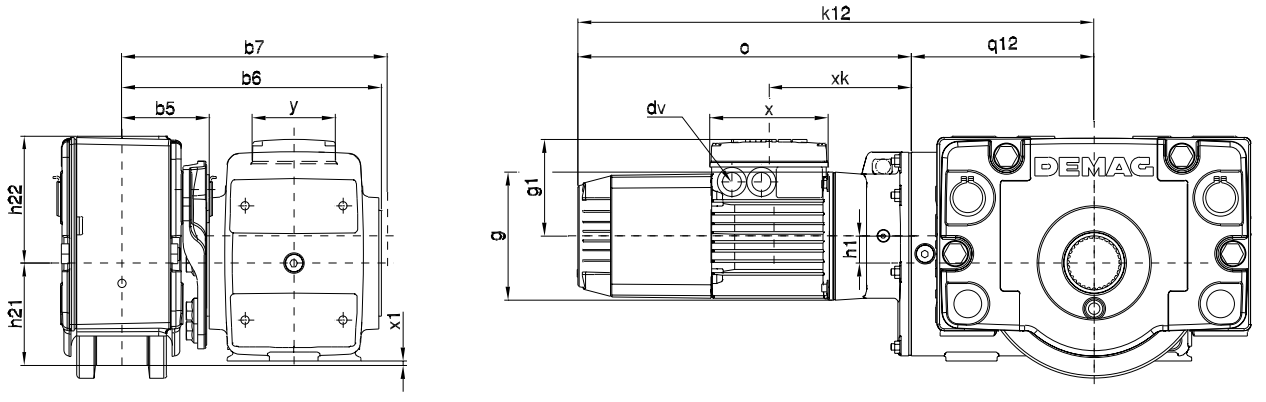
For travel wheel types E, C and F see section 3.1

42200145.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
200	WU. 60	63A/71A	63A/B/71A/B	658	307	98	331,5	283	351	140	124	54,5	100	205	153	157	–7	103	4 x M20
		80A	80A/B/90A	714				292	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	759				311	452	196	152				168	183		133	2 x M25 2 x M32

3.25 DRS 250 – 315 wheel block with angular gearbox and ZBF/ZBA motor

W 40 - W 50 2-stage direct input



For travel wheel types E, C and F see section 3.2

42096844.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU. 40	63A/71A	63A/B/71A/B	545	194	108	294,5	271	351	140	124	28,6	125	156	153	157	+20	103	4 x M20
		80A	80A/B/90A	601				280	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	646				299	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	788				331	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
	WU. 50	80A	80A/B/90A	634	227	108	319,5	293	407	157	134	33,3	125	156	153	170	+5 (+20)	103	4 x M25
		90B/100A	90B/100A/B	679				312	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	821				344	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	930				371	703	314	269					252			2 x M40 2 x M50
315	WU. 50	80A	80A/B/90A	634	277	130	341,5	319	407	157	134	33,3	157,5	192	153	170	+37 (+29)	103	4 x M25
		90B/100A	90B/100A/B	679				332	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	821				364	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	930				372	703	314	269					252			2 x M40 2 x M50

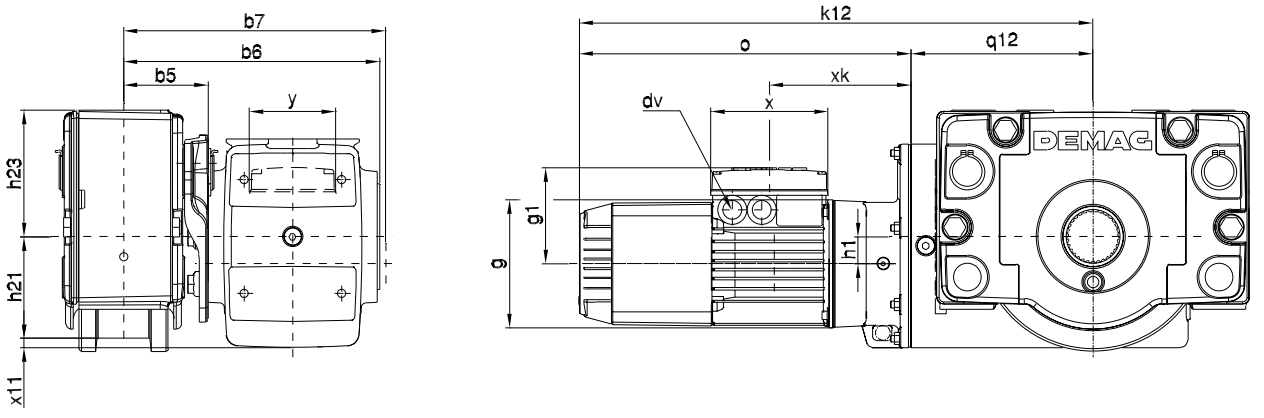
(...) Torque bracket obstacle edge

2033523b.p65/010407

3.25 DRS 250 – 315 wheel block with angular gearbox and ZBF/ZBA motor

W 40 - W 50 2-stage direct input

Note: This model offers greater ground clearance



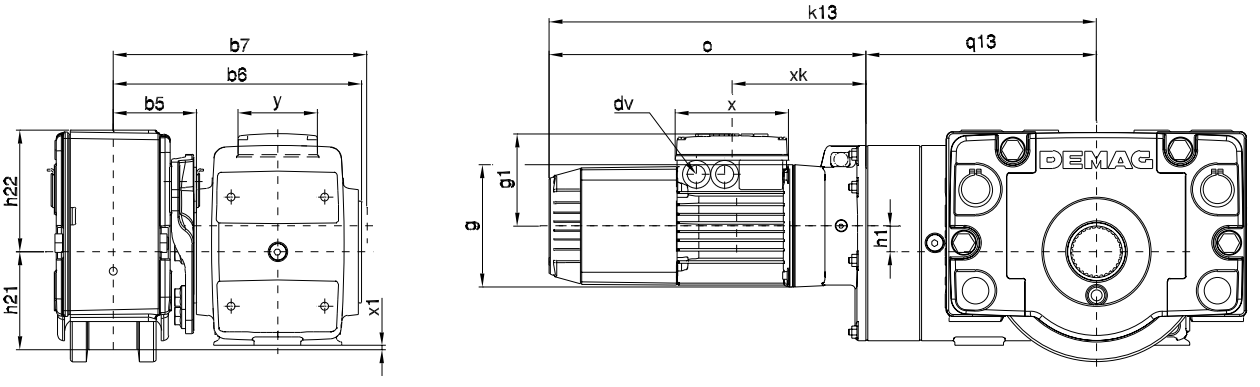
For travel wheel types E, C and F see section 3.2

42096845.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU. 40	63A/71A	63A/B/71A/B	545	194	108	294,5	271	351	140	124	28,6	125	156	153	157	+21	103	4 x M20
		80A	80A/B/90A	601				280	407	157	134					170	+17		4 x M25
		90B/100A	90B/100A/B	646				299	452	196	152				168	183	–2	133	2 x M25 2 x M32
		112A	112A	788				331	594	260	185				273	238	–34	173	2 x M32 2 x M40
		132A/B	132A/B/C																
	WU. 50	80A	80A/B/90A	634	227	108	319,5	293	407	157	134	33,3	125	156	153	170	–12	103	4 x M25
		90B/100A	90B/100A/B	679				312	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	821				344	594	260	185				273	238	–39	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	930				371	703	314	269					252	–66		2 x M40 2 x M50
315	WU. 50	80A	80A/B/90A	634	277	130	341,5	319	407	157	134	33,3	157,5	192	153	170	+21	103	4 x M25
		90B/100A	90B/100A/B	679				332	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	821				364	594	260	185				273	238	–6	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	930				372	703	314	269					252	–33		2 x M40 2 x M50

3.26 DRS 250 – 315 wheel block with angular gearbox and ZBF/ZBA motor

W 40 - W 50 3-stage direct input



For travel wheel types E, C and F see section 3.2

42096944.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU. 40	63A/71A	63A/B/71A/B	615	264	108	294,5	271	351	140	124	28,6	125	156	153	157	+20	103	4 x M20
		80A	80A/B/90A	671				280	407	157	134					170	+5 (+20)		4 x M25
	WU. 50	80A	80A/B/90A	704	297	108	319,5	293				33,3							
315	WU. 50	80A	80A/B/90A	704	297	130	341,5	319	407	157	134	33,3	157,5	192	153	170	+37 (+29)	103	4 x M25
		90B/100A	90B/100A/B	749				332	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	891				364	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1000				372	703	314	269					252			2 x M40 2 x M50

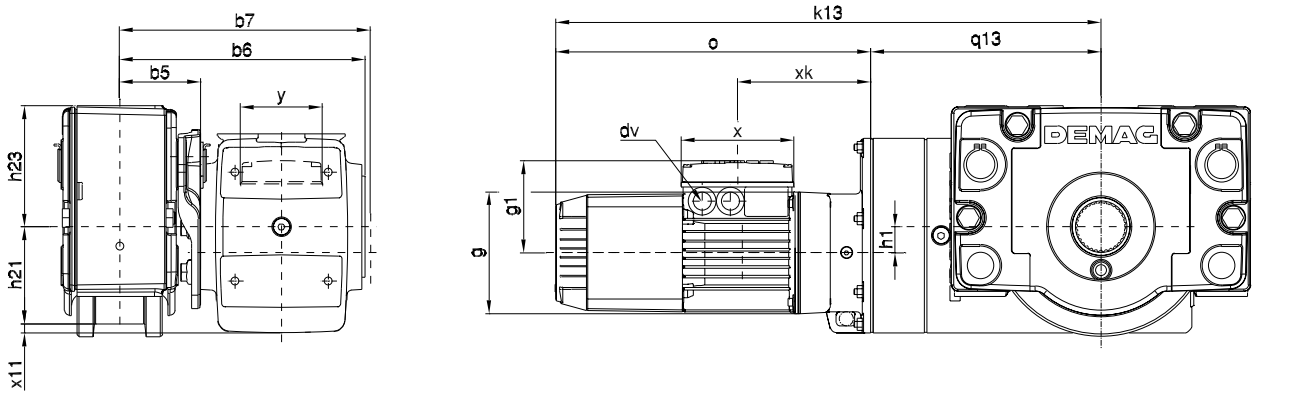
(...) Torque bracket obstacle edge

2033523b.p65/010407

3.26 DRS 250 – 315 wheel block with angular gearbox and ZBF/ZBA motor

W 40 - W 50 3-stage direct input

Note: This model offers greater ground clearance



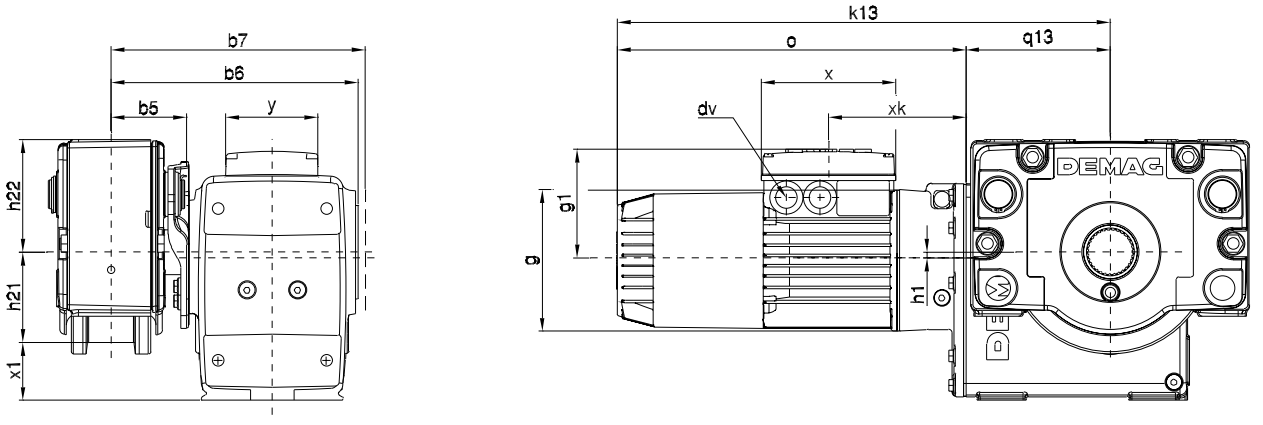
For travel wheel types E, C and F see section 3.2

42096945.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU. 40	63A/71A	63A/B/71A/B	615	264	108	294,5	271	351	140	124	28,6	125	156	153	157	+21	103	4 x M20
		80A	80A/B/90A	671				280	407	157	134					170	+17		4 x M25
	WU. 50	80A	80A/B/90A	704	297	108	319,5	293				33,3		192			–12		
315	WU. 50	80A	80A/B/90A	704	297	130	341,5	319	407	157	134	33,3	157,5	192	153	170	+21	103	4 x M25
		90B/100A	90B/100A/B	749				332	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	891				364	594	260	185				273	238	–6	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1000				372	703	314	269					252	–33		2 x M40 2 x M50

3.27 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

W 60 - W 100 3-stage direct input



41674244.eps

For travel wheel types E, C and F see section 3.2

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU. 60	80A	80A/B/90A	604	203	108	341,5	302	401	157	134	11,5	125	156	153	164	–80	103	4 x M25
		90B/100A	90B/100A/B	648				321	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	790				353	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				380	696	314	269					245			2 x M40 2 x M50
	WU. 70	80A	80A/B/90A	627	231	108	382	322	396	157	134	6	125	156	153	159	–120	103	4 x M25
		90B/100A	90B/100A/B	671				341	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				373	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				400	691	314	269					240			2 x M40 2 x M50
		–	180B/200A/B	1049				440	818	394	311					249			
		–	225A/B	1096				463	865	440	332					259			
315	WU. 60	80A	80A/B/90A	604	203	130	363,5	324	401	157	134	11,5	157,5	193	153	164	–48	103	4 x M25
		90B/100A	90B/100A/B	648				343	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	790				375	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				383	696	314	269					245			2 x M40 2 x M50
	WU. 70	80A	80A/B/90A	627	231	130	404	344	396	157	134	6	157,5	193	153	159	–88	103	4 x M25
		90B/100A	90B/100A/B	671				363	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				395	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				422	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1049				462	818	394	311					249			
		–	225A/B	1096				485	865	440	332					259			

2033523b.p65/010407

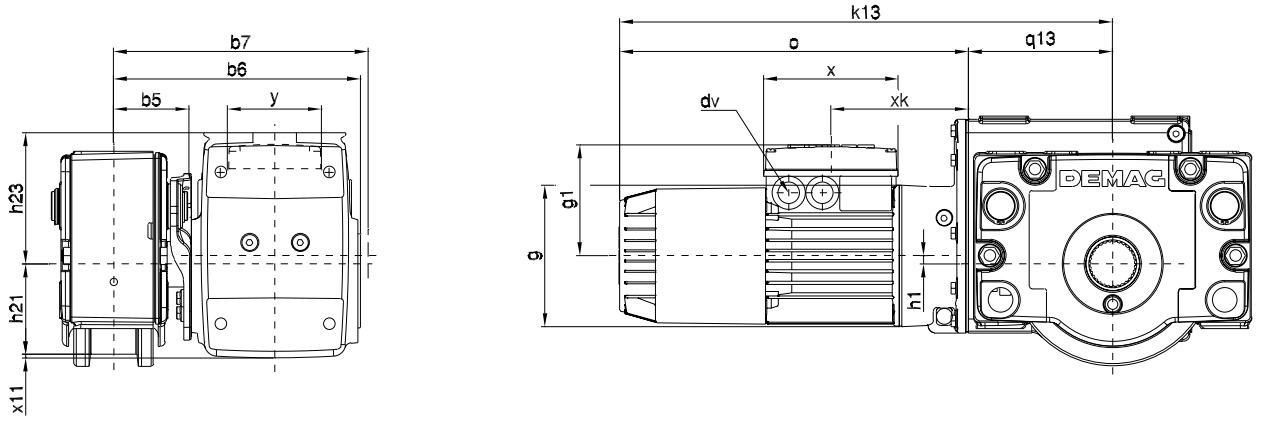
3.27 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
315	WU. 80	80A	80A/B/90A	646	250	130	409	346	396	157	134	32	157,5	193	153	159	–118	103	4 x M25
		90B/100A	90B/100A/B	690				366	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				398	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				425	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				465	818	394	311					249			
		–	225A/B	1115				488	865	440	332					259			
400	WU. 70	80A	80A/B/90A	627	231	154	428	368	396	157	134	6	200	240	153	159	–45	103	4 x M25
		90B/100A	90B/100A/B	671				387	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				419	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				446	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1049				486	818	394	311					249			
		–	225A/B	1096				509	865	440	332					259			
	WU. 80	80A	80A/B/90A	646	250	154	433	370	396	157	134	32	200	240	153	159	–75	103	4 x M25
		90B/100A	90B/100A/B	690				390	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				422	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				449	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				489	818	394	311					249			
		–	225A/B	1115				512	865	440	332					259			
	WU. 90	90B/100A	90B/100A/B	728	291	154	469	407	437	196	152	32	200	240	168	168	–115	133	2 x M25 2 x M32
		112A	112A	870				439	579	260	185				273	223		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	979				466	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1106				506	815	394	311					246			
		–	225A/B	1153				529	862	440	332					256			
500	WU. 80	80A	80A/B/90A	646	250	174	453	390	396	157	134	32	250	316	153	159	–25	103	4 x M25
		90B/100A	90B/100A/B	690				410	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				442	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				469	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				509	818	394	311					249			
		–	225A/B	1115				532	865	440	332					259			
	WU. 90	90B/100A	90B/100A/B	728	291	174	489	427	437	196	152	32	250	316	168	168	–65	133	2 x M25 2 x M32
		112A	112A	870				459	579	260	185				273	223		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	979				486	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1106				526	815	394	311					246			
		–	225A/B	1153				549	862	440	332					256			
	WU. 100	112A	112A	931	352	174	559	494	579	260	185	44	250	316	273	223	–140	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1040				521	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1167				561	815	394	311					246			
		–	225A/B	1214				584	862	440	332					256			

3.27 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

W 60 - W 100 3-stage direct input

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

41674245.eps

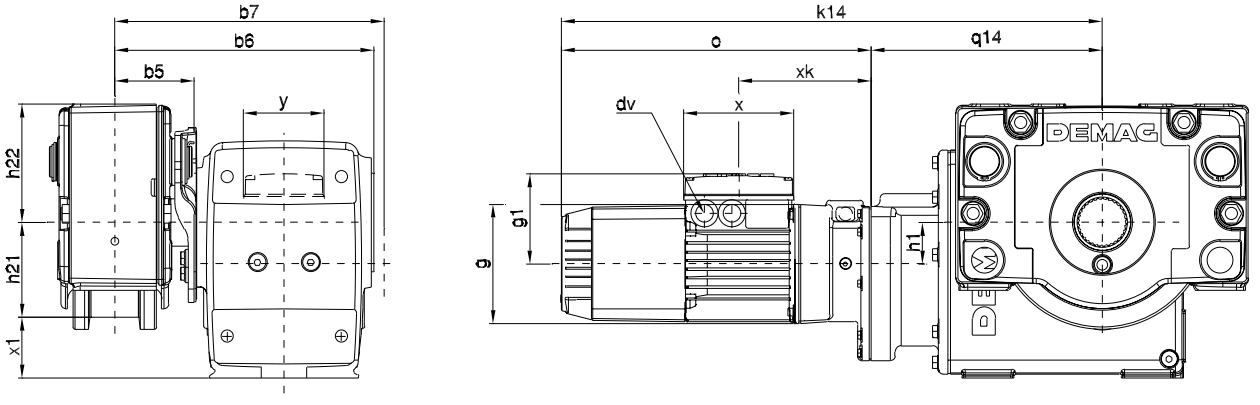
DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU. 60	80A	80A/B/90A	604	203	108	331,5	302	401	157	134	11,5	125	205	153	164	+18	103	4 x M25
		90B/100A	90B/100A/B	648				321	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	790				353	587	260	185				273	231	+6,5	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				380	696	314	269					245	–20,5		2 x M40 2 x M50
	WU. 70	80A	80A/B/90A	627	231	108	382	322	396	157	134	6	125	245	153	159	–3	103	4 x M25
		90B/100A	90B/100A/B	671				341	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				373	582	260	185				273	226	–3	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				400	691	314	269					240	–26		2 x M40 2 x M50
		–	180B/200A/B	1049				440	818	394	311					249	–66		
		–	225A/B	1096				463	865	440	332					259	–89		
315	WU. 60	80A	80A/B/90A	604	203	130	363,5	324	401	157	134	11,5	158	205	153	164	+30	103	4 x M25
		90B/100A	90B/100A/B	648				343	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	790				375	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	899				383	696	314	269					245	+12		2 x M40 2 x M50
	WU. 70	80A	80A/B/90A	627	231	130	404	344	396	157	134	6	158	245	153	159	+29	103	4 x M25
		90B/100A	90B/100A/B	671				363	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				395	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				422	691	314	269					240	+6,5		2 x M40 2 x M50
		–	180B/200A/B	1049				462	818	394	311					249	–33,5		
		–	225A/B	1096				485	865	440	332					259	–56,5		

3.27 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
315	WU. 80	80A	80A/B/90A	646	250	130	409	346	396	157	134	32	157,5	275	153	159	+15,5	103	4 x M25
		90B/100A	90B/100A/B	690				365,5	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				398	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				425	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				465	818	394	311					249	–7,5		
		–	225A/B	1115				488	865	440	332					259	–30,5		
400	WU. 70	80A	80A/B/90A	627	231	154	428	368	396	157	134	6	200	245	153	159	+55	103	4 x M25
		90B/100A	90B/100A/B	671				387	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	813				419	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	922				446	691	314	269					240	+49		2 x M40 2 x M50
		–	180B/200A	1049				486	818	394	311					249	+9		
		–	225A/B	1096				509	865	440	332					259	–14		
	WU. 80	80A	80A/B/90A	646	250	154	433	370	396	157	134	32	200	275	153	159	+55	103	4 x M25
		90B/100A	90B/100A/B	690				389,5	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				421,5	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				449	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				489	818	394	311					249	+35		
		–	225A/B	1115				512	865	440	332					259	+12		
	WU. 90	90B/100A	90B/100A/B	728	291	154	469	407	437	196	152	32	200	315	168	168	+55	133	2 x M25 2 x M32
		112A	112A	870				439	579	260	185				273	223		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	979				466	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1106				506	815	394	311					246			
		–	225A/B	1153				529	862	440	332					256	+12		
500	WU. 80	80A	80A/B/90A	646	250	174	453	390	396	157	134	32	250	275	153	159	+82	103	4 x M25
		90B/100A	90B/100A/B	690				410	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	832				442	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	941				469	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1068				509	818	394	311					249			
		–	225A/B	1115				532	865	440	332					259	+62		
	WU. 90	90B/100A	90B/100A/B	728	291	174	489	427	437	196	152	32	250	315	168	168	+82	133	2 x M25 2 x M32
		112A	112A	870				459	579	260	185				273	223		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	979				486	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1106				526	815	394	311					246			
		–	225A/B	1153				549	862	440	332					256	+62		
	WU. 100	112A	112A	931	352	174	559	494	579	260	185	44	250	390	273	223	+44	173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1040				521	688	314	269					237			2 x M40 2 x M50
		–	180B/200A	1167				561	815	394	311					246			
		–	225A/B	1214				584	862	440	332					256			

3.28 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

W 60 - W 100 4-stage direct input



For travel wheel types E, C and F see section 3.2

41680444.eps

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU. 60	63A/71A	63A/B/71A/B	658	307	108	341,5	293	351	140	124	54,5	125	156	153	157	–80	103	4 x M20
		80A	80A/B/90A	714				302	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	759				321	452	196	152				168	183		133	2 x M25 2 x M32
	WU. 70	80A	80A/B/90A	750	343	108	382	322	407	157	134	56	125	156	153	170	–120	103	4 x M25
		90B/100A	90B/100A/B	795				341	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				373	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1046				400	703	314	269					252			2 x M40 2 x M50
315	WU. 60	63A/71A	63A/B/71A/B	658	307	130	363,5	315	351	140	124	54,5	157,5	193	153	157	–48	103	4 x M20
		80A	80A/B/90A	714				324	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	759				343	452	196	152				168	183		133	2 x M25 2 x M32
	WU. 70	80A	80A/B/90A	750	343	130	404	344	407	157	134	56	157,5	193	153	170	–88	103	4 x M25
		90B/100A	90B/100A/B	795				363	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				395	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1046				422	703	314	269					252			2 x M40 2 x M50
	WU. 80	80A	80A/B/90A	769	362	130	409	346	407	157	134	82	157,5	193	153	170	–118	103	4 x M25
		90B/100A	90B/100A/B	814				366	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				399	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				425	703	314	269					252			2 x M40 2 x M50

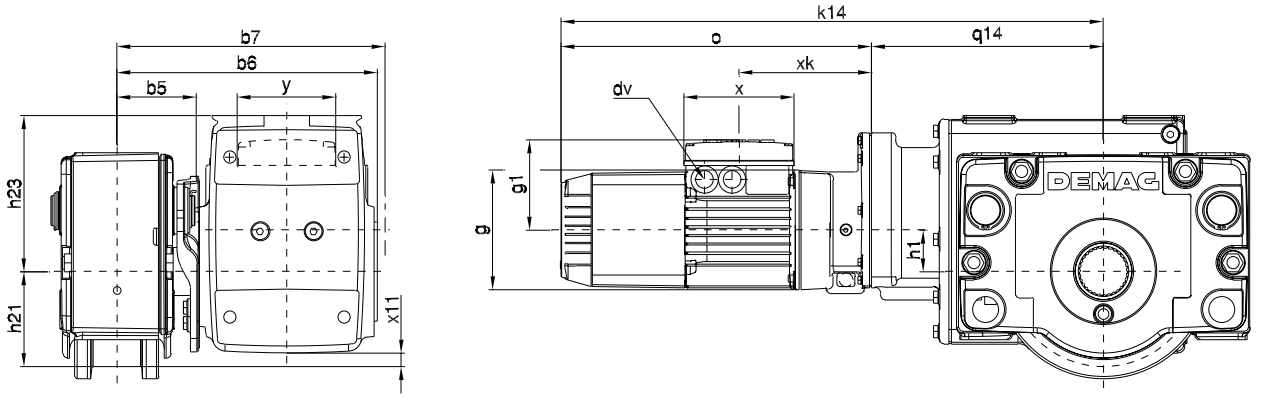
3.28 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
400	WU. 70	80A	80A/B/90A	750	343	154	428	368	401	157	134	56	200	240	153	170	–45	103	4 x M25
		90B/100A	90B/100A/B	795				387	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				419	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1046				446	703	314	269					252			2 x M40 2 x M50
	WU. 80	80A	80A/B/90A	769	362	154	433	370	407	157	134	82	200	240	153	170	–75	103	4 x M25
		90B/100A	90B/100A/B	814				390	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				421,5	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				449	703	314	269					252			2 x M40 2 x M50
	WU. 90	80A	80A/B/90A	821	420	154	469	388	401	157	134	93	200	240	153	164	–115	103	4 x M25
		90B/100A	90B/100A/B	865				407	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	1014				439	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1116				466	696	314	269					245			2 x M40 2 x M50
500	WU. 80	80A	80A/B/90A	769	362	174	453	390	407	157	134	82	250	316	153	170	–25	103	4 x M25
		90B/100A	90B/100A/B	814				410	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				442	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				469	703	314	269					252			2 x M40 2 x M50
	WU. 90	80A	80A/B/90A	821	420	174	489	408	401	157	134	93	250	316	153	164	–65	103	4 x M25
		90B/100A	90B/100A/B	865				427	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	1014				459	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1118				486	696	314	269					245			2 x M40 2 x M50
	WU. 100	80A	80A/B/90A	886	490	174	559	443	396	157	134	122	250	316	153	159	–140	103	4 x M25
		90B/100A	90B/100A/B	930				462	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	1072				494	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1181				521	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1308				561	818	394	311					249			
		–	225A/B	1355				584	865	440	332					259			

3.28 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

W 60 - W 100 4-stage direct input

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

41680445.eps

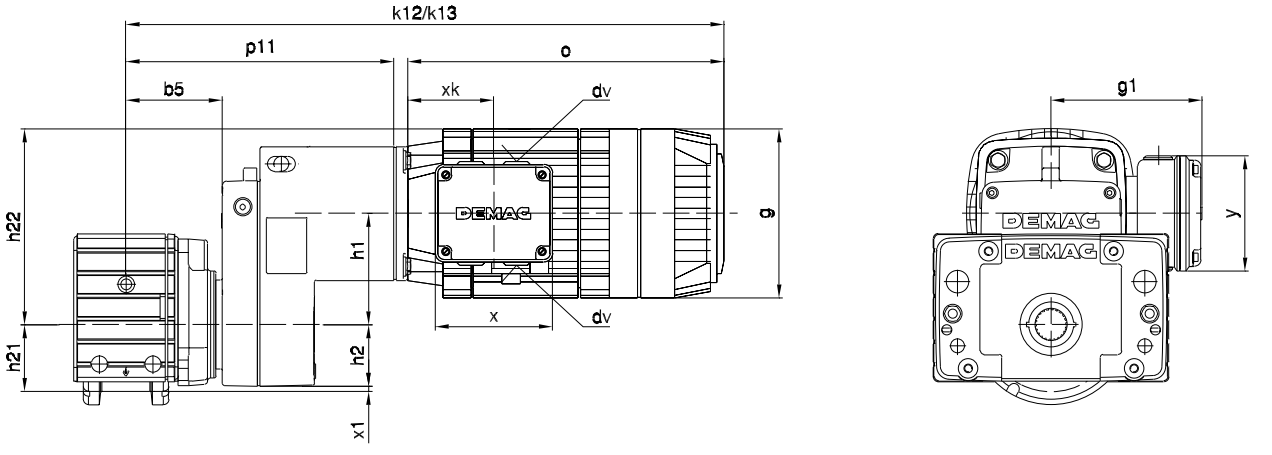
DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU. 60	63A/71A	63A/B/71A/B	658	307	108	341,5	293	351	140	124	54,5	125	205	153	157	+18	103	4 x M20
		80A	80A/B/90A	714				302	407	157	134					170			4 x M25
		90B/100A	90/100A/B	759				321	452	196	152				168	183		133	2 x M25 2 x M32
	WU. 70	80A	80A/B/90A	750	343	108	382	322	407	157	134	56	125	245	153	170	-3	103	4 x M25
		90B/100A	90/100A/B	795				341	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				373	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1046				400	703	314	269					252			2 x M40 2 x M50
315	WU. 60	63A/71A	63A/B/71A/B	658	307	130	363,5	315	351	140	124	54,5	157,5	205	153	157	+30	103	4 x M20
		80A	80A/B/90A	714				324	407	157	134					170			4 x M25
		90B/100A	90B/100A/B	759				343	452	196	152				168	183		133	2 x M25 2 x M32
	WU. 70	80A	80A/B/90A	750	343	130	404	344	407	157	134	56	157,5	245	153	170		103	4 x M25
		90B/100A	90B/100A/B	795				363	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				395	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1046				422	703	314	269					252			2 x M40 2 x M50
	WU. 80	80A	80A/B/90A	769	362	130	409	346	407	157	134	82	157,5	275	153	170	+15,5	103	4 x M25
		90B/100A	90B/100A/B	814				366	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				398	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				425	703	314	269					252			2 x M40 2 x M50

3.28 DRS 250 – 500 wheel block with angular gearbox and ZBF/ZBA motor

DRS wheel block size	Gearbox size	Motor ZBF	Motor ZBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
400	WU. 70	80A	80A/B/90A	750	343	154	428	368	401	157	134	56	200	245	153	170	+55	103	4 x M25
		90B/100A	90B/100A/B	795				387	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	937				419	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C													252			
		–	160A/B/180A	1046				446	703	314	269								2 x M40 2 x M50
	WU. 80	80A	80A/B/90A	769	362	154	433	370	407	157	134	82	200	275	153	170		103	4 x M25
		90B/100A	90B/100A/B	814				389,5	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				422	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				449	703	314	269					252			2 x M40 2 x M50
	WU. 90	80A	80A/B/90A	821	420	154	469	388	401	157	134	93	200	315	153	164	+34	103	4 x M25
		90B/100A	90B/100A/B	865				407	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	1014				439	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1116				466	696	314	269					245			2 x M40 2 x M50
500	WU. 80	80A	80A/B/90A	769	362	174	453	390	407	157	134	82	250	275	153	170	+82	103	4 x M25
		90B/100A	90B/100A/B	814				410	452	196	152				168	183		133	2 x M25 2 x M32
		112A	112A	956				442	594	260	185				273	238		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1065				469	703	314	269					252			2 x M40 2 x M50
	WU. 90	80A	80A/B/90A	821	420	174	489	408	401	157	134	93	250	315	153	164		103	4 x M25
		90B/100A	90B/100A/B	865				427	445	196	152				168	176		133	2 x M25 2 x M32
		112A	112A	1014				459	587	260	185				273	231		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1118				486	696	314	269					245			2 x M40 2 x M50
	WU. 100	80A	80A/B/90A	886	490	174	559	443	396	157	134	122	250	390	153	159	+44	103	4 x M25
		90B/100A	90B/100A/B	930				462	440	196	152				168	171		133	2 x M25 2 x M32
		112A	112A	1072				494	582	260	185				273	226		173	2 x M32 2 x M40
		132A/B	132A/B/C																
		–	160A/B/180A	1181				521	691	314	269					240			2 x M40 2 x M50
		–	180B/200A	1308				561	818	394	311					249			
		–	225A/B	1355				584	865	440	332					259			

3.29 DRS 112 – 200 wheel block with offset gearbox and KBF/KBA motor

A 10 - A 40 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.1

41810344.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
112	A .. 10	71A	71A	495	–	239	81	244	140	134	91,5	51	56	161,5	128	77	+5	108	4 x M25
		71B	71B	515				264											
		80A	80A	537				285	158	143				170,5		82			
		–	80B	552				300											
	A .. 20	71A	71A	497		241	81	244	140	134	104	57,5	56	174	128	77	–2	108	4 x M25
		71B	71B	517				264											
		80A	80A	540				285	158	143				183		82			
		–	80B	555				300											
		90A	90A	570	–			315	178	153				193		92			
		–	90B	586				331											
125	A .. 10	71A	71A	501	–	245	87	244	140	134	91,5	51	62,5	161,5	128	77	+11	108	4 x M25
		71B	71B	521				264											
		80A	80A	544				285	158	143				170,5		82			
		–	80B	559				300											
	A .. 20	71A	71A	503		247	87	244	140	134	104	57,5	62,5	174	128	77	+5	108	4 x M25
		71B	71B	523				264											
		80A	80A	546				285	158	143				183		82			
		–	80B	561				300											
		90A	90A	576	–			315	178	153				193		92			
		–	90B	592				331											
	A .. 30	71A	71A	519		259	88	244	140	134	129	75	62,5	209	128	77	–13	108	4 x M25
		71B	71B	539				264											
		80A	80A	562				285	158	143						82			
		–	80B	577				300											
		90A	90A	592				315	178	153				218		92			
		–	90B	608				331											
		100A	100A	628				349	196	176				227	158	103		128	4 x M32
		–	100B	645				366											

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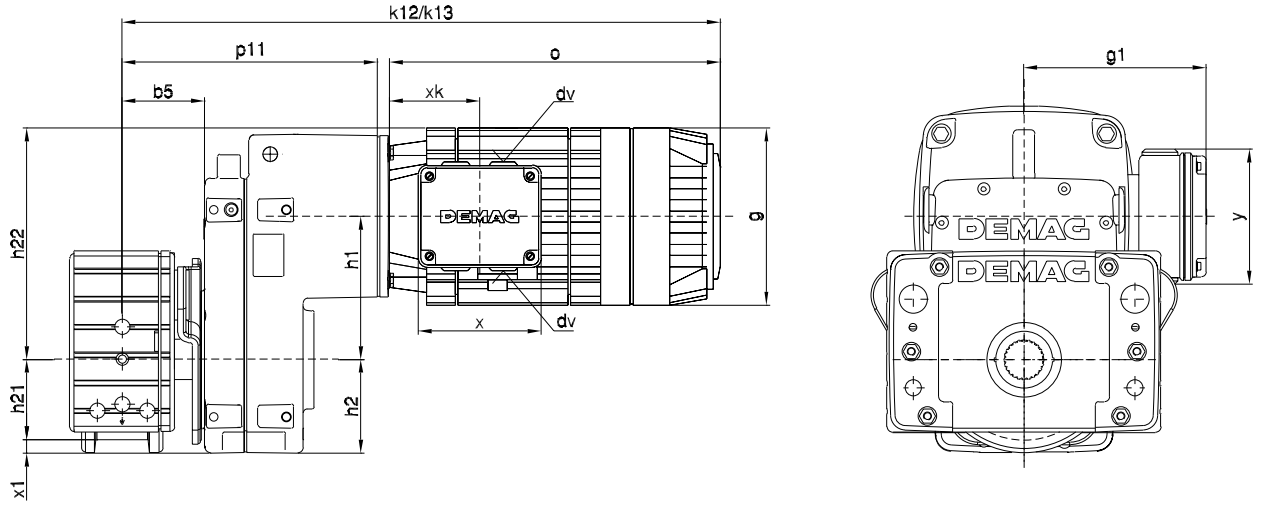
3.29 DRS 112 – 200 wheel block with offset gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
160	A .. 20	71A	71A	519		263	103	244	140	134	104	57,5	80	174	128	77	+22	108	4 x M25
		71B	71B	539				264											
		80A	80A	563				285	158	143				183		82			
		–	80B	577				300											
		90A	90A	592	–			315	178	153				193		92			
		–	90B	608				331											
	A .. 30	71A	71A	535		275	104	244	140	134	129	75	80	209	128	77	+5	108	4 x M25
		71B	71B	555				264											
		80A	80A	578				285	158	143						82			
		–	80B	593				300											
		90A	90A	608				315	178	153				218		92			
		–	90B	624				331											
		100A	100A	643				348	196	176				227	158	103		128	4 x M32
		–	100B	660				365											
	A .. 40	71A	71A	538		278	104	244	140	134	148	90	80	228	128	77	–10	108	4 x M25
		71B	71B	558				264											
		80A	80A	581				285	158	143						82			
		–	80B	596				300											
		90A	90A	611				315	178	153				234		92			
		–	90B	627				331											
		100A	100A	647				349	196	176				243	158	103		128	4 x M32
		–	100B	664				366											
200	A .. 30	71A	71A	545		285	114	244	140	134	129	75	100	209	128	77	+25	108	4 x M25
		71B	71B	565				264											
		80A	80A	588				285	158	143						82			
		–	80B	603				300											
		90A	90A	618				315	178	153				218		92			
		–	90B	634				331											
		100A	100A	653				349	196	176				227	158	103		128	4 x M32
		–	100B	670				366											
	A .. 40	71A	71A	548		288	114	244	140	134	148	90	100	228	128	77	+10	108	4 x M25
		71B	71B	568				264											
		80A	80A	591				285	158	143						82			
		–	80B	606				300											
		90A	90A	621				315	178	153				234		92			
		–	90B	637				331											
		100A	100A	656				349	196	176				243	158	103		128	4 x M32
		–	100B	673				366											

3.29 DRS 200 wheel block with offset gearbox and KBF/KBA motor

A 50 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.1

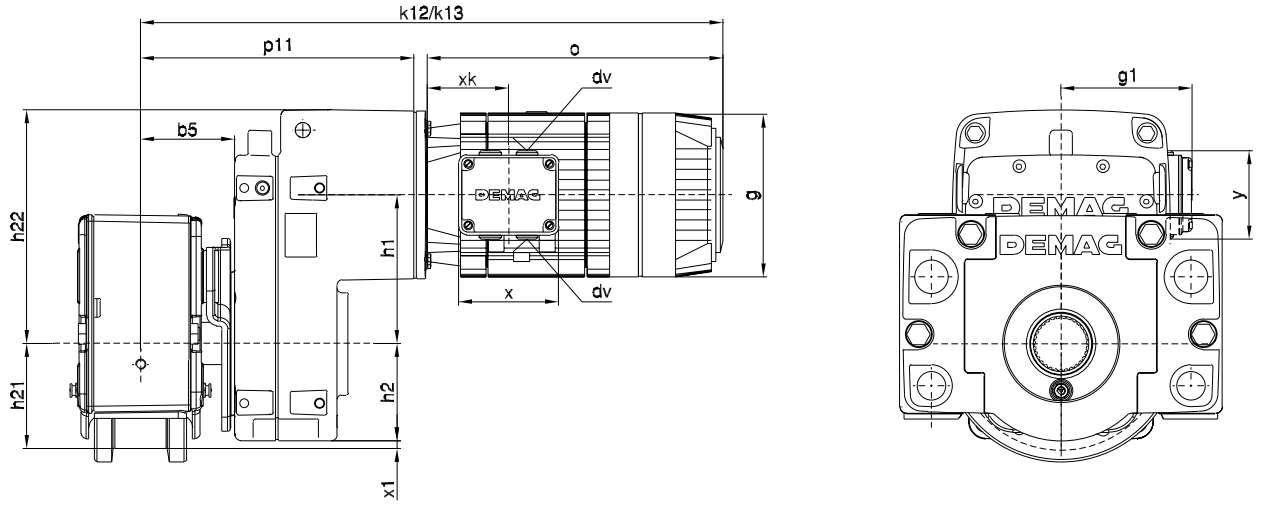
41871544.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
200	A .. 50	71A	71A	575		316	98	244	140	134	178	115	100	304	128	77	–15	108	4 x M25
		71B	71B	595				264											
		80A	80A	618				285	158	143						82			
		–	80B	633				300											
		90A	90A	648				315	178	153						92			
		–	90B	664				331											
		100A	100A	684				349	196	176						103			
		–	100B	701				366											
		112A	–	720				370	220	189					158	110		128	4 x M32
		–	112B	739				389											
		125A	–	772				420	246	200						122			
		–	125B	796				444											
		140A	140B	863				511	274	250				315	273	174		173	2 x M40 2 x M50

2033523c.p65/010407

3.30 DRS 250 wheel block with offset gearbox and KBF/KBA motor

A 40 - A 50 2 and 3-stage coupling design



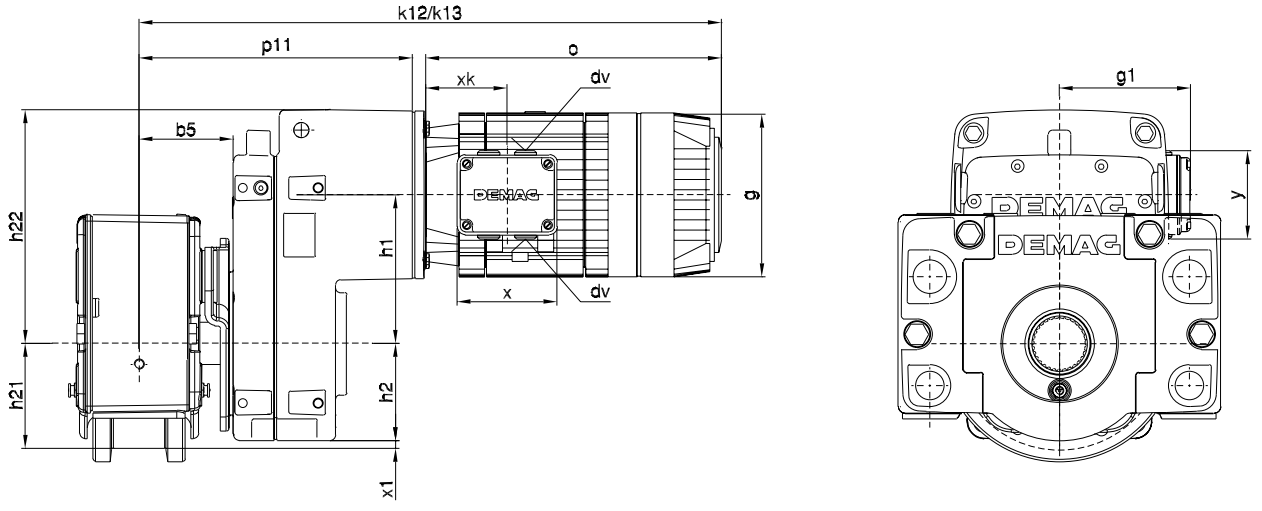
For travel wheel types E, C and F see section 3.2

42013644.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
250	A .. 40	71A	71A	544		282	108	244	140	134	148	90	125	228	128	77	+35	108	4 x M25
		71B	71B	564				264											
		80A	80A	587				285	158	143						82			
		–	80B	602				300											
		90A	90A	617				315	178	153				237		92			
		–	90B	633				331											
		100A	100A	654				349	196	176				246	158	103		128	4 x M32
		–	100B	671				366											
	A .. 50	71A	71A	585		326	108	244	140	134	178	115	125	304	128	77	+10	108	4 x M25
		71B	71B	605				264											
		80A	80A	628				285	158	143						82			
		–	80B	643				300											
		90A	90A	658				315	178	153						92			
		–	90B	674				331											
		100A	100A	694				349	196	176						103		128	4 x M32
		–	100B	711				366							158				
		112A	–	730				370	220	189						110			
		–	112B	749				389											
		125A	–	782				420	246	200						122			
		–	125B	806				444											
		140A	140B	873				511	274	250				315	273	174		173	2 x M40 2 x M50

3.30 DRS 250 wheel block with offset gearbox and KBF/KBA motor

A 60 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.2

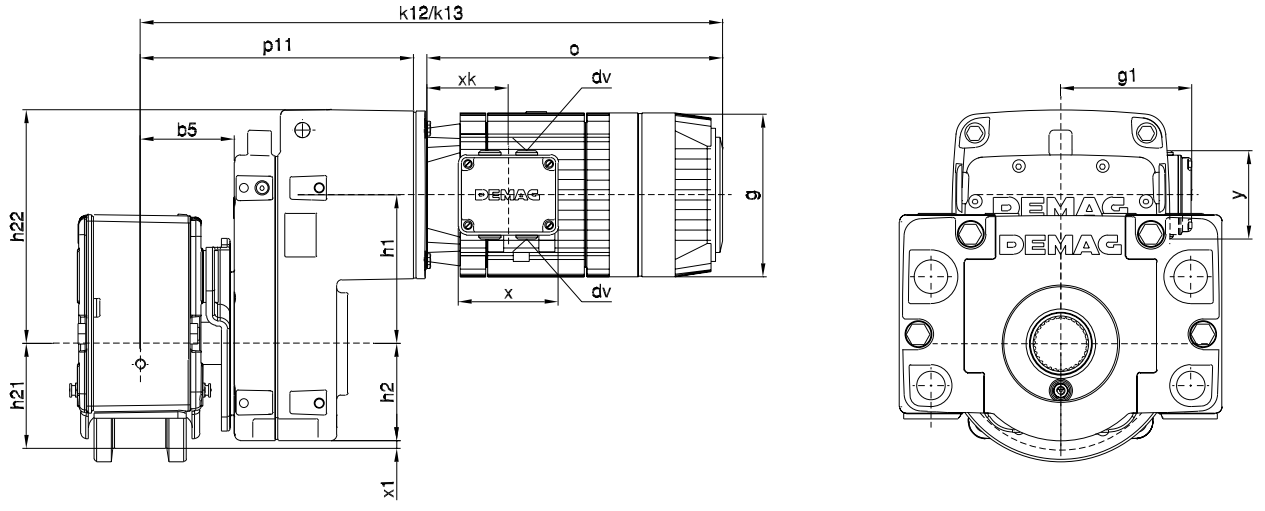
42013644.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
250	A .. 60	71A	71A	612		350	108	244	140	134	218	140	125	344	128	77	–15	108	4 x M25
		71B	71B	632				264											
		80A	80A	655				285	158	143						82			
		–	80B	670				300											
		90A	90A	685				315	178	153						92			
		–	90B	701				331											
		100A	100A	721				349	196	176					158	103		128	4 x M32
		–	100B	738				366											
		112A	–	757				370	220	189						110			
		–	112B	776				389											
		125A	–	809				420	246	200						122			
		–	125B	833				444											
		140A	140B	900				511	274	250				355	273	174		173	2 x M40 2 x M50

2033523c.p65/010407

3.30 DRS 315 – 500 wheel block with offset gearbox and KBF/KBA motor

A 50 - A 60 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.2

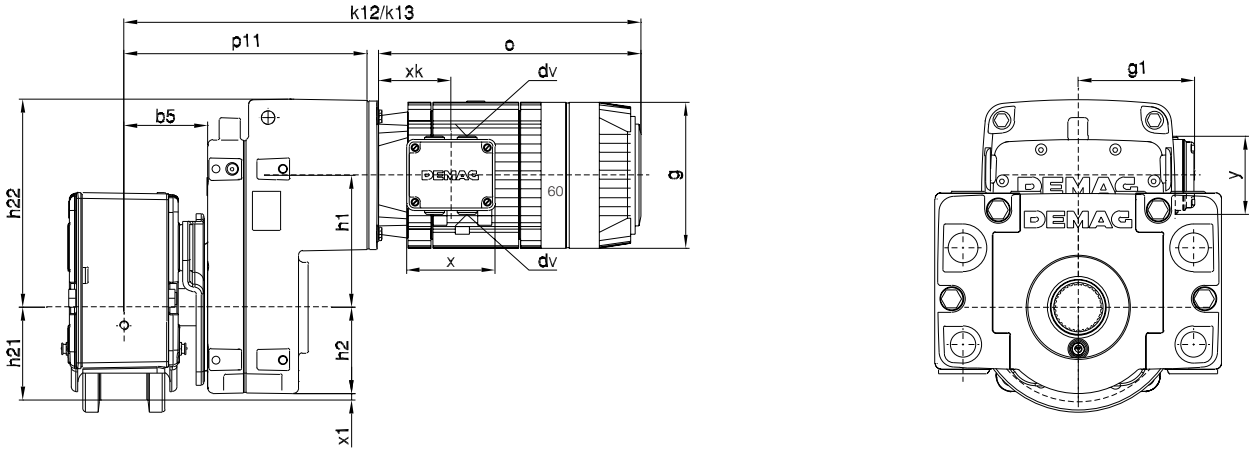
42013644.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
315	AD. 50	71A	71A	607		348	130	244	140	134	178	115	157,5	304	128	77	+42 (+29)	108	4 x M25
		71B	71B	627				264											
		80A	80A	650				285	158	143						82			
		80B	80B	665				300											
		90A	90A	680				315	178	153						92			
		90B	90B	696				331											
		100A	100A	716				349	196	176						103			
		100B	100B	733				366											
		112A	–	752				370	220	189					158	110		128	4 x M32
		–	112B	771				389											
		125A	–	804				420	246	200						122			
		–	125B	828				444											
		140A	140B	896				511	274	250				315	273	174		173	2 x M40 2 x M50
	AD. 60	71A	71A	634		372	130	244	140	134	218	140	157,5	344	128	77	+17 (+29)	108	4 x M25
		71B	71B	654				264											
		80A	80A	677				285	158	143						82			
		80B	80B	692				300											
		90A	90A	707				315	178	153						92			
		90B	90B	723				331											
		100A	100A	743				349	196	176					158	103		128	4 x M32
		100B	100B	760				366											
		112A	–	779				370	220	189						110			
		–	112B	798				389											
		125A	–	831				420	246	200						122			
		–	125B	855				444											
		140A	140B	922				511	274	250				355	273	174		173	2 x M40 2 x M50

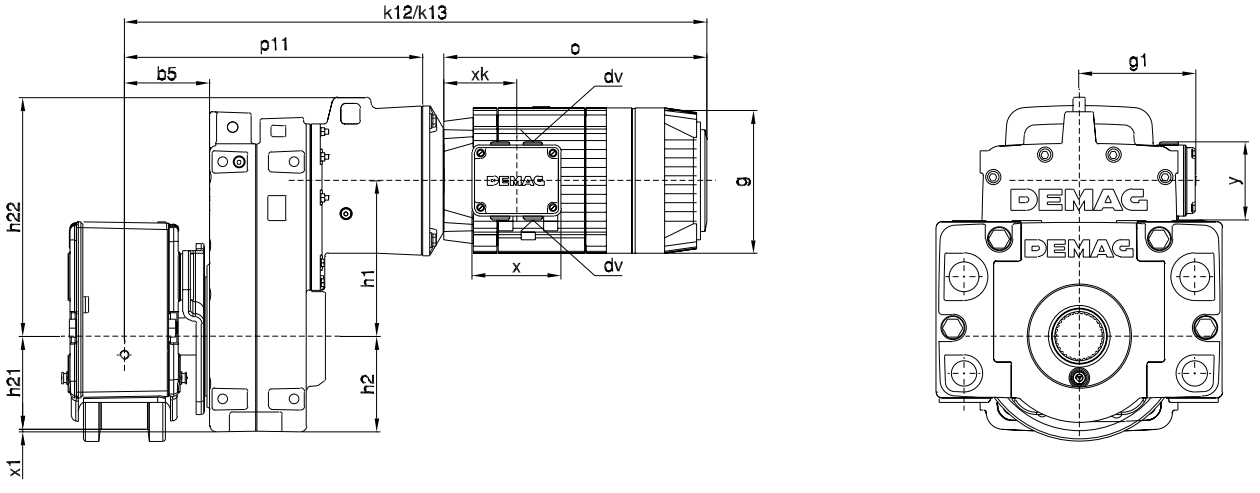
(...) Torque bracket obstacle edge

3.30 DRS 315 – 500 wheel block with offset gearbox and KBF/KBA motor

AD 60 2 and 3-stage coupling design



AD 70 - AD 80 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.2

41680844.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
315	AD. 70	71A	71A	742		484	130	244	140	134	272	165	157,5	380	128	77	–8 (+29)	108	4 x M25
		71B	71B	762				264											
		80A	80A	785				285	158	143						82			
		80B	80B	800				300											
		90A	90A	815				315	178	153						92			
		90B	90B	831				331											
		100A	100A	851				349	196	176					158	103		128	4 x M32
		100B	100B	868				366											
		112A	–	890				370	220	189				382		110			
		–	112B	909				389											
		125A	–	942	–			420	246	200				395		122			
		–	125B	966				444											
		140A	140B	1033				511	274	250				409	273	174		173	2 x M40 2 x M50
		–	160B	1144				586	314	269				429					

 (...) Torque bracket obstacle edge

2033523c.p65/010407

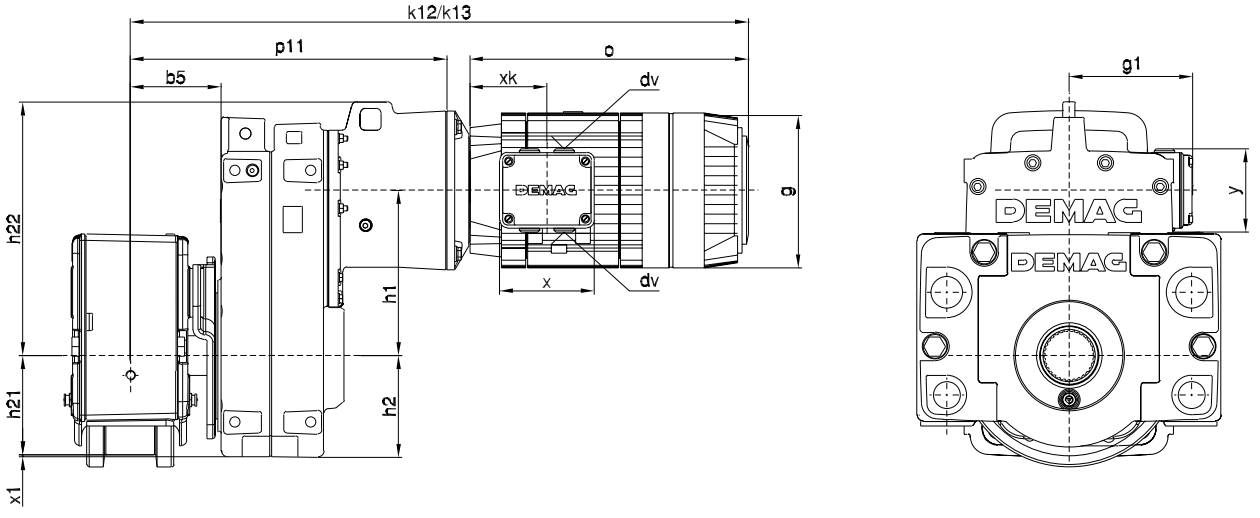
3.30 DRS 315 – 500 wheel block with offset gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
400	AD. 60	71A	71A	658		396	154	244	140	134	218	140	200	344	128	77	+60 (+55)	108	4 x M25
		71B	71B	678				264											
		80A	80A	701				285	158	143						82			
		80B	80B	716				300											
		90A	90A	731				315	178	153						92			
		90B	90B	747				331											
		100A	100A	767				349	196	176					158	103		128	4 x M32
		100B	100B	784				366											
		112A	–	803				370	220	189						110			
		–	112B	822				389											
		125A	–	855				420	246	200						122			
		–	125B	879				444											
		140A	140B	946				511	274	250				355	273	174		173	2 x M40 2 x M50
	AD. 70	71A	71A	766		508	154	244	140	134	272	165	200	380	128	77	+35 (+55)	108	4 x M25
		71B	71B	786				264											
		80A	80A	809				285	158	143						82			
		80B	80B	824				300											
		90A	90A	839				315	178	153						92			
		90B	90B	855				331											
		100A	100A	875				349	196	176					158	103		128	4 x M32
		100B	100B	892				366											
		112A	–	914				370	220	189				382		110			
		–	112B	933				389											
		125A	–	966	–			420	246	200				395		122			
		–	125B	990				444											
		140A	140B	1057				511	274	250				409	273	174		173	2 x M40 2 x M50
		–	160B	1168				586	314	269				429		221			
	AD. 80	80A	80A	830		529	154	285	158	143	328	201	200	461	128	82	-1 (+55)	108	4 x M25
		80B	80B	845				300											
		90A	90A	860				315	178	153						92			
		90B	90B	876				331											
		100A	100A	896				349	196	176					158	103		128	4 x M32
		100B	100B	913				366											
		112A	–	1006		605		364	220	189						110			
		–	112B	1030				388											
		125A	–	1064				420	246	200						122			
		–	125B	1088				444											
		140A	140B	1155				512	274	250				465	273	174		173	2 x M40 2 x M50
		–	160B	1267	–			587	314	269				485		221			
		–	180B	1342				663	354	293				505		237			
		–	200B	1420				729	394	311				525		246			

(...) Torque bracket obstacle edge

3.30 DRS 315 – 500 wheel block with offset gearbox and KBF/KBA motor

A 70 - A 90 2 and 3-stage coupling design



For travel wheel types E, C and F see section 3.2

41681244.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
500	AD. 70	71A	71A	786		528	174	244	140	134	272	165	250	380	128	77	+85 (+82)	108	4 x M25
		71B	71B	806				264											
		80A	80A	829				285	158	143						82			
		80B	80B	844				300											
		90A	90A	859				315	178	153						92			
		90B	90B	875				331											
		100A	100A	895				349	196	176					158	103		128	4 x M32
		100B	100B	912				366											
		112A	–	934				370	220	189				382		110			
		–	112B	953				389											
		125A	–	986				420	246	200				395		122			
		–	125B	1010				444											
		140A	140B	1077				511	274	250				409	273	174		173	2 x M40 2 x M50
		–	160B	1188				586	314	269				429		221			
	AD. 80	80A	80A	850		549	174	285	158	143	328	201	250	461	128	82	+49 (+82)	108	4 x M25
		80B	80B	865				300											
		90A	90A	880				315	178	153						92			
		90B	90B	896				331											
		100A	100A	917				349	196	176					158	103		128	4 x M32
		100B	100B	934				366											
		112A	–	956		625		370	220	189						110			
		–	112B	975				389											
		125A	–	1008				420	246	200						122			
		–	125B	1032				444											
		140A	140B	1099				511	274	250				465	273	174		173	2 x M40 2 x M50
		–	160B	1210				586	314	269				485		221			
		–	180B	1287				663	354	293				505		237			
		–	200B	1366				729	394	311				525		246			

(...) Torque bracket obstacle edge

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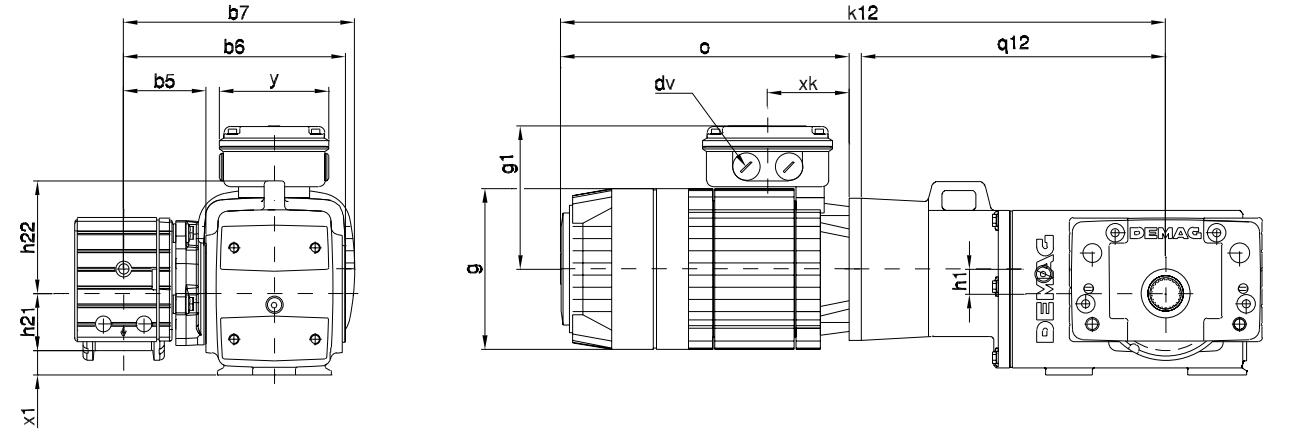
3.30 DRS 315 – 500 wheel block with offset gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12 2-stage D	k13 3-stage T	p11	b5	o	g	g1	h1	h2	h21	h22	x	xk	x1	y	dv
500	AU. 90	112A	–	1055		648	174	370	220	189	395	240	250	564	158	110	+10 (+82)	128	4 x M32
		–	112B	1074				389											
		125A	–	1107				420	246	200						122			
		–	125B	1131				444											
		140A	140B	1198				511	274	250					273	174		173	2 x M40 2 x M50
		–	160B	1309				586	314	269						221			
		–	180B	1386				663	354	293				572		237			
		–	200B	1465				729	394	311				592		246			
		–	225B	1505				769	440	332				615		256			

3.31 DRS 112 – 200 wheel block with angular gearbox and KBF/KBA motor

W 10 - W 20 2-stage coupling design



For travel wheel types E, C and F see section 3.1

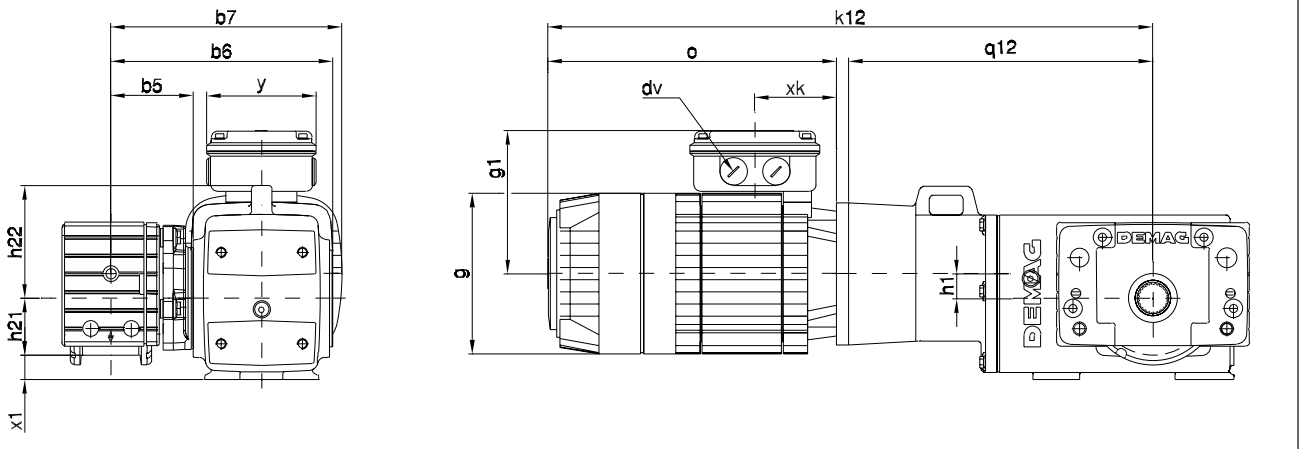
41815844.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
112	WU . 10	71A	71A	542	285	81	198	207	244	140	134	21,3	56	103,3	128	77	-9 (–18)	108	4 x M25
		71B	71B	562					264										
		80A	80A	585				216	285	158	143					82			
		–	80B	600					300										
	WU . 20	71A	71A	555	299,5	81	218	216	244	140	134	24,5	56	111,5	128	77	(–18)	108	4 x M25
		71B	71B	575					264										
		80A	80A	598				226	285	158	143					82			
		–	80B	613					300										
		90A	90A	628				235	315	178	153					92			
		–	90B	644					331										
125	WU . 10	71A	71A	542	285	87	204	224	244	140	134	21,3	62,5	103,3	128	77	-2 (–13)	108	4 x M25
		71B	71B	562					264										
		80A	80A	585				244	285	158	143					82			
		–	80B	600					300										

(...) Torque bracket obstacle edge

3.31 DRS 112 – 200 wheel block with angular gearbox and KBF/KBA motor

W 20 - W 50 2-stage coupling design



For travel wheel types E, C and F see section 3.1

41815844.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
125	WU . 20	71A	71A	555	299,5	87	224	224	244	140	134	24,5	62,5	111,5	128	77	–18	108	4 x M25
		71B	71B	575					264										
		80A	80A	598				234	285	158	143					82			
		–	80B	613					300										
		90A	90A	628				243	315	178	153					92			
		–	90B	644					331										
	WU . 30	71A	71A	576	316	88	245	234	244	140	134	27,5	62,5	119,5	128	77	–28	108	4 x M25
		71B	71B	596					264										
		80A	80A	619				243	285	158	143					82			
		–	80B	634					300										
		90A	90A	649				253	315	178	153					92			
		–	90B	665					331										
		100A	100A	686				262	349	196	176				158	103		128	4 x M32
		–	100B	703					366										
160	WU . 20	71A	71A	555	299,5	103	240	234	244	140	134	24,5	80	111,5	128	77	0 (–2)	108	4 x M25
		71B	71B	575					264										
		80A	80A	598				243	285	158	143					82			
		–	80B	613					300										
		90A	90A	628				253	315	178	153					92			
		–	90B	644					331										
	WU . 30	71A	71A	576	316	104	261	234	244	140	134	27,5	80	119,5	128	77	–10	108	4 x M25
		71B	71B	596					264										
		80A	80A	619				243	285	158	143					82			
		–	80B	634					300										
		90A	90A	649				253	315	178	153					92			
		–	90B	665					331										
		100A	100A	686				262	349	196	176				158	103		128	4 x M32
		–	100B	703					366										

2033523c.p65/010407

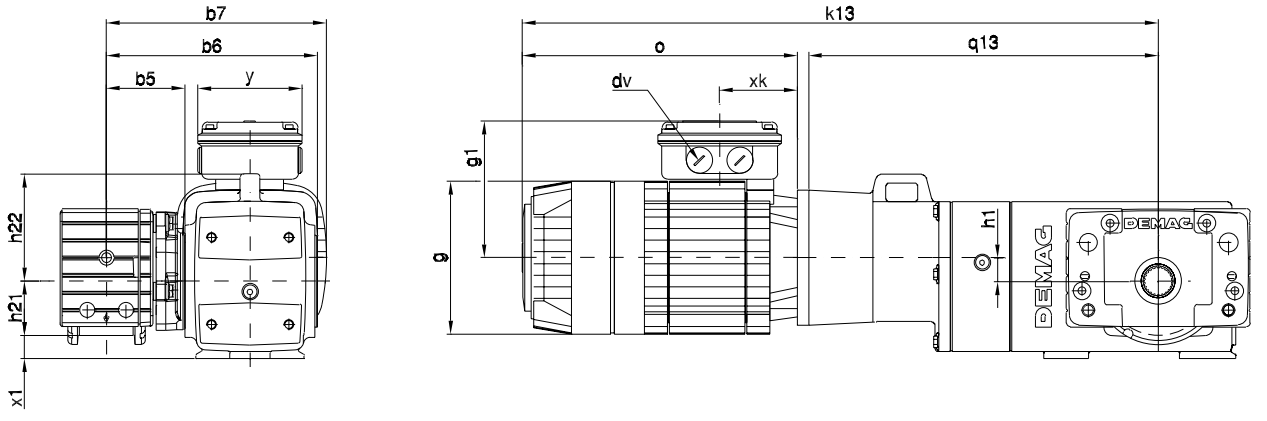
3.31 DRS 112 – 200 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
160	WU . 40	71A	71A	596	336	104	290,5	267	244	140	134	28,6	80	118,6	128	77	–25	108	4 x M25
		71B	71B	616					264										
		80A	80A	639				275	285	158	143					82			
		–	80B	654					300										
		90A	90A	669				285	315	178	153					92			
		–	90B	685					331										
		100A	100A	705				294	349	196	176				158	103		128	4 x M32
		–	100B	722					366										
		112A	–	768	366			306	370	220	189			131,6		110			
		–	112B	787					389										
		125A	–	820				319	420	246	200					122			
		–	125B	844					444										
200	WU . 30	71A	71A	576	316	114	271	261	244	140	134	27,5	100	119,5	128	77	+10 (–5)	108	4 x M25
		71B	71B	596					264										
		80A	80A	619				270	285	158	143					82			
		–	80B	634					300										
		90A	90A	649				280	315	178	153					92			
		–	90B	665					331										
		100A	100A	686				289	349	196	176				158	103		128	4 x M32
		–	100B	703					366										
	WU . 40	71A	71A	596	336	114	300,5	277	244	140	134	28,6	100	118,6	128	77	–5	108	4 x M25
		71B	71B	616					264										
		80A	80A	639				285	285	158	143					82			
		–	80B	654					300										
		90A	90A	669				295	315	178	153					92			
		–	90B	685					331										
		100A	100A	705				304	349	196	176				158	103		128	4 x M32
		–	100B	722					366										
		112A	112A	768	366			316	370	220	189			131,6		110			
		–	112B	787					389										
		125A	–	820				329	420	246	200					122			
		–	125B	844					444										
	WU . 50	71A	71A	629	369	114	325,5	288	244	140	134	33,3	100	136,3	128	77	–20	108	4 x M25
		71B	71B	649					264										
		80A	80A	672				297	285	158	143					82			
		–	80B	687					300										
		90A	90A	702				307	315	178	153					92			
		–	90B	718					331										
		100A	100A	738				316	349	196	176				158	103		128	4 x M32
		–	100B	755					366										
		112A	–	801	395			328	370	220	189			158,3		110			
		–	112B	820					389										
		125A	–	853				341	420	246	200					122			
		–	125B	877					444										
		140A	140B	944				355	511	274	250				273	174		173	2 x M40 2 x M50

(...) Torque bracket obstacle edge

3.32 DRS 112 – 200 wheel block with angular gearbox and KBF/KBA motor

W 20 - W 50 3-stage coupling design



For travel wheel types E, C and F see section 3.1

41815845.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
112	WU . 20	71A	71A	617	361,5	81	218	216	244	140	134	24,5	56	111,5	128	77	-24	108	4 x M25
		71B	71B	637					264										
		80A	80A	660				226	285	158	143					82			
		–	80B	675					300										
125	WU . 20	71A	71A	617	361,5	87	224	224	244	140	134	24,5	62,5	111,5	128	77	–18	108	4 x M25
		71B	71B	637					264										
		80A	80A	660				234	285	158	143					82			
		–	80B	675					300										
	WU . 30	71A	71A	639	378	88	245	234	244	140	134	27,5	62,5	119,5	128	77	–28	108	4 x M25
		71B	71B	659					264										
		80A	80A	682				243	285	158	143					82			
		–	80B	697					300										

2033523c.p65/010407

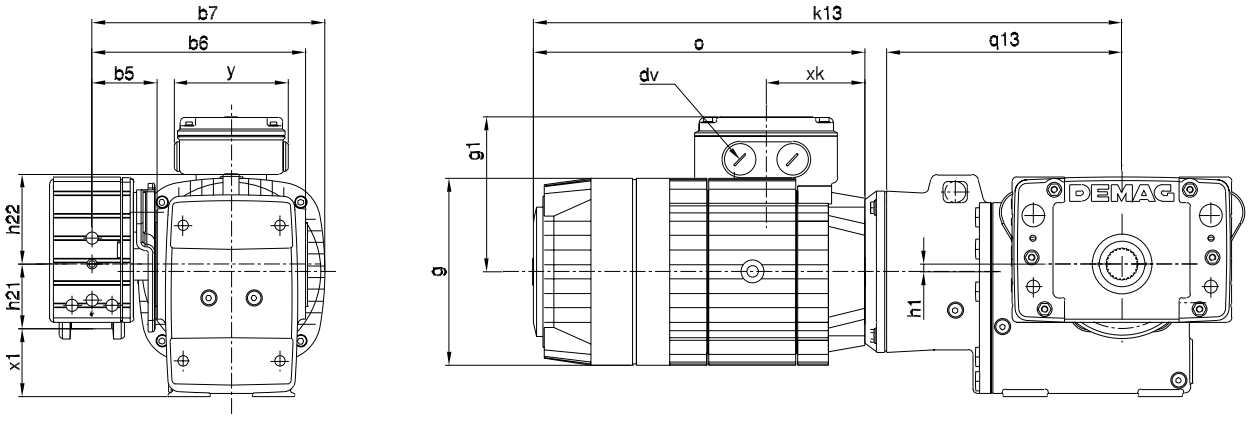
3.32 DRS 112 – 200 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
160	WU . 20	71A	71A	617	361,5	103	240	241	244	140	134	24,5	80	111,5	128	77	0 (–2)	108	4 x M25
		71B	71B	637					264										
		80A	80A	660				250	285	158	143					82			
		–	80B	675					300										
	WU . 30	71A	71A	639	378	104	261	251	244	140	134	27,5	80	119,5	128	77	–10	108	4 x M25
		71B	71B	659					264										
		80A	80A	682				260	285	158	143					82			
		–	80B	697					300										
	WU . 40	71A	71A	666	406	104	290,5	267	244	140	134	28,6	80	118,6	128	77	–25	108	4 x M25
		71B	71B	686					264										
		80A	80A	709				275	285	158	143					82			
		–	80B	724					300										
200	WU . 30	71A	71A	639	378	114	271	261	244	140	134	27,5	100	119,5	128	77	10 (–5)	108	4 x M25
		71B	71B	659					264										
		80A	80A	682				270	285	158	143					82			
		–	80B	697					300										
	WU . 40	71A	71A	666	406	114	300,5	277	244	140	134	28,6	100	118,6	128	77	–5	108	4 x M25
		71B	71B	686					264										
		80A	80A	709				285	285	158	143					82			
		–	80B	724					300										
	WU . 50	71A	71A	699	439		325,5	288	244	140	134	33,3	100	136,3	128	77	–20	108	4 x M25
		71B	71B	719					264										
		80A	80A	742				297	285	158	143					82			
		–	80B	757					300										

(...) Torque bracket obstacle edge

3.33 DRS 200 wheel block with angular gearbox and KBF/KBA motor

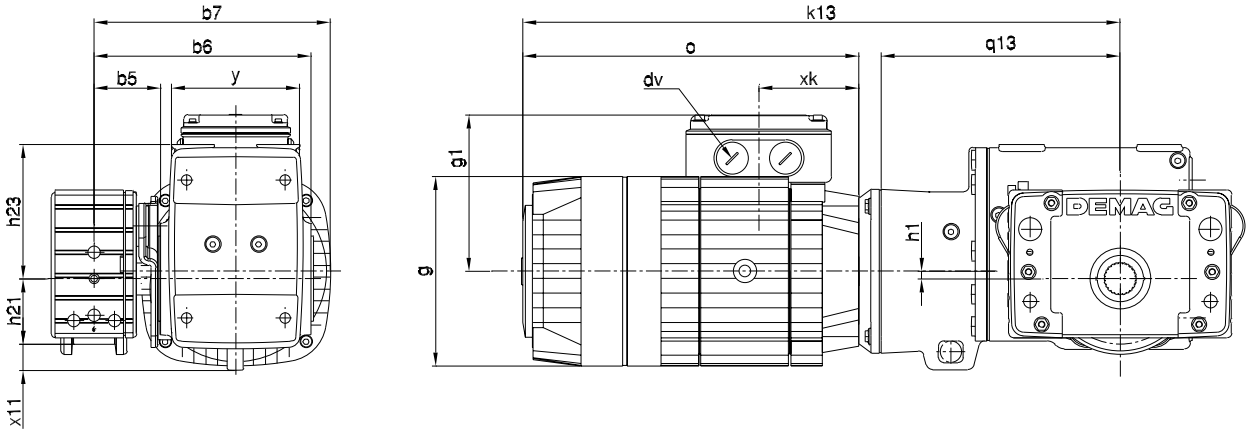
W 60 3-stage coupling design



42013444.eps

W 60 3-stage coupling design

Note: This model offers greater ground clearance



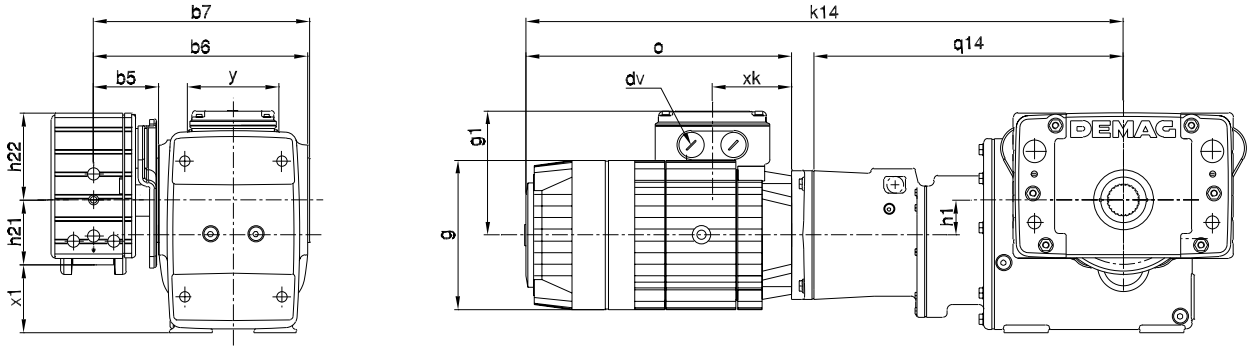
For travel wheel types E, C and F see section 3.1

42200244.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	h23	x	xk	x1	x11	y	dv
200	WU . 60	**71A**	**71A**	621	364	98	331,5	331	244	140	134	11,5	100	107	205	128	77	–105	–7	108	4 x M25
		71B	**71B**	641					264												
		80A	**80A**	664					285	158	143						82				
		–	**80B**	679					300												
		90A	**90A**	694					315	178	153						92				
		–	**90B**	710					331												
		100A	**100A**	731					349	196	176					158	103			128	4 x M32
		–	**100B**	748					366												
		112A	–	770					370	220	189			138,5			110				
		–	**112B**	789					389												
		125A	–	822				336	420	246	200						122				
		–	**125B**	846					444												
		140A	**140B**	913				350	511	274	250					273	174		-25	173	2 x M40
			160B	1024				370	586	314	269								-45,5		2 x M50

3.34 DRS 200 wheel block with angular gearbox and KBF/KBA motor

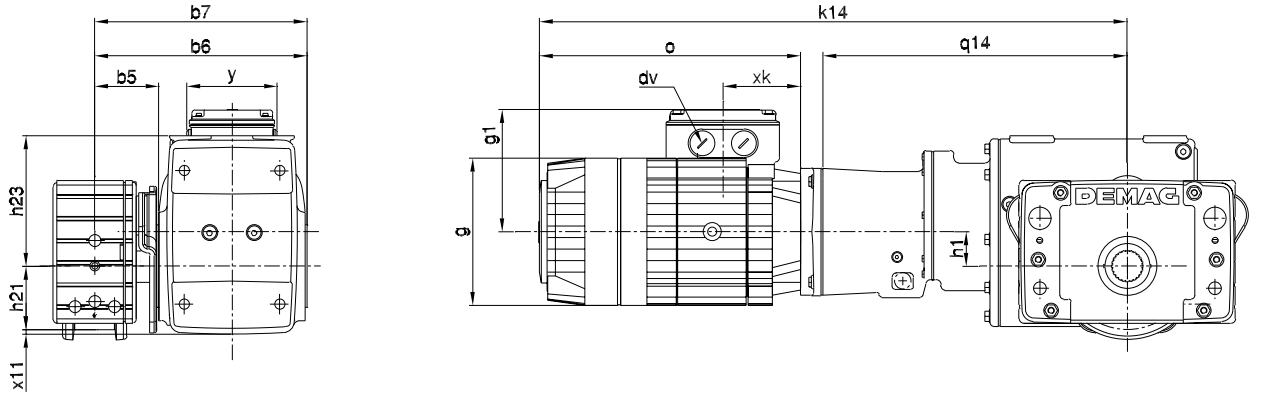
W 60 4-stage coupling design



42200344.eps

W 60 4-stage coupling design

Note: This model offers greater ground clearance



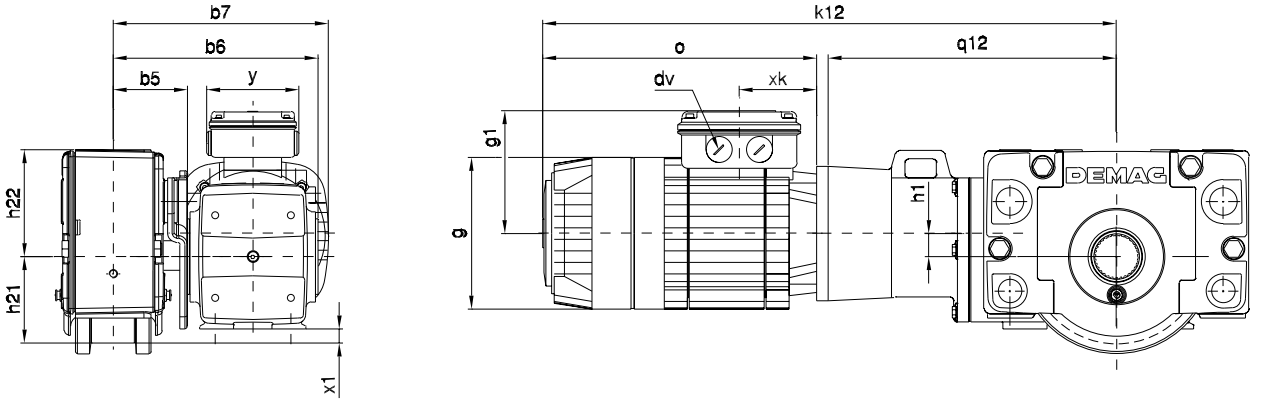
42200444.eps

For travel wheel types E, C and F see section 3.1

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	o	g	g1	h1	h21	h22	h23	x	xk	x1	x11	y	dv
200	WU . 60	71A	71A	708	449	98	331,5	244	140	134	54,5	100	107	205	128	77	–105	–7	108	4 x M25
		71B	71B	728				264												
		80A	80A	751				285	158	143						82				
		–	80B	766				300												
		90A	90A	781				315	178	153						92				
		–	90B	797				331												
		100A	100A	818				349	196	176					158	103			128	4 x M32
		–	100B	835				366												
		112A	–	839				370	220	189			138,5			110				
		–	112B	858				389												

3.35 DRS 250 wheel block with angular gearbox and KBF/KBA motor

W 40 - W 50 2-stage coupling design



For travel wheel types E, C and F see section 3.2

42014144.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU . 40	**71A**	**71A**	596	336	108	294,5	294	244	140	134	28,6	125	156	128	77	+20	108	4 x M25
		71B	**71B**	616					264										
		80A	**80A**	639					285	158	143					82			
		–	**80B**	654					300										
		90A	**90A**	669					315	178	153					92			
		–	**90B**	685					331										
		100A	**100A**	705				298	349	196	176				158	103		128	4 x M32
		–	**100B**	722					366										
		112A	–	773	366			310	370	220	189					110			
		–	**112B**	792					389										
		125A	–	823				323	420	246	200					122			
		–	**125B**	847					444										
	WU . 50	**71A**	**71A**	629	369	108	319,5	282	244	140	134	33,3	125	156	128	77	+5 (+20)	108	4 x M25
		71B	**71B**	649					264										
		80A	**80A**	672				292	285	158	143					82			
		–	**80B**	687					300										
		90A	**90A**	702				301	315	178	153					92			
		–	**90B**	718					331										
		100A	**100A**	738				310	349	196	176				158	103		128	4 x M32
		–	**100B**	755					366										
		112A	–	801	395			322	370	220	189			158,3		110			
		–	**112B**	820					389										
		125A	–	853				335	420	246	200					122			
		–	**125B**	877					444										
		140A	**140B**	944				349	511	274	250			170,3	273	174		173	2 x M40 2 x M50

(...) Torque bracket obstacle edge

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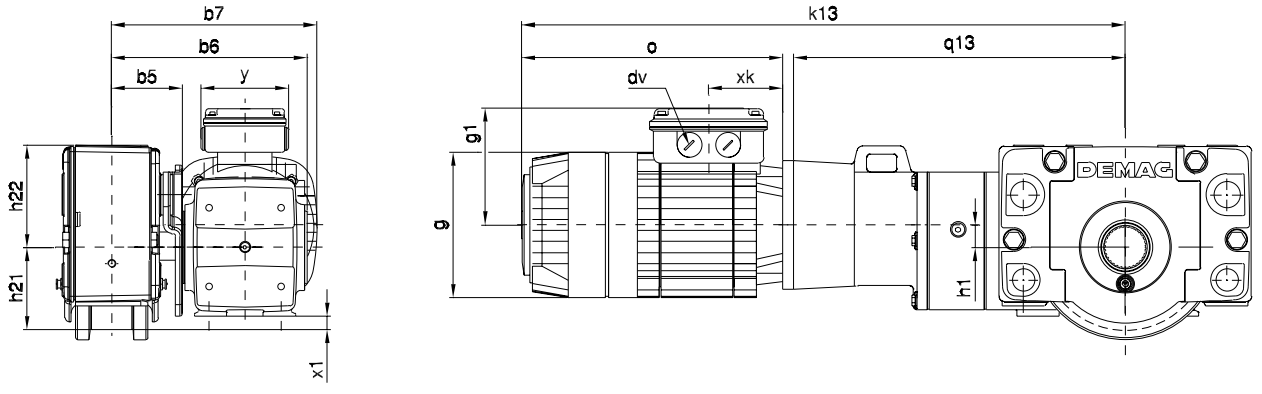
3.36 DRS 250 wheel block with angular gearbox and KBF/KBA motor

W 40 - W 50 3-stage coupling design



For travel wheel types E, C and F see section 3.2

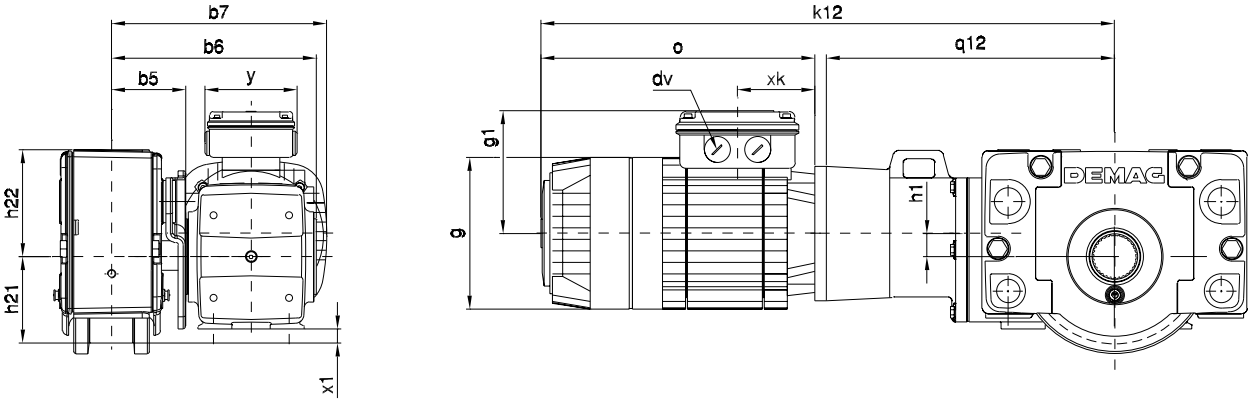
42014145.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU . 40	71A	71A	666	406	108	294,5	294	244	140	134	28,6	125	156	128	77	+20	108	4 x M25
		71B	71B	686					264										
		80A	80A	709					285	158	143					82			
		–	80B	724					300										
	WU . 50	71A	71A	699	439	108	319,5	282	244	140	134	33,3	125	156	158	77	+5 (+20)	128	4 x M25
		71B	71B	719					264										
		80A	80A	742				292	285	158	143					82			
		–	80B	757					300										

(...) Torque bracket obstacle edge

3.37 DRS 315 wheel block with angular gearbox and KBF/KBA motor

W 50 2-stage coupling design



For travel wheel types E, C and F see section 3.2

42014144.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k12	q12	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
315	WU . 50	71A	71A	629	369	130	341,5	304	244	140	134	33,3	157,5	193	128	77	+37 (+29)	108	4 x M25
		71B	71B	649					264										
		80A	80A	672					285	158	143					82			
		–	80B	687				313	300										
		90A	90A	702				323	315	178	153					92			
		–	90B	718					331										
		100A	100A	738				332	349	196	176				158	103		128	4 x M32
		–	100B	755					366										
		112A	–	801	395			344	370	220	189					110			
		–	112B	820					389										
		125A	–	853				357	420	246	200					122			
		–	125B	877					444										
		140A	140B	944				371	511	274	250				273	174		173	2 x M40 2 x M50

(...) Torque bracket obstacle edge

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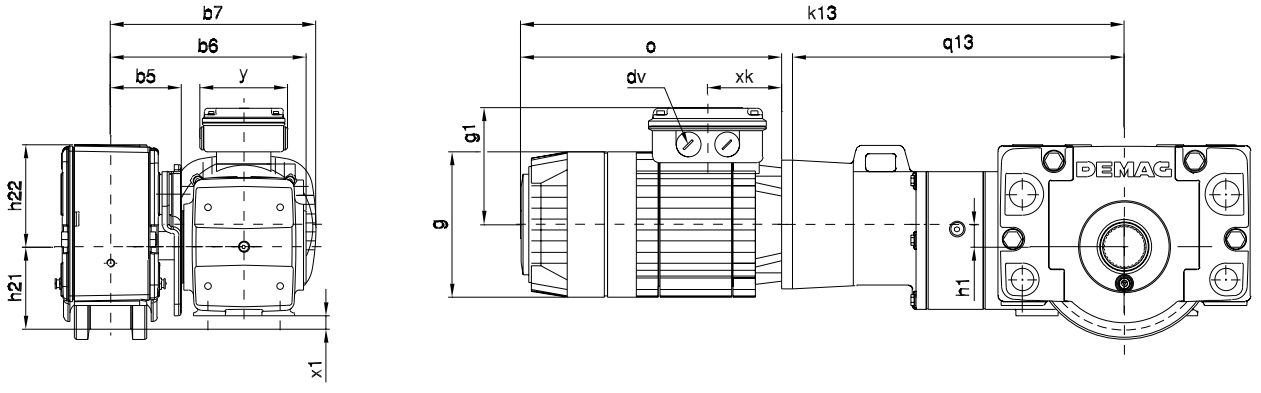
3.38 DRS 315 wheel block with angular gearbox and KBF/KBA motor

W 50 3-stage coupling design



For travel wheel types E, C and F see section 3.2

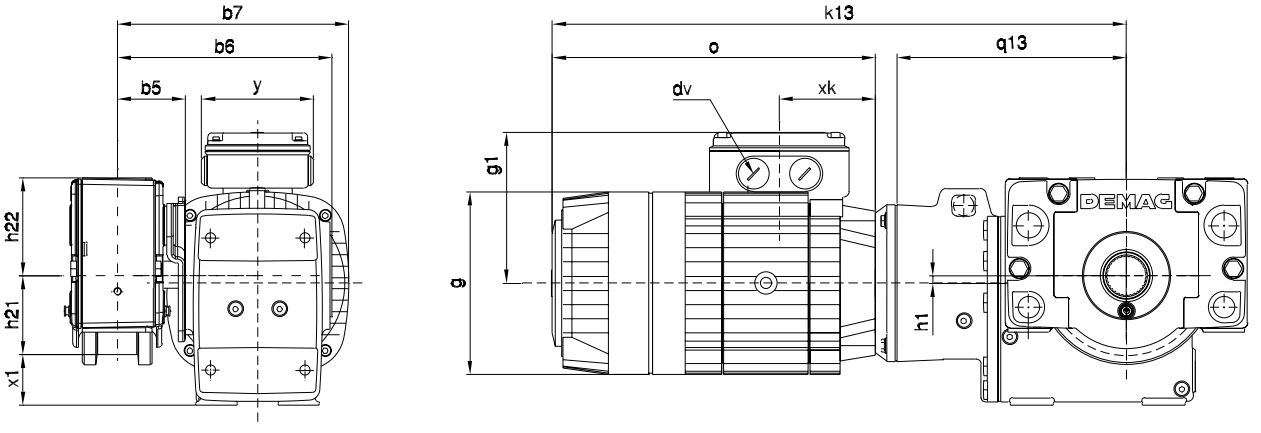
42014145.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
315	WU . 50	71A	71A	699	439	130	341,5	304	244	140	134	33,3	157,5	193	128	77	+37 (+29)	108	4 x M25
		71B	71B	719					264										
		80A	80A	742					285	158	143					82			
		–	80B	757				313	300										

(...) Torque bracket obstacle edge

3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 60 - W 80 3-stage coupling design



For travel wheel types E, C and F see section 3.2

42013944.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU . 60	71A	71A	621	364	108	341,5	341	244	140	134	11,5	125	156	128	77	-80	108	4 x M25
		71B	71B	641					264										
		80A	80A	664					285	158	143					82			
		–	80B	679					300										
		90A	90A	694					315	178	153					92			
		–	90B	710					331										
		100A	100A	731					349	196	176				158	103		128	4 x M32
		–	100B	748					366										
		112A	–	770					370	220	189					110			
		–	112B	789					389										
		125A	–	822				346	420	246	200					122			
		–	125B	846					444										
		140A	140B	913				360	511	274	250				273	174		173	2 x M40 2 x M50
			160B	1024				380	586	314	269			168,5		221			
315	WU . 60	71A	71A	621	364	130	363,5	315	244	140	134	11,5	157,5	193	128	77	–48	108	4 x M25
		71B	71B	641					264										
		80A	80A	664				324	285	158	143					82			
		–	80B	679					300										
		90A	90A	694				334	315	178	153					92			
		–	90B	710					331										
		100A	100A	731				343	349	196	176				158	103		128	4 x M32
		–	100B	748					366										
		112A	–	770				355	370	220	189					110			
		–	112B	789					389										
		125A	–	822				368	420	246	200					122			
		–	125B	846					444										
		140A	140B	913				382	511	274	250				273	174		173	2 x M40 2 x M50
			160B	1024				402	586	314	269					221			

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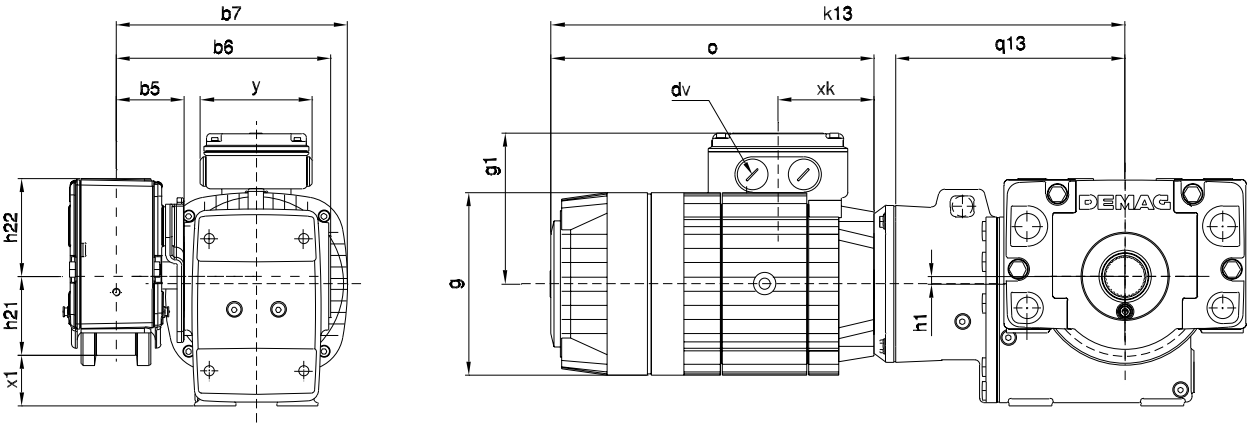
3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
315	WU . 70	71A	71A	649	387	130	404	335	244	140	134	6	157,5	193	128	77	–88	108	4 x M25
		71B	71B	669					264										
		80A	80A	692				344	285	158	143					82			
		–	80B	707					300										
		90A	90A	722				354	315	178	153					92			
		–	90B	738					331										
		100A	100A	759				363	349	196	176				158	103		128	4 x M32
		–	100B	776					366										
		112A	–	873	462			375	370	220	189					110			
		–	112B	892					389										
		125A	–	925				388	420	246	200					122			
		–	125B	949					444										
		140A	140B	1016				402	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1127				422	586	314	269					221			
		–	180B	1204				442	663	354	293					237			
		–	200B	1283				462	729	394	311					246			
	WU. 80	71A	71A	664	406	130	409	338	244	140	134	32	157,5	193	128	77	–118	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				347	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				357	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				366	349	196	176				158	103		128	4 x M32
		–	100B	790					366										
		112A	–	888	481			378	370	220	189					110			
		–	112B	907					389										
		125A	–	940				391	420	246	200					122			
		–	125B	964					444										
		140A	140B	1031				405	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1142				425	586	314	269					221			
		–	180B	1219				445	663	354	293					237			
		–	200B	1298				465	729	394	311					246			
400	WU . 70	71A	71A	649	387	154	428	359	244	140	134	6	200	240	128	77	–45	108	4 x M25
		71B	71B	669					264										
		80A	80A	692				368	285	158	143					82			
		–	80B	707					300										
		90A	90A	722				378	315	178	153					92			
		–	90B	738					331										
		100A	100A	759				387	349	196	176				158	103		128	4 x M32
		–	100B	776					366										
		112A	–	873	462			399	370	220	189					110			
		–	112B	892					389										
		125A	–	925				412	420	246	200					122			
		–	125B	949					444										
		140A	140B	1016				426	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1127				446	586	314	269					221			
		–	180B	1204				466	663	354	293					237			
		–	200B	1283				486	729	394	311					246			

3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 80 - W 100 3-stage coupling design



For travel wheel types E, C and F see section 3.2

42013944.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
400	WU. 80	71A	71A	664	406	154	433	362	244	140	134	32	200	240	128	77	–75	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				371	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				381	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				390	349	196	176				158	103		128	4 x M32
		–	100B	790					366										
		112A	–	888	481			402	370	220	189					110			
		–	112B	907					389										
		125A	–	940				415	420	246	200					122			
		–	125B	964					444										
		140A	140B	1031				429	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1142				449	586	314	269					221			
		–	180B	1219				469	663	354	293					237			
		–	200B	1298				489	729	394	311					246			
	WU. 90	112A	–	926	519	154	469	419	370	220	189	32	200	240	158	110	–115	128	4 x M32
		–	112B	945					389										
		125A	–	978				432	420	246	200					122			
		–	125B	1002					444										
		140A	140B	1069				446	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1180				466	586	314	269					221			
		–	180B	1256				486	663	354	293					237			
		–	200B	1336				506	729	394	311					246			
		–	225B	1376				529	769	440	332			252		256			

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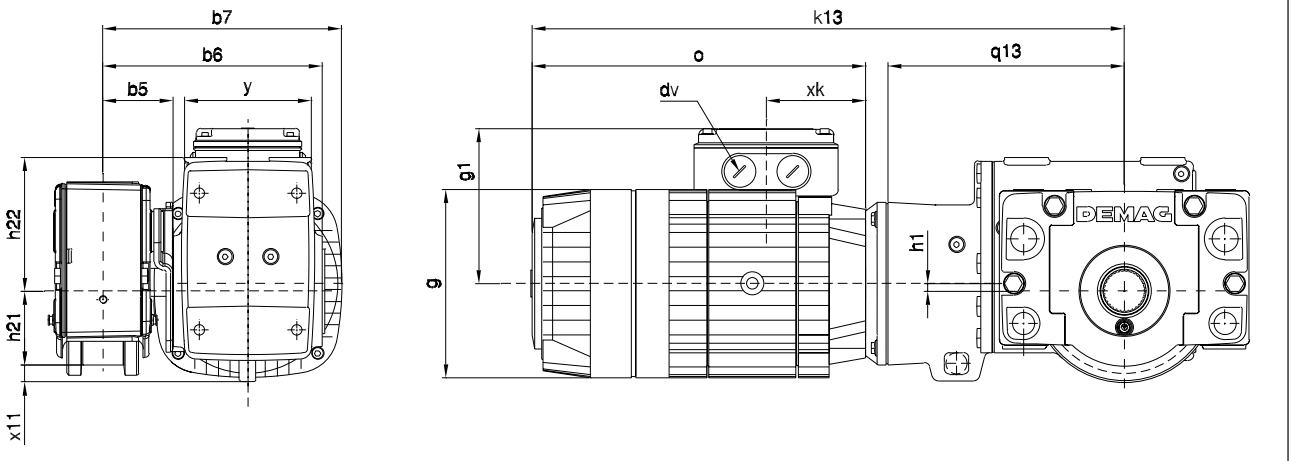
3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
500	WU. 80	71A	71A	664	406	174	453	382	244	140	134	32	250	316	128	77	–25	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				391	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				401	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				410	349	196	176					158			
		–	100B	790					366										
		112A	–	888	481			422	370	220	189				103	110		128	4 x M32
		–	112B	907					389										
		125A	–	940				435	420	246	200					122			
		–	125B	964					444										
		140A	140B	1031				449	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1142				469	586	314	269					221			
		–	180B	1219				489	663	354	293					237			
		–	200B	1298				509	729	394	311					246			
	WU. 90	112A	–	926	519	174	489	439	370	220	189	32	250	316	103	110	–65	128	4 x M32
		–	112B	945					389										
		125A	–	978				452	420	246	200					122			
		–	125B	1002					444										
		140A	140B	1069				466	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1180				486	586	314	269					221			
		–	180B	1256				506	663	354	293					237			
		–	200B	1336				526	729	394	311					246			
		–	225B	1376				549	769	440	332					256			
	WU. 100	112A	–	986	580	174	559	474	370	220	189	44	250	316	103	110	–140	128	4 x M32
		–	112B	1005					389										
		125A	–	1038				487	420	246	200					122			
		–	125B	1062					444										
		140A	140B	1138				501	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1240				521	586	314	269					221			
		–	180B	1317				543	663	354	293					237			
		–	200B	1396				561	729	394	311					246			
		–	225B	1436				584	769	440	332								

3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 60 - W 80 3-stage coupling design

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

42200544.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU . 60	71A	71A	621	364	108	341,5	341	244	140	134	11,5	125	205	128	77	+18	108	4 x M25
		71B	71B	641					264										
		80A	80A	664					285	158	143					82			
		–	80B	679					300										
		90A	90A	694					315	178	153					92			
		–	90B	710					331										
		100A	100A	731					349	196	176					103			
		–	100B	748					366										
		112A	–	770					370	220	189				158	110	+13,5	128	4 x M32
		–	112B	789					389										
		125A	–	822				346	420	246	200					122			
		–	125B	846					444										
		140A	140B	913				360	511	274	250				273	174	–0,5	173	2 x M40 2 x M50
			160B	1024				380	586	314	269					221	–21		
315	WU . 60	71A	71A	621	364	130	363,5	315	244	140	134	11,5	157,5	205	128	77	+30	108	4 x M25
		71B	71B	641					264										
		80A	80A	664				324	285	158	143					82			
		–	80B	679					300										
		90A	90A	694				334	315	178	153					92			
		–	90B	710					331										
		100A	100A	731				343	349	196	176					103			
		–	100B	748					366										
		112A	–	770				355	370	220	189				158	110		128	4 x M32
		–	112B	789					389										
		125A	–	822				368	420	246	200					122			
		–	125B	846					444										
		140A	140B	913				382	511	274	250				273	174		173	2 x M40 2 x M50
			160B	1024				402	586	314	269					221	+12		

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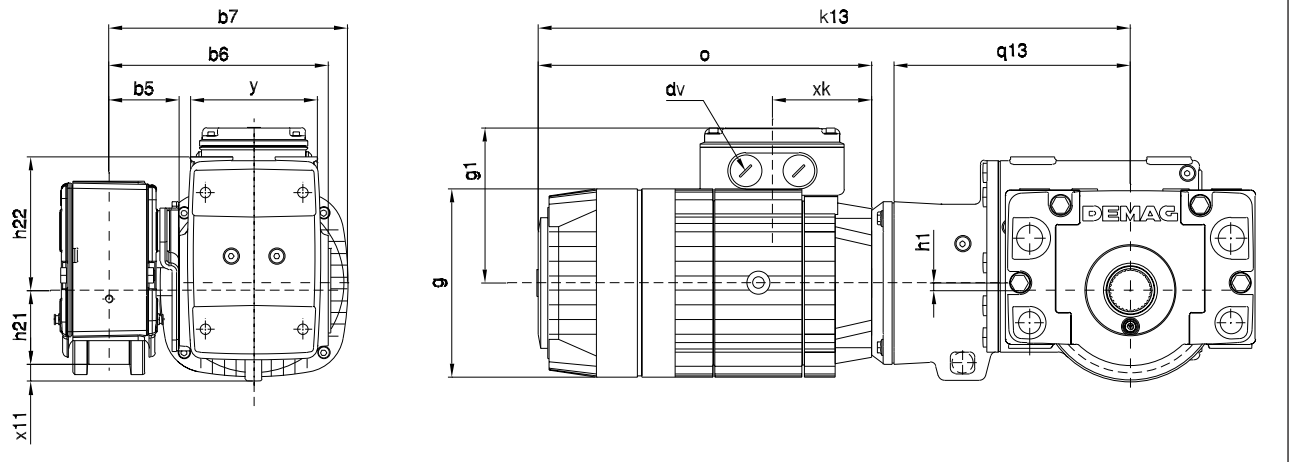
3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
315	WU . 70	71A	71A	649	387	130	404	335	244	140	134	6	157,5	245	128	77	+29,5	108	4 x M25
		71B	71B	669					264										
		80A	80A	692				344	285	158	143					82			
		–	80B	707					300										
		90A	90A	722				354	315	178	153					92			
		–	90B	738					331										
		100A	100A	759				363	349	196	176					103			
		–	100B	776					366										
		112A	–	873	462			375	370	220	189				158	110		128	4 x M32
		–	112B	892					389										
		125A	–	925				388	420	246	200					122			
		–	125B	949					444										
		140A	140B	1016				402	511	274	250				273	174	+26,5	173	2 x M40 2 x M50
		–	160B	1127				422	586	314	269					221	+6,5		
		–	180B	1204				442	663	354	284					237	–14		
		–	200B	1283				462	729	394	311					246	–34		
	WU. 80	71A	71A	664	406	130	409	338	244	140	134	32	157,5	275	128	77	+15,5	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				347	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				357	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				366	349	196	176					103			
		–	100B	790					366										
		112A	–	888	481			378	370	220	189				158	110		128	4 x M32
		–	112B	907					389										
		125A	–	940				391	420	246	200					122			
		–	125B	964					444										
		140A	140B	1031				405	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1142				425	586	314	269					221			
		–	180B	1219				445	663	354	284					237	+12,5		
		–	200B	1298				465	729	394	311					246	–8		

3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 70 - W 100 3-stage coupling design

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

42200544.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
400	WU . 70	71A	71A	649	387	154	433	359	244	140	134	6	200	245	128	77	+55	108	4 x M25
		71B	71B	669					264										
		80A	80A	692				368	285	158	143					82			
		–	80B	707					300										
		90A	90A	722				378	315	178	153					92			
		–	90B	738					331										
		100A	100A	759				387	349	196	176					103			
		–	100B	776					366										
		112A	–	873	462			399	370	220	189				158	110		128	4 x M32
		–	112B	892					389										
		125A	–	925				412	420	246	200					122			
		–	125B	949					444										
		140A	140B	1016				426	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1191				446	586	314	269					221	+49		
		–	180B	1204				466	663	354	293					237	+29		
		–	200B	1283				486	729	394	311					246	+9		
	WU. 80	71A	71A	664	406	154	469	362	244	140	134	32	200	275	128	77	+55	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				371	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				381	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				390	349	196	176					103			
		–	100B	790					366										
		112A	–	888	481			402	370	220	189				158	110		128	4 x M32
		–	112B	907					389										
		125A	–	940				415	420	246	200					122			
		–	125B	964					444										

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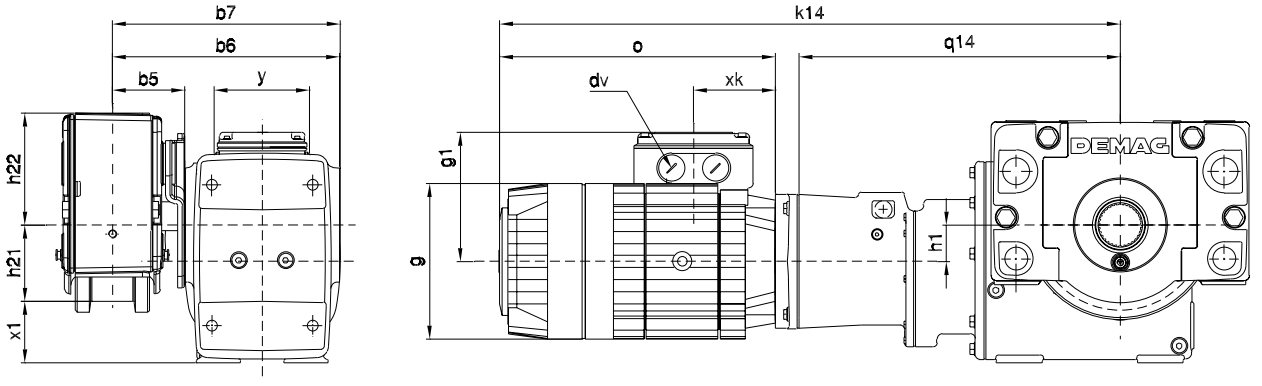
3.39 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k13	q13	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
400	WU. 80	140A	140B	1031	481	154	433	429	511	274	250	32	200	275	273	174	+55	173	2 x M40 2 x M50
		–	160B	1142				449	586	314	269					221			
		–	180B	1219				469	663	354	293					237			
		–	200B	1298				489	729	394	311					246	+35		
	WU. 90	112A	–	928	519	154	469	419	370	220	189	32	200	315	158	110	+34	128	4 x M32
		–	112B	947					389										
		125A	–	978				432	420	246	200					122			
		–	125B	1002					444										
		140A	140B	1069				446	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1180				466	586	314	269					221			
		–	180B	1270				486	663	354	293					237			
		–	200B	1336				506	729	394	311					246			
		–	225B	1376				529	769	440	332					256	+12		
500	WU. 80	71A	71A	664	406	174	453	382	244	140	134	32	250	275	128	77	+82	108	4 x M25
		71B	71B	684					264										
		80A	80A	707				391	285	158	143					82			
		–	80B	722					300										
		90A	90A	737				401	315	178	153					92			
		–	90B	753					331										
		100A	100A	773				410	349	196	176					103			
		–	100B	790					366										
		112A	–	888	481			422	370	220	189				158	110		128	4 x M32
		–	112B	907					389										
		125A	–	940				435	420	246	200					122			
		–	125B	964					444										
		140A	140B	1031				449	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1142				469	586	314	269					221			
		–	180B	1219				489	663	354	293					237			
		–	200B	1298				509	729	394	311					246			
	WU. 90	112A	–	928	519	174	489	439	370	220	189	32	250	315	158	110		128	4 x M32
		–	112B	947					389										
		125A	–	978				452	420	246	200					122			
		–	125B	1002					444										
		140A	140B	1069				466	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1180				486	586	314	269					221			
		–	180B	1270				506	663	354	293					237			
		–	200B	1336				526	729	394	311					246			
		–	225B	1376				549	769	440	332					256	+62		
	WU. 100	112A	–	986	580	174	559	474	370	220	189	44	250	390	158	110	+44	128	4 x M32
		–	112B	1005					389										
		125A	–	1038				487	420	246	200					122			
		–	125B	1067					444										
		140A	140B	1138				501	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1240				521	586	314	269					221			
		–	180B	1317				543	663	354	293					237			
		–	200B	1396				561	729	394	311					246			
		–	225B	1436				584	769	440	332					256			

3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 60 - W 80 4-stage coupling design



For travel wheel types E, C and F see section 3.2

42200644.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
250	WU. 60	71A	71A	708	449	108	341,5	341	244	140	134	54,5	125	156	128	77	–80	108	4 x M25
		71B	71B	728					264										
		80A	80A	751					285	158	143					82			
		–	80B	766					300										
		90A	90A	781					315	178	153					92			
		–	90B	797					331										
		100A	100A	818				346	349	196	176				158	103		128	4 x M32
		–	100B	835					366										
		112A	–	839				360	370	220	189					110			
		–	112B	858				380	389										
315	WU. 60	71A	71A	708	449	130	363,5	315	244	140	134	54,5	157,5	193	128	77	–48	108	4 x M25
		71B	71B	728					264										
		80A	80A	751				324	285	158	143					82			
		–	80B	766					300										
		90A	90A	781				334	315	178	153					92			
		–	90B	797					331										
		100A	100A	818				343	349	196	176				158	103		128	4 x M32
		–	100B	835					366										
		112A	–	839				355	370	220	189					110			
		–	112B	858					389										
	WU. 70	71A	71A	749	485	130	404	335	244	140	134	56	157,5	193	128	77	–88	108	4 x M25
		71B	71B	769					264										
		80A	80A	792				344	285	158	143					82			
		–	80B	807					300										
		90A	90A	822				354	315	178	153					92			
		–	90B	838					331										
		100A	100A	859				363	349	196	176				158	103		128	4 x M32
		–	100B	876					366										

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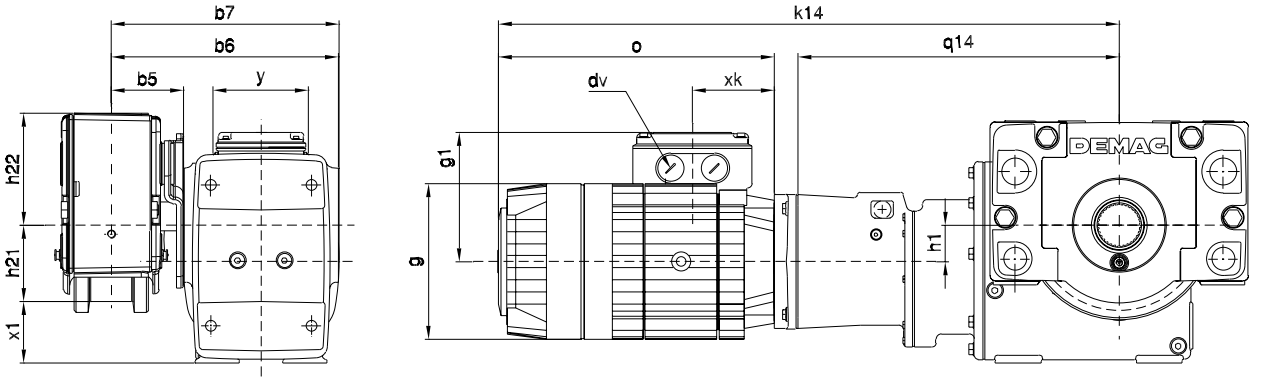
3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
315	WU. 70	112A	–	922	511	130	404	375	370	220	189	56	157,5	193	158	110	–88	128	4 x M32
		–	112B	941					389										
		125A	–	974				388	420	246	200					122			
		–	125B	998					444										
		140A	140B	1065				402	511	274	250				273	174		173	2 x M40 2 x M50
	WU. 80	71A	71A	764	504	130	409	338	244	140	134	82	157,5	193	128	77	–118	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				347	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				357	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				366	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			378	370	220	189					110			
		–	112B	955					389										
		125A	–	988				391	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				405	511	274	250				273	174		173	2 x M40 2 x M50
400	WU. 70	71A	71A	749	485	154	428	359	244	140	134	56	200	240	128	77	–45	108	4 x M25
		71B	71B	769					264										
		80A	80A	792				368	285	158	143					82			
		–	80B	807					300										
		90A	90A	822				378	315	178	153					92			
		–	90B	838					331										
		100A	100A	859				387	349	196	176				158	103		128	4 x M32
		–	100B	876					366										
		112A	–	922	511			399	370	220	189					110			
		–	112B	941					389										
		125A	–	974				412	420	246	200					122			
		–	125B	998					444										
		140A	140B	1065				426	511	274	250				273	174		173	4 x M40 4 x M50
	WU. 80	71A	71A	764	504	154	433	362	244	140	134	82	200	240	128	77	–75	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				371	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				381	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				390	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			402	370	220	189					110			
		–	112B	955					389										
		125A	–	988				415	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				429	511	274	250				273	174		173	2 x M40 2 x M50

3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 90 - W 100 4-stage coupling design



For travel wheel types E, C and F see section 3.2

42200644.eps

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
400	WU. 90	**80A**	**80A**	882	581	154	469	388	285	158	143	93	200	240	128	82	–115	108	4 x M25
		–	**80B**	897					300										
		90A	**90A**	912				398	315	178	153					92			
		–	**90B**	928					331										
		100A	**100A**	948				407	349	196	176				158	103		128	4 x M32
		–	**100B**	965					366										
		112A	–	987				419	370	220	189					110			
		–	**112B**	1006					389										
		125A	–	1031				432	420	246	200					122			
		–	**125B**	1063					444										
		140A	**140B**	1130				446	511	274	250				273	174		173	2 x M40 2 x M50
		–	**160B**	1241				466	586	314	269					221			

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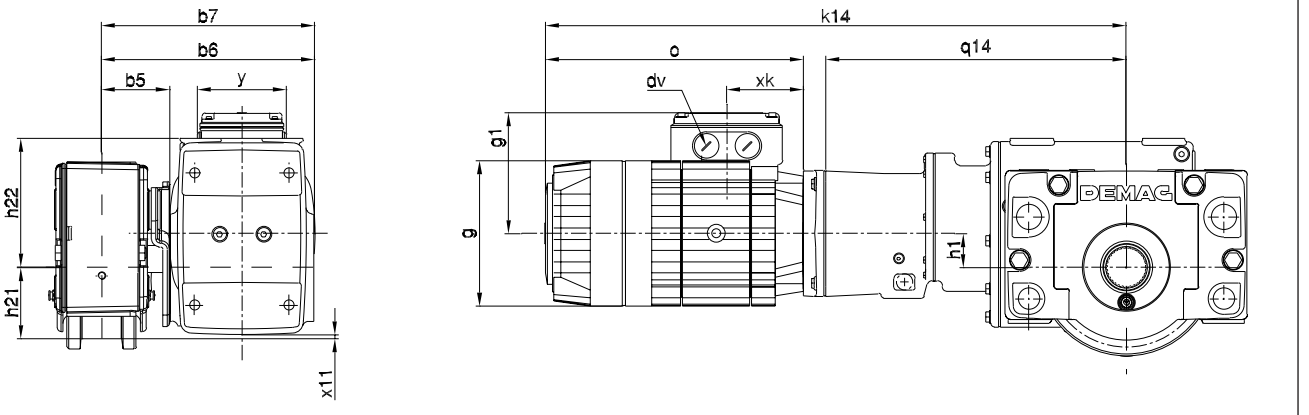
3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h22	x	xk	x1	y	dv
500	WU. 80	71A	71A	764	504	174	453	382	244	140	134	82	250	316	128	77	–25	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				391	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				401	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				410	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			422	370	220	189					110			
		–	112B	955					389										
		125A	–	988				435	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				449	511	274	250				273	174		173	2 x M40 2 x M50
	WU. 90	80A	80A	882	581	174	489	408	285	158	143	93	250	316	128	82	–65	108	4 x M25
		–	80B	897					300										
		90A	90A	914				418	315	178	153					92			
		–	90B	930					331										
		100A	100A	968				427	349	196	176				158	103		128	4 x M32
		–	100B	985					366										
		112A	–	1025				439	370	220	189					110			
		–	112B	1044					389										
		125A	–	1075				452	420	246	200					122			
		–	125B	1099					444										
		140A	140B	1179				466	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1254				486	586	314	269					221			
	WU. 100	80A	80A	946	646	174	559	443	285	158	143	122	250	316	128	82	–140	108	4 x M25
		–	80B	961					300										
		90A	90A	976				453	315	178	153					92			
		–	90B	992					331										
		100A	100A	1013				462	349	196	176				158	103		128	4 x M32
		–	100B	1030					366										
		112A	–	1124	721			474	370	220	189					110			
		–	112B	1143					389										
		125A	–	1176				487	420	246	200					122			
		–	125B	1200					444										
		140A	140B	1267				501	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1378				521	586	314	269					221			
		–	180B	1455				543	663	354	293					237			
		–	200B	1534				561	729	394	311					246			

3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 60 - W 80 4-stage coupling design

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

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DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
250	WU. 60	71A	71A	708	449	108	341,5	341	244	140	134	54,5	125	205	128	77	+18	108	4 x M25
		71B	71B	728					264										
		80A	80A	751					285	158	143					82			
		–	80B	766					300										
		90A	90A	781					315	178	153					92			
		–	90B	797					331										
		100A	100A	818				346	349	196	176				158	103		128	4 x M32
		–	100B	835					366										
		112A	–	839				360	370	220	189					110			
		–	112B	858				380	389										
315	WU. 60	71A	71A	708	448,5	130	363,5	315	244	140	134	54,5	157,5	205	128	77	+30	108	4 x M25
		71B	71B	728					264										
		80A	80A	751				324	285	158	143					82			
		–	80B	766					300										
		90A	90A	781				334	315	178	153					92			
		–	90B	797					331										
		100A	100A	818				343	349	196	176				158	103		128	4 x M32
		–	100B	835					366										
		112A	–	839				355	370	220	189					110			
		–	112B	858					389										
	WU. 70	71A	71A	749	485	130	404	335	244	140	134	56	157,5	245	128	77	+29,5	108	4 x M25
		71B	71B	769					264										
		80A	80A	792				344	285	158	143					82			
		–	80B	807					300										
		90A	90A	822				354	315	178	153					92			
		–	90B	838					331										
		100A	100A	859				363	349	196	176				158	103		128	4 x M32
		–	100B	876					366										

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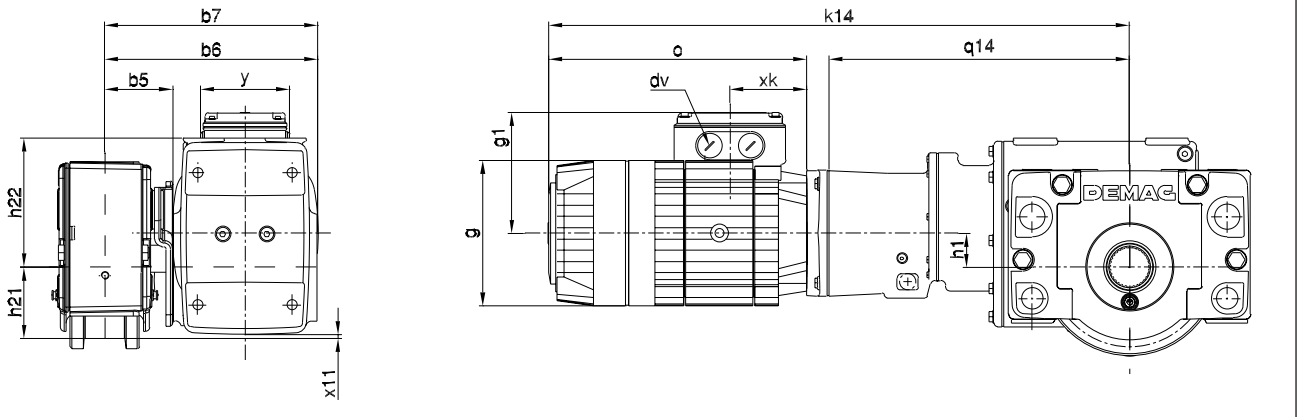
3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
315	WU. 70	112A	–	922	511	130	404	375	370	220	189	56	157,5	245	158	110	+29,5	128	4 x M32
		–	112B	941					389										
		125A	–	974				388	420	246	200					122			
		–	125B	999					444										
		140A	140B	1065				402	511	274	250				273	174		173	2 x M40 2 x M50
	WU. 80	71A	71A	764	504	130	409	338	244	140	134	82	157,5	275	128	77	+15,5	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				347	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				357	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				366	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			378	370	220	189					110			
		–	112B	955					389										
		125A	–	988				391	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				405	511	274	250				273	174		173	2 x M40 2 x M50
400	WU. 70	71A	71A	749	485	154	428	359	244	140	134	56	200	245	128	77	+55	108	4 x M25
		71B	71B	769					264										
		80A	80A	792				368	285	158	143					82			
		–	80B	807					300										
		90A	90A	822				378	315	178	153					92			
		–	90B	838					331										
		100A	100A	859				387	349	196	176				158	103		128	4 x M32
		–	100B	876					366										
		112A	–	922	511			399	370	220	189					110			
		–	112B	941					389										
		125A	–	974				412	420	246	200					122			
		–	125B	998					444										
		140A	140B	1065				426	511	274	250				273	174		173	4 x M40 4 x M50
	WU. 80	71A	71A	764	504	154	433	362	244	140	134	82	200	275	128	77	+55	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				371	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				381	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				390	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			402	370	220	189					110			
		–	112B	955					389										
		125A	–	988				415	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				429	511	274	250				273	174		173	2 x M40 2 x M50

3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

W 80 - W 100 4-stage coupling design

Note: This model offers greater ground clearance



For travel wheel types E, C and F see section 3.2

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DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
400	WU. 90	**80A**	**80A**	882	581	154	469	388	285	158	143	93	200	315	128	82	+34	108	4 x M25
		–	**80B**	897					300										
		90A	**90A**	914				398	315	178	153					92			
		–	**90B**	930					331										
		100A	**100A**	968				407	349	196	176				158	103		128	4 x M32
		–	**100B**	985					366										
		112A	–	1025				419	370	220	189					110			
		–	**112B**	1044					389										
		125A	–	1075				432	420	246	200					122			
		–	**125B**	1099					444										
		140A	**140B**	1179				446	511	274	250				273	174		173	2 x M40 2 x M50
		–	**160B**	1254				466	586	314	269					221			

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3.40 DRS 250 – 500 wheel block with angular gearbox and KBF/KBA motor

DRS wheel block size	Gearbox size	Motor KBF	Motor KBA	k14	q14	b5	b6	b7	o	g	g1	h1	h21	h23	x	xk	x11	y	dv
500	WU. 80	71A	71A	764	504	174	453	382	244	140	134	82	250	275	128	77	+82	108	4 x M25
		71B	71B	784					264										
		80A	80A	807				391	285	158	143					82			
		–	80B	822					300										
		90A	90A	837				401	315	178	153					92			
		–	90B	853					331										
		100A	100A	873				410	349	196	176				158	103		128	4 x M32
		–	100B	890					366										
		112A	–	936	530			422	370	220	189					110			
		–	112B	955					389										
		125A	–	988				435	420	246	200					122			
		–	125B	1012					444										
		140A	140B	1079				449	511	274	250				273	174		173	2 x M40 2 x M50
	WU. 90	80A	80A	882	581	174	489	408	285	158	143	93	250	315	128	82	+82	108	4 x M25
		–	80B	897					300										
		90A	90A	914				418	315	178	153					92			
		–	90B	930					331										
		100A	100A	968				427	349	196	176				158	103		128	4 x M32
		–	100B	985					366										
		112A	–	1025				439	370	220	189					110			
		–	112B	1044					389										
		125A	–	1075				452	420	246	200					122			
		–	125B	1099					444										
		140A	140B	1179				466	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1254				486	586	314	269					221			
	WU. 100	80A	80A	946	646	174	559	443	285	158	143	122	250	390	128	82	+44	108	4 x M25
		–	80B	961					300										
		90A	90A	979				453	315	178	153					92			
		–	90B	995					331										
		100A	100A	1033				462	349	196	176				158	103		128	4 x M32
		–	100B	1050					366										
		112A	–	1165	721			474	370	220	189					110			
		–	112B	1186					389										
		125A	–	1215				487	420	246	200					122			
		–	125B	1239					444										
		140A	140B	1319				501	511	274	250				273	174		173	2 x M40 2 x M50
		–	160B	1394				521	586	314	269					221			
		–	180B	1458				543	663	354	293					237			
		–	200B	1537				561	729	394	311					246			

4 Demag DRS wheel block system Options and accessories

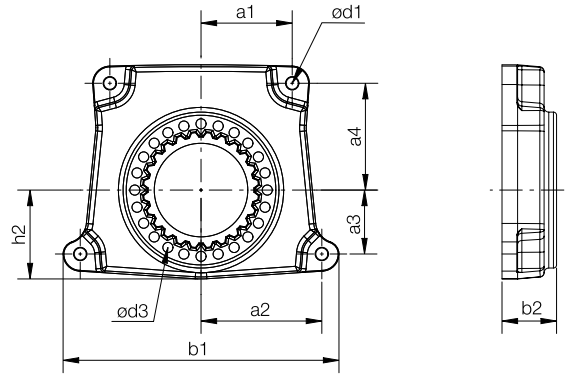
4.1 MA/MW torque brackets

Individual and central drive unit torque brackets

Dimensions and part nos. for

- **MA112 – MA250 offset gearboxes**
- **MW112 – MW250 angular gearboxes**

MA112-1/MA125-1/MA160-1



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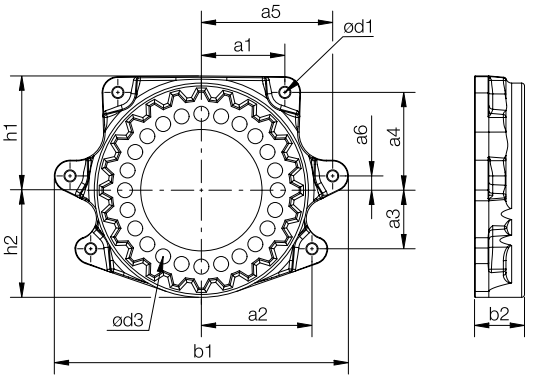
MA125-2/MA160-2/MA200-1



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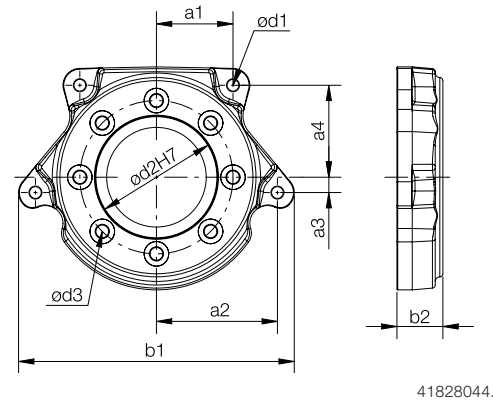
Gearbox	Designation	a1	a2	a3	a4	a5	a6	b1	b2	Lock nut d1	Lock nut MA in Nm	Locking screw d3	Locking screw MA in Nm	h1	h2
AM . 10/20	MA 112-1	50	79	10	60	–	–	180	30	8,5	35	8,2	8	72	51
AM . 10/20	MA 125-1	58,5	77,5	41	68,5	–	–	177	35			8,5		80	57
AM . 30	MA 125-2					92	10	206				10,5	60	80	75
AM . 20	MA 160-1	75	97,5	56	90	–	–	221	45	11	65	8,5	8	104	69
AM . 30/40	MA 160-2					110	12	246		11,5		10,5	60	105	75
AM . 30/40	MA 200-1	105	120	70	115	140	10	306		11				130	85

MW112-1/MW112-2



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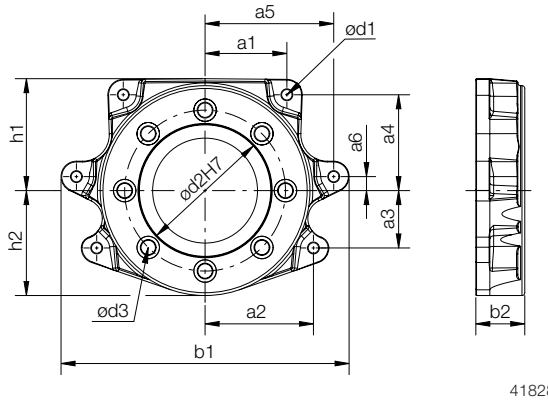
MW125-1/MW125-2/MW160-1/MW160-2/ MW200-1/MW200-2/MW200-3



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Gearbox	Designation	a1	a2	a3	a4	a5	a6	b1	b2	Lock nut d1	Lock nut MA in Nm	d2	Locking screw d3	Locking screw MA in Nm	h1	h2
WU . 10	MW 112-1	50	79	10	60	–	–	180	30	8,5	35	80	8,3	42	72	73,5
WU . 20	MW 112-2											95	10,3	85		
WU . 10	MW 125-1	58,5	77,5	41	68,5	92	10	206	35	8,5		80	8,3	42	80	75
WU . 20/30	MW125-2											95	10,3	85		
WU . 20/30	MW 160-1	75	97,5	56	90	110	12	246	45	11	65	95			105	82
WU . 40	MW 160-2											110	12,3	130		
WU . 30	MW 200-1	105	120	70	115	140	10	306	45	11		95	10,3	85	130	105
WU . 40	MW 200-2											110	12,3	130		
WU . 50	MW 200-3									11,5	85	130	16,3	330		

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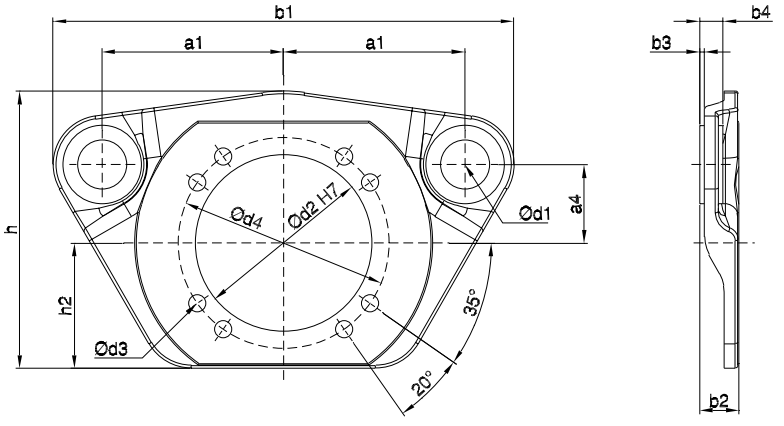
Torque bracket MA/MW



Material: GJS 500-2

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Torque bracket MA

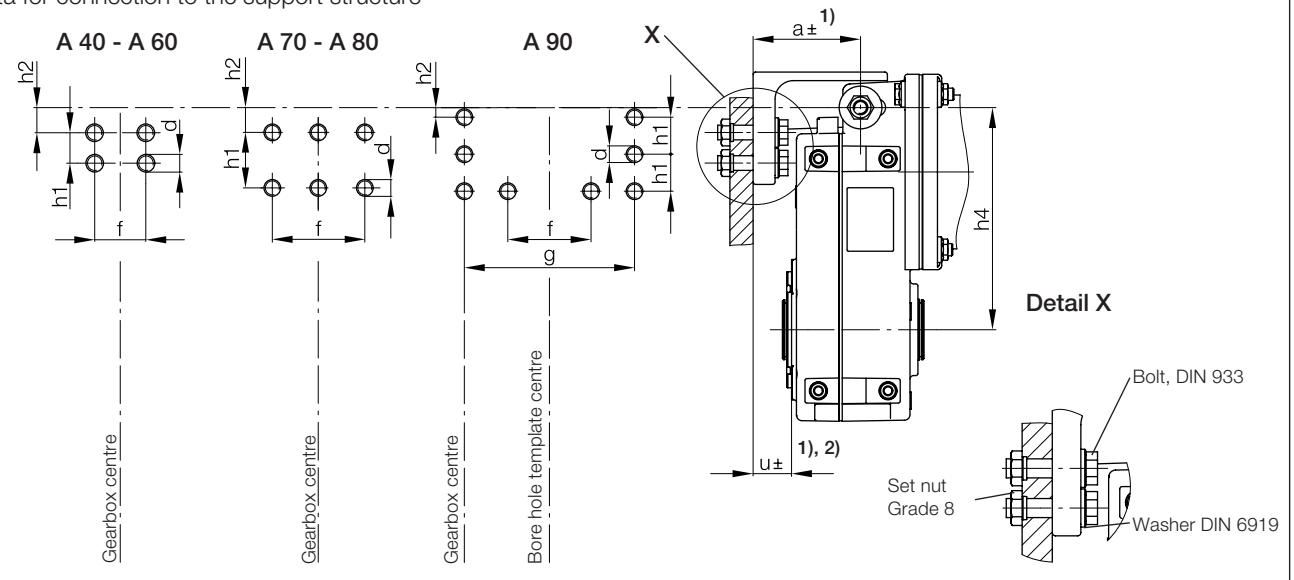
Gearbox	Designation	a1	a4	b1	b2	b3	b4	d1	d2	Locking screw				h	h2
										d3	d4	Qty	MA in Nm		
AD . 50	MA 200-2	137,5	75	345	33	4	18	40,1	130	13,5	165	8	130	195	85
AD . 40	MA 250-1	155	80	380	33	4	18	40,1	110		130	4		230	105
AD . 50	MA 250-2								130		165	8			
AD . 60	MA 250-3								180	17,5	215		330		
AD . 50	MA 315-1	185	80	470	40	5	24	50,1	130	13,5	165		130	302	128
AD . 60	MA 315-2								180	17,5	215		330		
AD . 70	MA 315-3								230		265				
AD . 60	MA 400-1	225	130	568	49	6	28	65,1	180	17,5	215		330	334	145
AD . 70	MA 400-2								230		265				
AD . 80	MA 400-3								250	22	300		720		
AD . 70	MA 500-1	290	160	710	54	7	33	70,1	230	17,5	265		330	420	168
AD . 80	MA 500-2								250	22	300		720		
AU . 90	MA 500-3								300		350				

Torque bracket MW

Gearbox	Designation	a1	a4	b1	b2	b3	b4	d1	d2	Locking screw				h	h2
										d3	d4	Qty	MA in Nm		
WU . 60	MW 200-4	137,5	75	345	33	4	18	40,1	130	13,5	165	8	130	195	85
WU . 40	MW 250-1	155	80	380	33	4	18	40,1	110		130	4		230	105
WU . 50	MW 250-2								130	17,5	165		330		
WU . 60	MW 250-3									13,5	165	8	130		
WU . 70	MW 250-4								180	17,5	215		330		
WU . 50	MW 315-1	185	80	470	40	5	24	50,1	130	17,5	165	4	330	302	128
WU . 60	MW 315-2									13,5	165	8	130		
WU . 70	MW 315-3								180	17,5	215		330		
WU . 80	MW 315-4								230		265				
WU . 70	MW 400-1	225	130	568	49	6	28	65,1	180	17,5	215		330	359	145
WU . 80	MW 400-2								230		265				
WU . 90	MW 400-3								250	22	300		720		
WU . 80	MW 500-1	290	160	710	54	7	33	70,1	230	17,5	265		330	420	168
WU . 90	MW 500-2								250	22	300		720		
WU . 100	MW 500-3								300		350				

4.2 D2 torque bracket

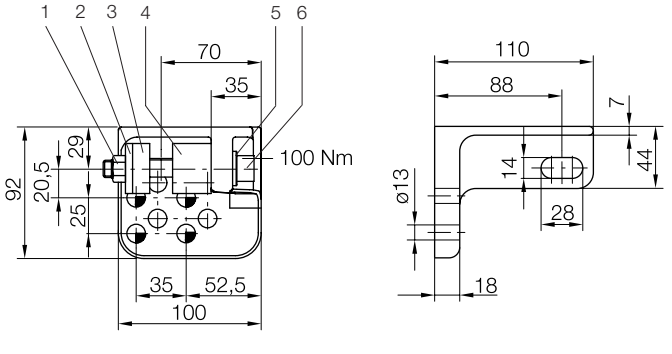
Data for connection to the support structure



Gearbox	Torque bracket 3)	Mounting bolt grad 10.9			Bore hole template							
	Part no.	Size	Qty	Torque bracket	d H11	f ±0,3	g	h1	h2	h4	a± 1)	u± 1), 2)
AU/AD 40	818 649 44	M 12	4	115 Nm	14	35	–	25	20,5	206	91,5 ± 4	30 ± 4
AU/AD 50	811 208 44	M 16	4	300 Nm	18	65	–	60	20	255	140 ± 6	54,5 ± 6
AU/AD 60	787 989 44	M 16	4	300 Nm	18	100	–	60	83	309	120 ± 12	73 ± 12
AU/AD 70	787 990 44	M 16	6	300 Nm	18	100	–	60	83	366	120 ± 12	68,5 ± 12
AU/AD 80	787 991 44	M 16	6	300 Nm	18	100	–	60	83	440	118 ± 12	64,5 ± 12
AU 90	787 995 44	M 16	8	300 Nm	18	90	184	40	10	520	159 ± 12	93 ± 12

1) To flange support surface.
2) Tolerance due to torque bracket slot.
3) Drive shaft fitted into hollow shafts must be checked for strength.

AU/AD 40, gearbox, part no. 818 649 44



1 Lock nutVM12, DIN 980-8
2 Washer 13x35x5, DIN 6340
3 Spring element 13x35x10
4 Spring element 13x35x25
5 Washer 13x24x3, DIN 6916-HV
6 Socket head screw M12x100, DIN 912-10.9

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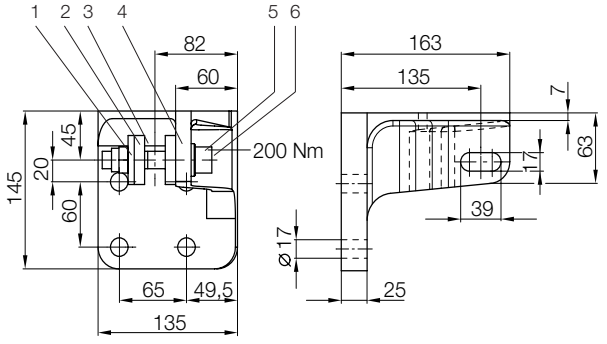
AU/AD 50 gearbox, part no. 811 208 44



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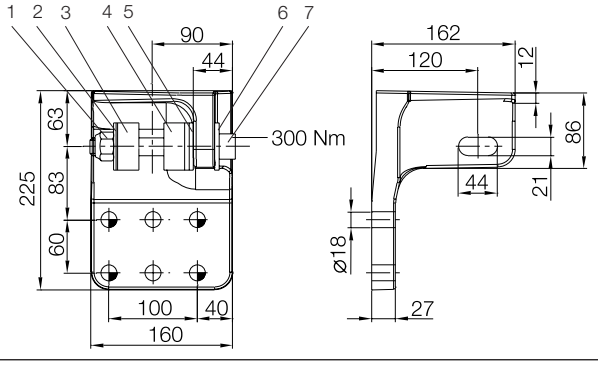
1 Lock nutVM16, DIN 980-8
2 Washer 17x45x6, DIN 6340
3, 4 Spring element 17x45x10
5 Washer 17x30x4, DIN 6916-HV
6 Socket head screw M16x90, DIN 912-10.9

AU/AD 60 gearbox, part no. 787 989 44



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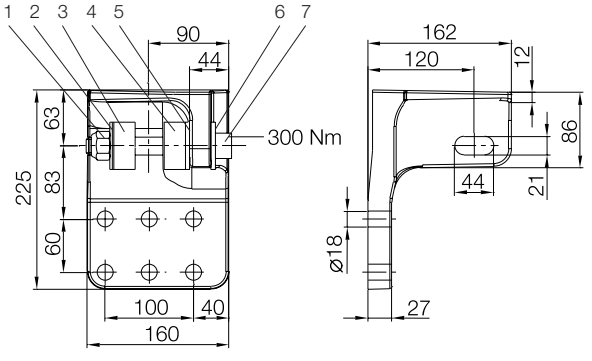
1 Lock nutVM20, DIN 980-8
2, 6 Washer 21x50x6, DIN 6340
3, 4 Spring element 21x50x23,5
5 2 x washer 21x50x6, DIN 6340
7 Socket head screw M20x150, DIN 912-10.9

AU/AD 70 gearbox, part no. 787 990 44



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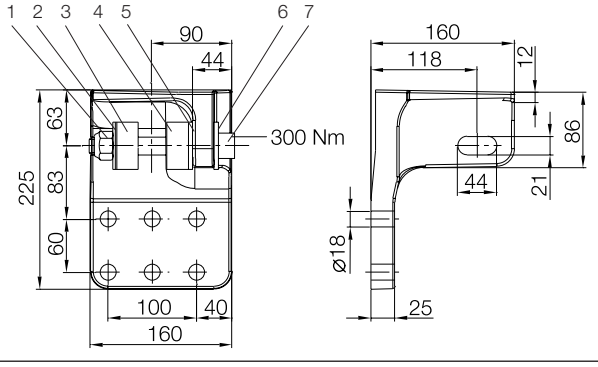
1 Lock nutVM20, DIN 980-8
3, 4 Spring element 21x50x23,5
2, 5, 6 Washer 21x50x6, DIN 6340
7 Socket head screw M20x150, DIN 912-10.9

AU/AD 80 gearbox, part no. 787 991 44



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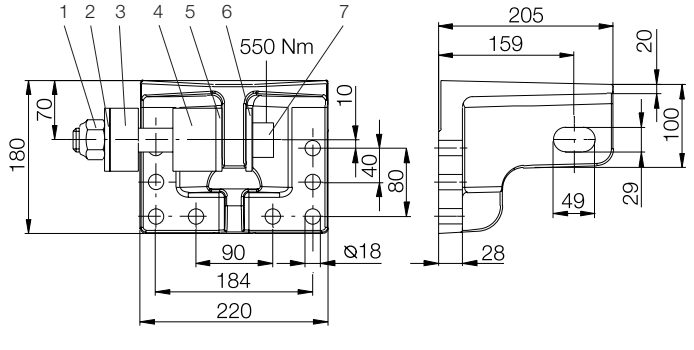
1 Lock nutVM20, DIN 980-8
3, 4 Spring element 21x50x23,5
2, 5, 6 Washer 21x50x6, DIN 6340
7 Socket head screw M20x150, DIN 912-10.9

AU 90 gearbox, part no. 787 995 44



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1 Lock nutVM24, DIN 980-8
3, 4 Spring element 26x60x43
2, 5, 6 Washer 25x60x8, DIN 6340
7 Socket head screw M24x220, ISO 4014-10.9

4.3 Torque bracket set

DRS wheel block size	Gearbox	Designation	Part no. 1)			
			Tope connection	Side connection	Pin connection	Torque bracket D2 2)
			K	W	B	
112	AM . 10/20	MA112-1	753 796 44		753 797 44	
	WU . 10	MW112-1	753 890 44		753 892 44	
	WU . 20	MW112-2	753 891 44		753 894 44	
125	AM . 10/20	MA125-1	752 396 44		752 397 44	
	AM . 30	MA125-2	752 39144		752 394 44	
	WU . 10	MW125-1	752 490 44		752 492 44	
	WU . 20/30	MW125-2	752 49144		752 494 44	
160	AM . 20	MA160-1	752 696 44		752 697 44	
	AM . 30/40	MA160-2	752 69144		752 694 44	
	WU . 20/30	MW160-1	752 790 44		752 792 44	
	WU . 40	MW160-2	752 79144		752 794 44	
200	AM . 30/40	MA200-1	753 190 44		753 192 44	
	AD . 50	MA200-2	753 19144		753 193 44	
	WU . 30	MW200-1	753 290 44		753 293 44	
	WU . 40	MW200-2	753 29144		753 294 44	
	WU . 50	MW200-3	753 292 44		753 295 44	
	WU . 60	MW200-4	753 296 44		753 297 44	
250	AD . 40	MA250-1	753 490 44		753 570 44	818 649 44
	AD . 50	MA250-2	753 49144		753 57144	811 208 44
	AD . 60	MA250-3	753 492 44		753 572 44	787 989 44
	WU . 40	MW250-1	753 590 44		753 580 44	-
	WU . 50	MW250-2	753 591 44		753 581 44	-
	WU . 60	MW250-3	753 592 44		753 582 44	-
	WU . 70	MW250-4	753 593 44		753 583 44	-
315	AD . 50	MA315-1	754 190 44		754 270 44	811 208 44
	AD . 60	MA315-2	754 19144		754 271 44	787 989 44
	AD . 70	MA315-3	754 192 44		754 272 44	787 990 44
	WU . 50	MW315-1	754 290 44		754 280 44	-
	WU . 60	MW315-2	754 291 44		754 281 44	-
	WU . 70	MW315-3	754 292 44		754 282 44	-
	WU . 80	MW315-4	754 293 44		754 283 44	-
400	AD . 60	MA400-1	754 490 44		754 570 44	787 989 44
	AD . 70	MA400-2	754 49144		754 57144	787 990 44
	AD . 80	MA400-3	754 492 44		754 572 44	787 991 44
	WU . 70	MW400-1	754 590 44		754 580 44	-
	WU . 80	MW400-2	754 591 44		754 581 44	-
	WU . 90	MW400-3	754 592 44		754 582 44	-
500	AD . 70	MA500-1	754 790 44		754 870 44	787 990 44
	AD . 80	MA500-2	754 791 44		754 871 44	787 991 44
	AU . 90	MA500-3	754 792 44		754 872 44	787 995 44
	WU . 80	MW500-1	754 890 44		754 880 44	-
	WU . 90	MW500-2	754 891 44		754 881 44	-
	WU . 100	MW500-3	754 892 44		754 882 44	-

1) Part no. includes torque bracket, bolted fastening parts and retaining elements depending on the design.

2) Torque bracket with threaded pin set for threaded hole (e.g. welded-on plate).

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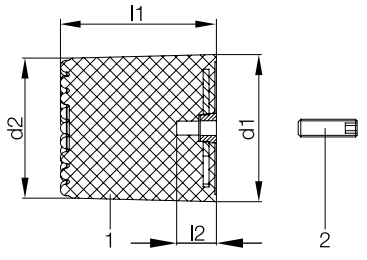
4.4 Buffer dimensions

4.4.1 Buffer elements, DPZ cellular plastic buffer

DPZ cellular plastic buffer



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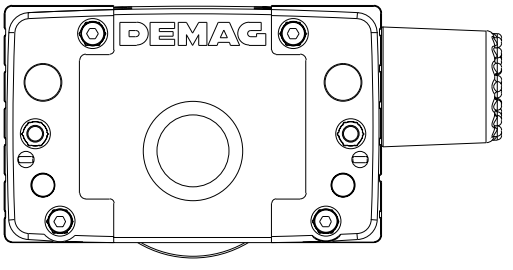
DRS wheel block size		Buffer	Dimensions in mm					
							w/o guide rollers	with guide rollers
			d1	d2	l1	l2	Threaded pins (2)	
112 125	160 200	DPZ 70	70	65	70	26	M12 x 30	M12 x 55
		DPZ 100	100	95	100	26	M12 x 30	M12 x 55
–		DPZ 130	130	122	126	26	M12 x 30	M12 x 55
		DPZ 160	160	155	150	40	M12 x 30	M12 x 55

DRS wheel block size		Buffer	Dimensions in mm				
			d1	d2	l1	l2	Threaded pin (2)
250 315	400 500	DPZ 70	70	65	70	26	M12 x 30
		DPZ 100	100	95	100	26	M12 x 30
		DPZ 130	130	122	120	26	M12 x 30
		DPZ 160	160	155	150	40	M12 x 30
–		DPZ 210	210	200	200	68	M20 x 75

Solo fitting to DRS 112 – 200 units



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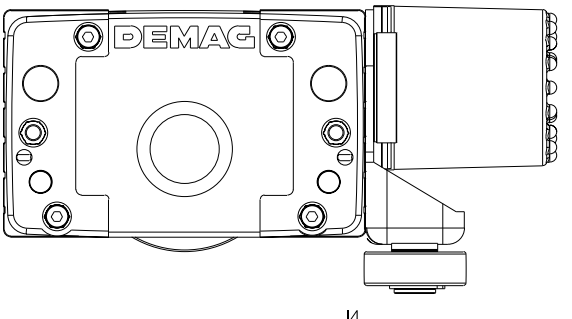
DRS 112 – 200
Guide roller fitting including distance elements

DRS wheel block size	Buffer	l4 mm
112 / 125	DPZ 70	11 ± 0,5
	DPZ 100	
160 / 200	DPZ 70	14 ± 0,5
	DPZ 100	
	DPZ 130	
	DPZ 160	



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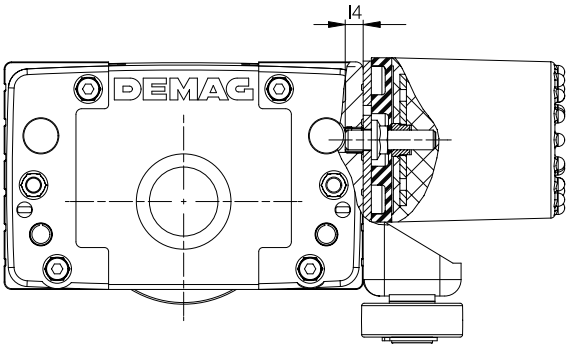

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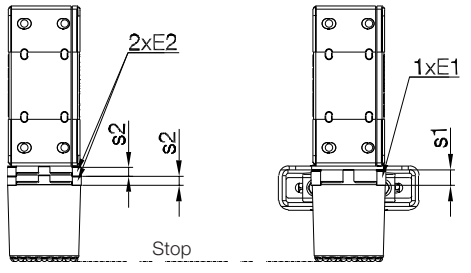
To ensure uniform buffer impact with a horizontal guide roller arrangement fitted to only one wheel block, type E1/E2 spacers must be fitted between the buffer and wheel block on the opposite side.

DRS 112 – 125 – 160 – 200



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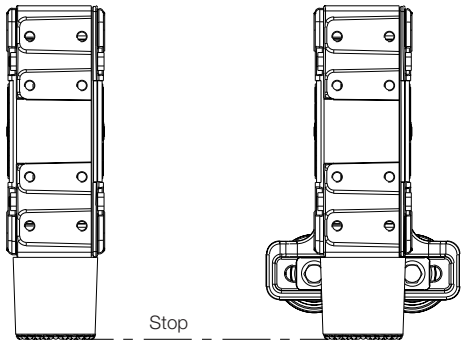
DRS wheel block size		Buffer	Distance elements			
			E1		E2	
			s1	Part no.	s2	Part no.
112 125	160 200	DPZ 70	14	752 003 44	10	752 002 44
		DPZ 100	12,5	752 005 44	20	752 004 44
–		DPZ 130	25	752 007 44	16	752 006 44
		DPZ 160 4)	15	752 008 44	21	752 009 44

DRS wheel block size		Buffer	Buffer set part no.		
			Solo fitting to DRS or connecting structure w/o distance element	Compensating side incl. distance element	Guide roller arrangement including distance element
112 125	160 200	DPZ 70	860 810 46 1)	860 812 46 2)	860 811 46 3)
		DPZ 100	860 814 46 1)	860 816 46 2)	860 815 46 3)
–		DPZ 130	860 818 46 1)	860 820 46 2)	860 819 46 3)
		DPZ 160	860 822 46 1)	860 824 46 2)	860 823 46 3)

DRS 250 – 315 – 400 – 500



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DRS wheel block size	Buffer	Buffer set part no. Solo fitting to DRS or connecting structure w/o distance element
250 / 315	DPZ 100	860 814 46 1)
	DPZ 130	860 818 46 1)
	DPZ 160	860 822 46 1)
400 / 500	DPZ 70	860 810 46 1)
	DPZ 100	860 814 46 1)
	DPZ 130	860 818 46 1)
	DPZ 160	860 822 46 1)
	DPZ 210	860 826 46 1)

1) Part no. includes buffer and threaded pin
2) Part no. includes buffer, threaded pin and distance element
3) Part no. includes buffer, nut and distance element
4) Requires a type E2 spacer

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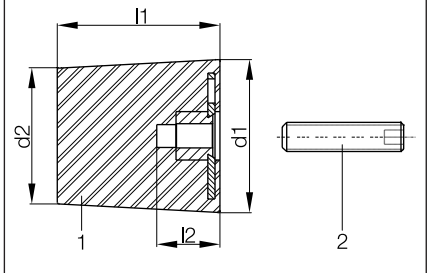
4.4.2 Buffer elements, DPG rubber buffer

DPG rubber buffer



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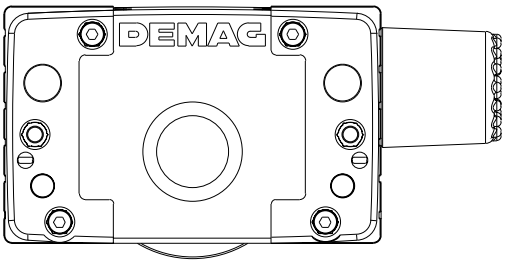
DRS wheel block size		Buffer	Dimensions in mm					
							w/o guide rollers	with guide rollers
			d1	d2	l1	l2	Threaded pin (2)	
112 125	160 200	DPG 63	63	56	67	26	M12 x 30	M12 x 55
		DPG 80	80	71	84	26	M12 x 30	M12 x 55
–		DPG 100	100	90	105	26	M12 x 30	M12 x 55

DRS wheel block size		Buffer	Dimensions in mm				
			d1	d2	l1	l2	Threaded pin (2)
250 315	400 500	DPG 63	63	56	67	26	M12 x 30
		DPG 80	80	71	84	26	M12 x 30
		DPG 100	100	90	105	26	M12 x 30
		DPG 160	160	151	131	40	M12 x 30
–		DPG 200	200	189	166	58	M20 x 75

Solo fitting to DRS 112 – 200 units



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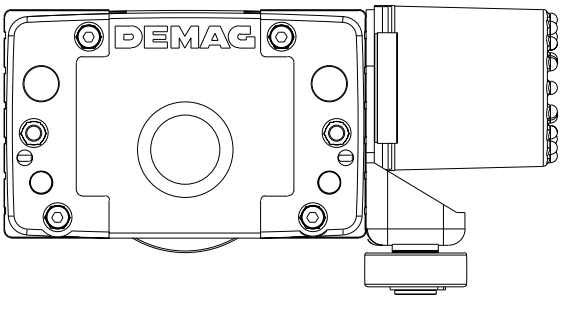
DRS 112 – 200
Guide roller fitting including distance elements

DRS wheel block size	uffer	l4 mm
112 / 125	DPG 63	11 ± 0,5
	DPG 80	
160 / 200	DPG 63	14 ± 0,5
	DPG 80	
	DPG 100	



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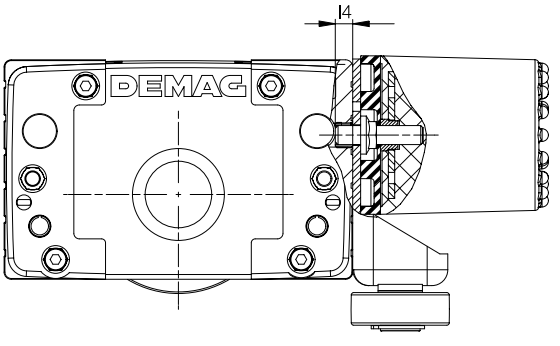

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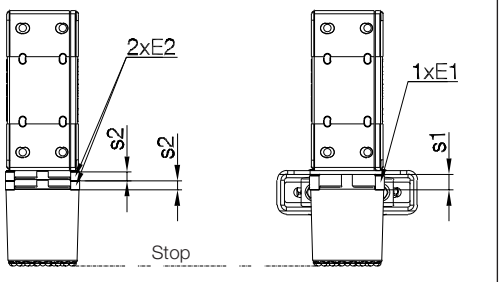
To ensure uniform buffer impact with a horizontal guide roller arrangement fitted to only one wheel block, type E1/E2 spacers must be fitted between the buffer and wheel block on the opposite side.

DRS 112 – 125 – 160 – 200



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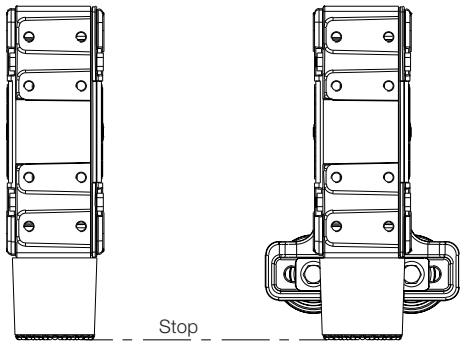
DRS wheel block size		Buffer	Distance elements			
			E1		E2	
			s1	Part no.	s2	Part no.
112 125	160 200	DPG 63	14	752 003 44	10	752 002 44
		DPG 80	20	752 005 44	12,5	752 004 44
–		DPG 100	25	752 007 44	16	752 006 44

DRS wheel block size		Buffer	Buffer set part no.		
			Solo fitting to DRS or connecting structure w/o distance element	Compensating side incl. distance element	Guide roller arrangement incl. distance element
112 125	160 200	DPG 63	860 834 46 1)	860 836 46 2)	860 835 46 3)
		DPG 80	860 838 46 1)	860 840 46 2)	860 839 46 3)
–		DPG 100	860 842 46 1)	860 844 46 2)	860 843 46 3)

DRS 250 – 315 – 400 – 500



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DRS wheel block size	Buffer	Buffer set part no.
		Solo fitting to DRS or connecting structure w/o distance element
250 / 315 / 400 / 500	DPG 63	860 834 46 1)
	DPG 80	860 838 46 1)
	DPG 100	860 842 46 1)
	DPG 160	860 846 46 1)
400 / 500	DPG 200	860 850 46 1)

1) Part no. includes buffer and threaded pin
2) Part no. includes buffer, threaded pin and distance element
3) Part no. includes buffer, nut and distance element

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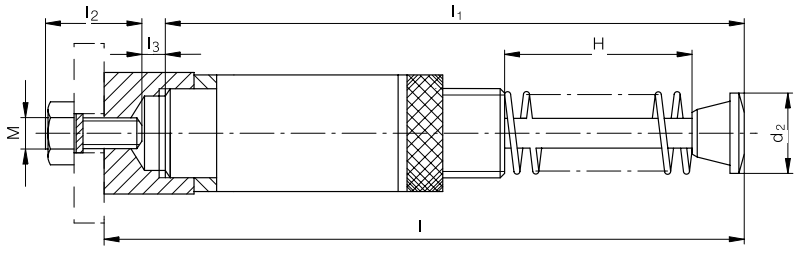
4.4.3 DPH hydraulic buffer

Standard installation variant with adapter, threaded pin and set nut suitable for fitting to the connecting structure

Standard installation variant with adapter



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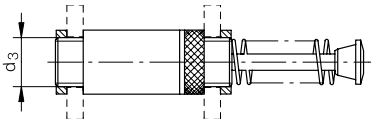
Installation variant II

Foot or neck mounting configuration



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Size	Energy absorption E_{pu} [Nm]	eff. mass m_{pu} [kg]	Hydraulic buffer Stroke H	Length l1	Thread d3	l3	d2	Weight [kg]	Adapter M	Adapter l	Pin l2	Part no. 1)
DPH 7 self-adjusting	68	113 + 1130	25,4	149,9	2) M 25 x 1,5	102	23	0,26	M 12	167	40	811 294 44
DPH 25 adjustable	230	500 + 8000	50,8	189	UNF 1¼ - 12	17	25,4	0,76	M 12	207	40	811 295 44
DPH 80 adjustable	780	54 + 9500	76	246	UNF 1¾ - 12	23	38	2,1	M 12	267	40	811 296 44
DPH 350 self-adjusting	3390	1360 + 6800	152	450	4) M 64 x 2	38	60	4,7	M 20	478	40	811 297 44 N

1) Part no. includes hydraulic buffer, nut, adapter, threaded pin and set nut
2) Second nut required for installation variant II for foot or neck mounting configuration

4.5 Selecting buffers for DRS wheel blocks

Buffers with a high energy absorption capacity are required to prevent any critical deformation in structural steelwork resulting from travel units colliding with each other or with the end of a track.

The complete volume of the buffer is utilized as pressure is distributed over the whole section of the buffer. Lateral deformation remains low even under maximum compression.

The favourable diameter-to-length ratio of the buffer ensures that any displacement of the buffers due to play in the guidance of the crane on the rails has no adverse effect.

4.5.1 DPZ cellular plastic buffers

Due to its excellent physical qualities as regards elasticity, cushioning and energy absorption, the cellular polyurethane material is particularly well suited for buffers.

The material is chemically resistant to ozone, oxygen, water, petrol and most oils and industrial greases. The buffer is fully functional at operating temperatures of – 20° C to + 80° C. In conditions of high humidity in conjunction with high temperatures, the rubber buffer should be used.

4.5.2 DPG rubber buffers

The buffer consists of a compact elastic rubber. This material features different characteristics to that of cellular plastic buffers.

This buffer material should preferably be used under conditions of high humidity. The buffer is fully functional at operating temperatures of – 30° C to + 70° C.

4.5.3 DPH hydraulic buffers

The buffer is an enclosed system consisting of maintenance-free hydraulic elements. Owing to almost uniform deceleration, this buffer makes it possible to achieve the smallest possible braking force for the shortest possible brake path.

The permissible ambient operating temperatures range from – 12° C to + 90° C for adjustable, and to + 65° C for self-adjusting buffers; using special seals and special oil from – 40° C to + 120° C.

The maximum axial deviation of the impact direction from the piston rod axis is approx. 3°. Hydraulic buffers can be installed in any position.

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4.5.4 Buffer calculation

For buffer impact special load situations, it is assumed that cranes, crabs and travel carriages, etc. only rarely collide in normal operation.

The required buffer energy absorption capacity must be calculated:

- for the maximum possible buffer impact speed, however, at least k = 70 % of the travel speed, if speed reduction devices are fitted
- with k = 85 % of the travel speed for cranes
- with k = 100 % of the travel speed for crabs, travel carriages, etc.

(k = buffer energy factor)

For an impact between two installations with identical buffers, calculate:

- mass acting on the buffer m_{pu}

Masses acting on the buffer are the masses acting on the corresponding part of the buffer depending on the distribution of masses of the structure when the buffer is impacted. The masses acting on cellular and rubber buffers (DPZ, DPG) can be doubled when a counterpart buffer of the same size is used.

$$m_{pu} = \frac{m_{pu1} \cdot m_{pu2}}{m_{pu1} + m_{pu2}}$$

m_{pu} = Mass acting on the rubber

m_{pu1} ... m_{pu2} = Mass acting on the buffers of installations 1 and 2

- Travel speed

$$v = |v_1| + |v_2|$$

v = Travel speed

v_1 ... v_2 = Individual impact speeds of installations 1 and 2

4.5.5 DPZ cellular plastic buffer table

Cellular buffer		Travel speed in m/min												
Limit switch k=70%		bis 14,3	bis 17,9	bis 22,9	bis 28,6	bis 35,7	bis 45,0	bis 57,1	bis 71,4	bis 90,0	bis 114,3	bis 142,9	bis 178,6	bis 228,6
Long travel k=85%		bis 11,8	bis 14,7	bis 18,8	bis 23,5	bis 29,4	bis 37,1	bis 47,1	bis 58,8	bis 74,1	bis 94,1	bis 117,6	bis 147,1	bis 188,2
Cross travel k=100%		bis 10,0	bis 12,5	bis 16,0	bis 20,0	bis 25,0	bis 31,5	bis 40,0	bis 50,0	bis 63,0	bis 80,0	bis 100,0	bis 125,0	bis 160,0
DRS wheel block size	**Buffer**	**max. mass which can be buffered in kg with counterbuffer**												
112 – 500	DPZ 70	6400	4170	2600	1710	1120	730	480						
112 – 500	DPZ 100	22230	14500	9080	5980	2960	2610	1710	1160					
160 – 500	DPZ 130	48480	31670	19660	12900	8500	5560	3610	2460					
200 – 500	DPZ 160	87300	66760	34720	22740	14960	9760	6330	4270					
400 – 500	DPZ 210	130140	84730	67730	34560	22760	14780	9660	6500	7360				

With counterbuffer:
The maximum mass which can be buffered is doubled when a counterbuffer of the same size is used. Masses acting on the buffer are the masses acting on the corresponding part of the buffer depending on the distribution of masses of the structure when the buffer is impacted. The masses acting on cellular and rubber buffers (DPZ, DPG) can be doubled when a counterpart buffer of the same size is used.
The values given in the table are the maxi mum masses which can be buffered. It must be considered that deceleration must not exceed 3 g.

4.5.6 DPG rubber buffer table

Rubber buffer		Travel speed in m/min												
Limit switch k=70%		to 14,3	to 17,9	to 22,9	to 28,6	to 35,7	to 45,0	to 57,1	to 71,4	to 90,0	to 114,3	to 142,9	to 178,6	to 228,6
Long travel k=85%		to 11,8	to 14,7	to 18,8	to 23,5	to 29,4	to 37,1	to 47,1	to 58,8	to 74,1	to 94,1	to 117,6	to 147,1	to 188,2
Cross travel k=100%		to 10,0	to 12,5	to 16,0	to 20,0	to 25,0	to 31,5	to 40,0	to 50,0	to 63,0	to 80,0	to 100,0	to 125,0	to 160,0
DRS wheel block size	**Buffer**	**max. mass which can be buffered in kg with counterbuffer**												
112 – 500	DPG 63	17490	11190	6830	4370	2790	1760	1090	690					
112 – 125	DPG 80	27360	17510	10680	6840	4370	2750	1710	1090					
160 – 500		36000	23040	14060	9000	5760	3620	2250	1440					
160 – 200	DPG 100	66600	42620	26010	16650	10650	6710	4160	2660	1670				
250 – 500		72000	460080	28120	18000	11520	7250	4500	2880	1810				
250 – 315	DPG 160	136080	87090	53150	34020	21770	13710	8500	5440	3420				
400 – 500		193680	123950	75650	48420	30980	19510	12100	7740	4870				
400 – 500	DPG 200	280800	179710	109680	70200	44920	28290	17550	11230	7070				
Structure		455760	291680	178030	113940	72920	45930	28480	18230	11480				

With counterbuffer:
The maximum mass which can be buffered is doubled when a counterbuffer of the same size is used.
The values given in the table only apply for buffers when fitted direct to the wheel block.
The maximum masses which can be buffered by the given buffer may be used when fitted to the connecting structure.
The values given in the table (max. masses which can be buffered by the relevant buffer) apply for buffers when fitted to the connecting structure and when fitted direct to the wheel block.

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4.5.7 DPH hydraulic buffer table

Hydraulic buffer		Travel speed in m/min												
Limit switch k=70%		to 14,3	to 17,9	to 22,9	to 28,6	to 35,7	to 45,0	to 57,1	to 71,4	to 90,0	to 114,3	to 142,9	to 178,6	to 228,6
Long travel k=85%		to 11,8	to 14,7	to 18,8	to 23,5	to 29,4	to 37,1	to 47,1	to 58,8	to 74,1	to 94,1	to 117,6	to 147,1	to 188,2
Cross travel k=100%		to 10,0	to 12,5	to 16,0	to 20,0	to 25,0	to 31,5	to 40,0	to 50,0	to 63,0	to 80,0	to 100,0	to 125,0	to 160,0
DRS wheel block size	**Buffer**	**max. mass which can be buffered in kg with counterbuffer**												
112 – 500	DPH 7				1000	790	600	370						
112 – 500	DPH 25		10000	8000	6300	4000	2530	1590						
112 – 500	DPH 80				8000	8000	8000	5000	3200	2010	1250	800		
400 – 500	DPH 350						10000	10000	8800	7300	5000	3200	2040	

The values given in the table are the maximum masses which can be buffered. It must be considered that the minimum mass to be buffered must not be less than 20 % of the table value due to the acceleration which occurs in the event of a buffer impact.

4.6.1 General

Permissible horizontal load: Maximum 15% of the actual wheel load.
The roller guide arrangement as a solo part can transmit at least 20 % of the actual wheel load.

Note for ordering:

If a roller guide arrangement is included in the type specification when ordering a single wheel block, the block is correspondingly prepared before leaving the factory.

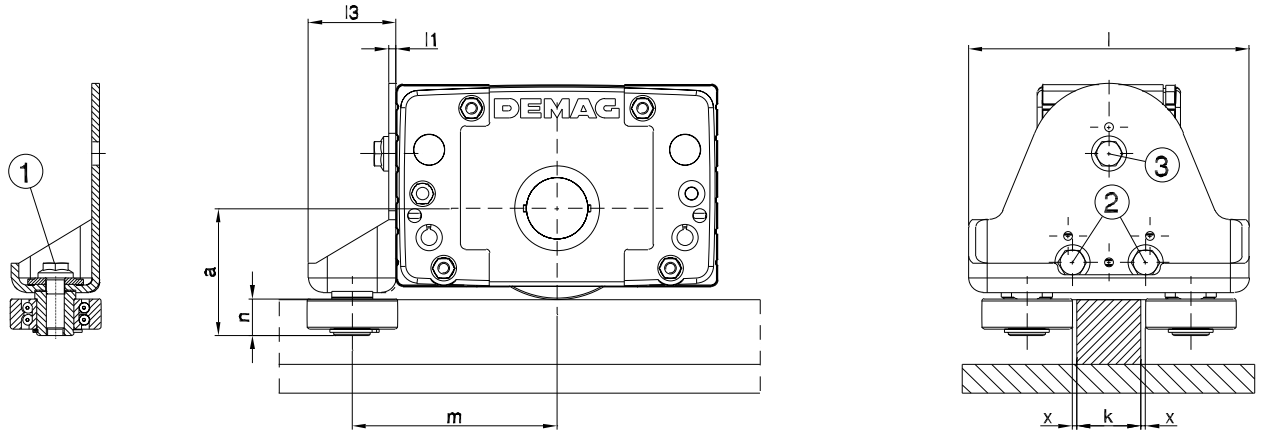
Exception: DRS 200 with top connection

The permissible horizontal load is limited to 10 % of the actual wheel load.

Guide rollers must not be used with rails that have sloping head flank surfaces.

4.6.2 Horizontal guide rollers DRS 112 – 200

Note: When using the guide roller arrangement, note
for flat rail: section 2.6.5 (table)
for crane rail: section 2.6.6 (table)



k = Rail width

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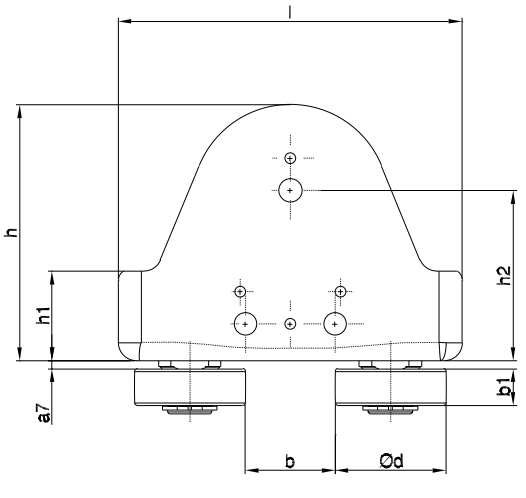
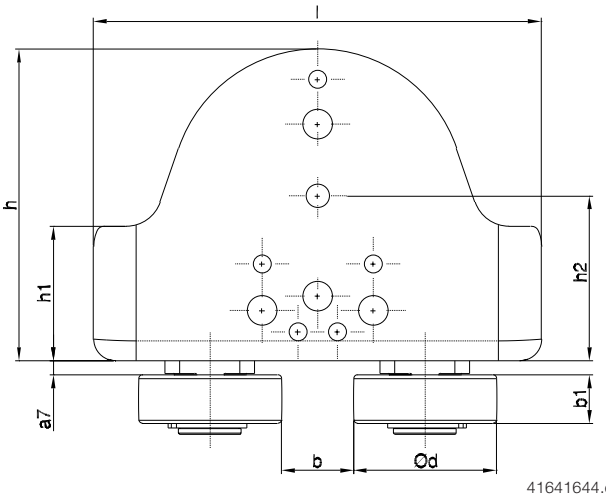
DRS 112 – 125 – 160



DRS 200



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DRS wheel block size	Tightening torques in Nm Locking screw			Dimensions in mm														
	①	②	③	x_{min}	x_{max}	a	a7	b_{min}	b_{max}	b1	d	h	h1	h2	l	l1	l3	m	n
112	130			1	5	80,5	4,5	30	70	20,6	52	126,5	38,2	76	180	5	60	125	24,5
125	130			1	5	88	4,5	30	70	20,6	62	143	50	95,5	192	5	60	140	25,4
160	330		130	1	5	109	7,5	30	80	23,8	72	162	65	93,5	230	6	72	173,5	29
200	330		130	1	5	133	8	40	90	27	80	174	75	92	250	6	80	210	33

DRS wheel block size	Travel wheel type	a mm	Part no. Horizontal guide roller assembly 1)	Retrofitting set - Part no.	
				Fitted to wheel block 2)	Fitted to connecting structure 1)
112	B	81	753 610 44	753 611 44	753 610 44
	E	87	753 710 44	753 711 44	753 710 44
125	B	88	752 210 44	752 211 44	752 210 44
	E	98	752 310 44	752 311 44	752 310 44
160	B	109	752 510 44	752 511 44	752 510 44
	E	119	752 610 44	752 611 44	752 610 44
200	B	133	753 010 44	753 011 44	753 010 44
	E	145	753 110 44	752 111 44	753 110 44

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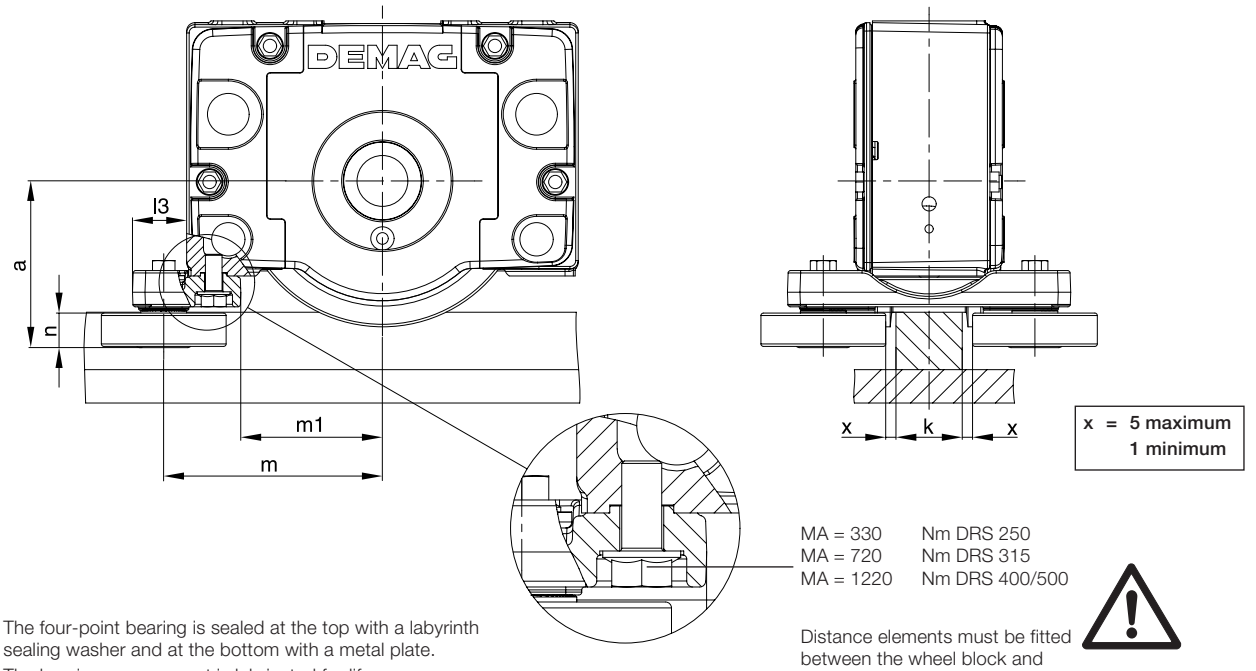
1) Part no. includes roller guide arrangement and bolted fastening parts
2) Part no. includes roller guide arrangement, threaded sleeves and roll pins

4.6.3 Horizontal guide rollers
DRS 250 – 500

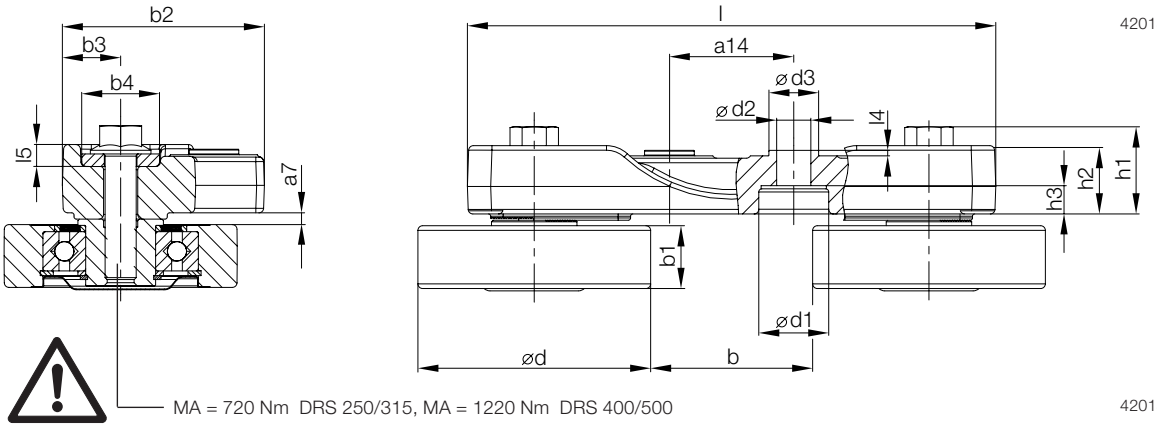
Note: When using the guide roller arrangement, note
for flat rail: section 2.6.5 (table)
for crane rail: section 2.6.6 (table)



MA = 330 Nm DRS 250
MA = 720 Nm DRS 315
MA = 1220 Nm DRS 400/500

The four-point bearing is sealed at the top with a labyrinth sealing washer and at the bottom with a metal plate.
The bearing arrangement is lubricated for life.

Distance elements must be fitted between the wheel block and roller bracket for travel wheel type E



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MA = 720 Nm DRS 250/315, MA = 1220 Nm DRS 400/500

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DRS wheel block size	Dimensions in mm													
	x_{min}	x_{max}	a	a7	k_{min}	k_{max}	b_{min}	b_{max}	b1	b2	b3	b4	d	d1
250	1	5	163	2,8	25	88	30	90	34	130	40	51	120	36
315	1	5	200	4,5	35	98	40	100	40	130	37,5	51	150	42
400	1	5	246	4	55	115	60	120	44,5	158	45	61	180	58
500	1	5	297	4	75	155	80	160	50	180	50	61	220	58
DRS wheel block size	**Dimensions in mm**													
	d2	**d3**	**h1**	**h2**	**h3**	**l**	**l2**	**l3**	**l4**	**l5**	**m**	**m1**	**n**	
250	18	30 g6	46	40	15	296	70	65,5	3,5	20	218	128	38	
315	22	32 g6	58,5	46,5	18	340	80	65	3,5	14	262,5	170	42,5	
400	26	44 g6	66,5	53,5	19	400	100	76	3,5	14	321	208	46	
500	26	54 g6	74	61	19	490	110	80	4,5	14	380	250	47	

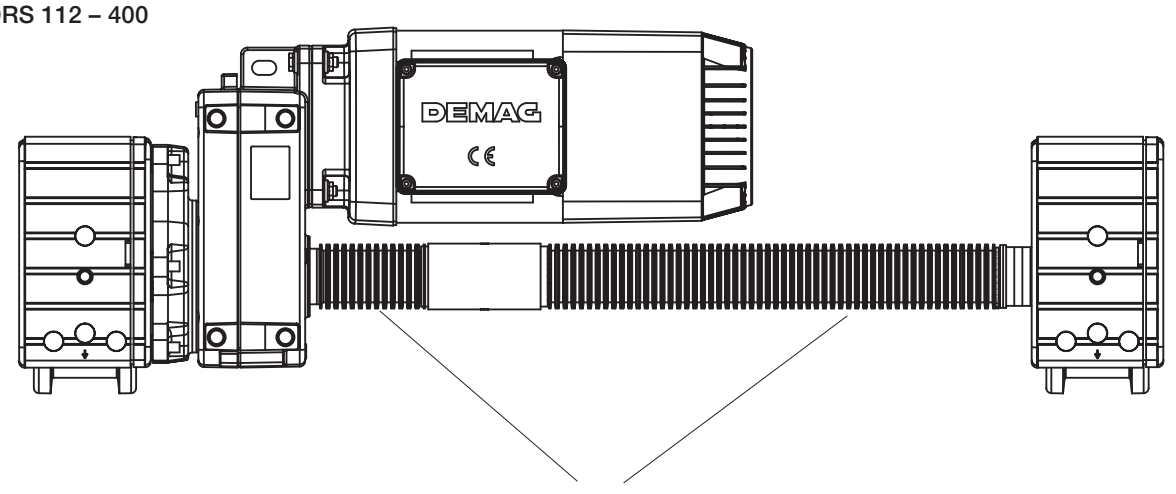
DRS wheel block size	Travel wheel type	a mm	Retrofitting set - Part no.	
			Fitted to wheel block	Fitted to connecting structure 3)
250	B	163	753 311 44 1)	
	E	173	753 511 44 2)	
315	B	200	754 011 44 1)	
	E	212,5	754 211 44 2)	
400	B	246	754 311 44 1)	
	E	266	754 511 44 2)	
500	B	297	754 611 44 1)	
	E	317	754 811 44 2)	

1) Part no. includes roller guide arrangement and bolted fastening parts
2) Part no. includes roller guide arrangement, bolted fastening parts and distance element
3) If the horizontal guide roller arrangement is not fitted to the DRS wheel block, the corresponding connecting structure must be provided with 2 counterpart bore holes. DRS 250 = Ø $D30^{H8}$
DRS 315 = Ø $D32^{H8}$
DRS 400 = Ø $D44^{H8}$
DRS 500 = Ø $D54^{H8}$

4.7 Shaft protection for central drive unit

Under normal conditions, the shaft protection tube used in combination with the greased splines offers protection against corrosion and external damage.

DRS 112 – 400



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Flexible plastic shaft protection tube

DRS wheel block	Splined shaft profile	For track gauge mm	Part no. [1]
112	W30	1000 - 1400	300 390 84
		2240 - 3150	300 391 84
125	W35	1000 - 1400	300 392 84
		2240 - 3150	300 393 84
160	W45	1000 - 1400	300 394 84
		2240 - 3150	300 395 84
200	W50	1000 - 1400	300 396 84
		2240 - 3150	300 397 84
250	W65	1000 - 1400	300 398 84
		2240 - 3150	300 399 84
315	W75	1000 - 1400	300 400 84
		2240 - 3150	300 401 84
400	W90	1000 - 1400	300 402 84
		2240 - 3150	300 403 84

 1) Each part no. includes a long shaft protection tube which can be simply cut to the required lengths by the customer.

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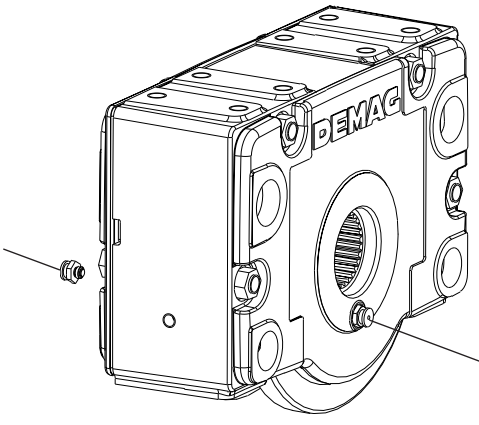
Relubrication of grooved ball bearings
DRS 250 – 500

Relubrication on accessible side surfaces via screw-fitted flat nipple.



Part no. 350 580 99 1)
Flat lubrication nipple
AM10x1 DIN 3404,

1) Part no. includes 1 off flat lubrication nipple

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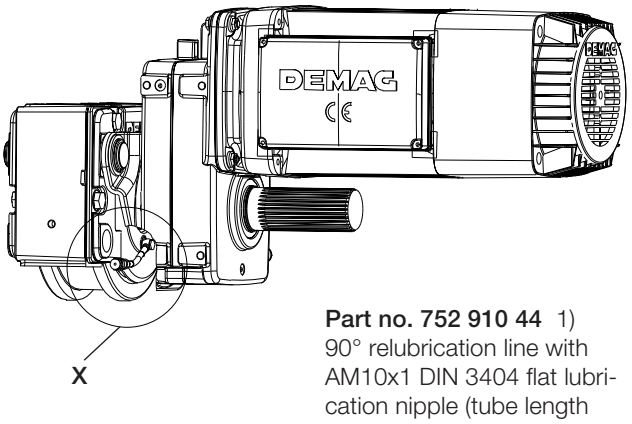
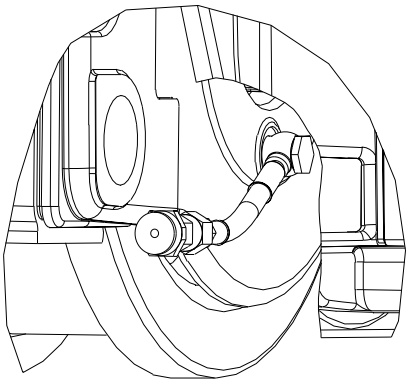
Relubrication on inaccessible side surfaces, e.g. due to fitted drive or superstructure. Lubrication nipple part no. 350 580 99 can be used for the accessible side.



Part no. 752 910 44 1)
90° relubrication line with AM10x1 DIN 3404 flat lubrication nipple (tube length

Detail X



1) Part no. contains complete lubrication unit including a tube clip to attach the lubricating line.

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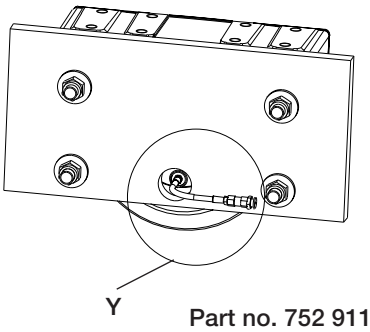
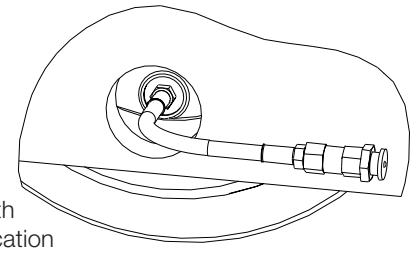
Relubrication on inaccessible side surfaces, e.g. due to side connection or similar connecting structures. Lubrication nipple part no. 350 580 99 can be used for the accessible side.



Part no. 752 911 44 1)
Straight relubrication line with AM10x1 DIN 3404 flat lubrication nipple (tube length 200 mm)

Detail Y



1) Part no. contains complete lubrication unit including a tube clip to attach the lubricating line.

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Friction bearings with double-lip sealing discs for DRS 112 – 200	Low-maintenance grooved ball bearings with double-lip sealing discs must be used for extremely dusty and damp operating conditions. Suitable for temperatures from -20° C to +110° C.
Travel wheels with hardened treads	For operating conditions in which increased travel wheel wear is likely (e.g. rails with extreme dirt accumulation), the running surfaces of the spheroidal graphite cast iron travel wheels can be induction hardened (to a depth of 1.2 to 2 mm). Hardening is then to 56 ±2 HRC.
Hardened wheel flanges	For operating conditions in which increased wheel flange wear is likely (e.g. rails with extreme dirt accumulation), the running surfaces of the spheroidal graphite cast iron travel wheel flanges can be specially hardened (penetration depth up to 3 mm). Hardening is then to 56 HRC. **This does not apply to** flanges turned at a later date beyond the standard tread, e.g. DRS 112 to 62 mm.
Aligning device	See section 1.9 for information on the aligning device.
Acid-resistant paint finish DRS 112 – 500	See section 1.8 for information.
Special paint finish DRS 112 – 200	See section 1.8 for information on special paint finish.
Special paint finish DRS 250 – 500	See section 1.8 for information on special paint finish.
Temperatures + 70 ºC to + 150 ºC DRS 250 – 500	High-temperature grease, V sealing ring of Viton and relubrication opening closed with screws.

5 Demag DRS wheel block system Specification

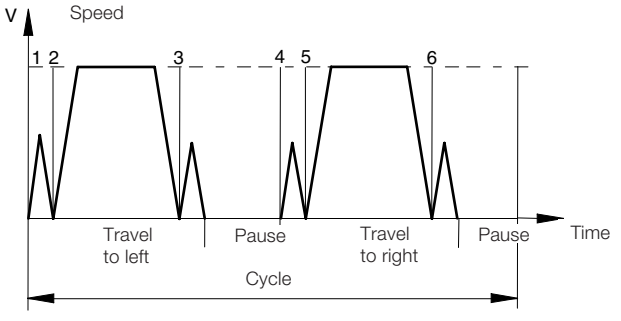
5.1 Travel drives

5.1.1 Number of cycles, relative duty factor and starting frequency

Number of cycles

A normal cycle is made up as shown in the following diagram, i.e. 1 x travel to the left – pause, 1 x travel to the right – pause, with 3 starts being assumed on average for each travel motion.

Single-speed drive



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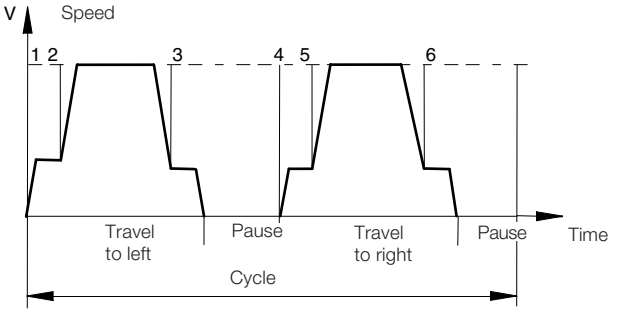
Drive with two speeds



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The maximum number of cycles is calculated from:

$$S \approx 0{,}3 \cdot \frac{CDF \cdot v}{L}$$

This equation applies on condition that the permissible number of starts is not exceeded.

S = Number of cycles per hour, cycle according to diagram, one or two speeds

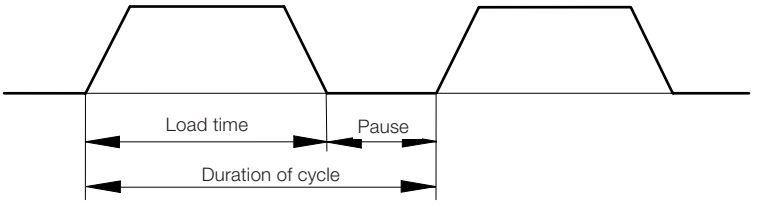
CDF = Relative duty factor in %

v = Travel speed in m/min

L = Travel path (single) with travel motor switched on in m

Duty factor

Duty factor



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Intermittent duty

The ratio of load time to the duration of the cycle is called the relative duty factor (CDF). Recommended values to EN 600341 are 15, 25, 40 and 60 %.
If a 10 minute duration of cycle is not exceeded, the relative duty factor is calculated as follows:

$$CDF = \frac{\text{Sum of load times}}{\text{Sum of load times} + \text{pauses without current}} \cdot 100\,\text{in}\,\%$$

If the duration of the cycle is greater than 10 minutes, service is considered to be continuous duty (CD) of temporary duty (TD).

Minimum values for starts per hour

Minimum values for the starts per hour, the context for the minimum values between duty factor, number of load cycles per hour and starts per hour are given in the table of minimum values (to FEM 9.683).

In practical operation, lower numbers of cycles may also occur in the lower groups for the given number of starts and higher numbers of cycles, e.g. for automatic operation, may occur in the higher groups. If travel motors are used in temporary duty, e.g. for long travel paths, no more than 10 starts may occur. Minimum values for the ON-time are given in the table of minimum values for the individual groups of mechanisms.

Table of minimum values

Group of mechanisms		Intermittent duty			Temporary duty	
		Cycles/h	Starts/h	CDF in %	ON-time	
FEM	ISO				low-pole [2]	high-pole [2]
1 Dm	M 1	10	60	10	10 min	1,5 min
1 Cm	M 2	15	90	15	15 min	2,0 min
1 Bm	M 3	20	120	20	20 min	2,5 min
1 Am	M 4	25	150	25	25 min	3,0 min
2 m	M 5	30	180	30	30 min	3,5 min
3 m	M 6	40	240	40	40 min	4,0 min
4 m	M 7	50	300	50	50 min	5,0 min
5 m	M 8	≥ 60	≥ 360	60	> 60 min	6,0 min

2) For general orientation: **low-pole** ≤ **4-pole**, **high-pole** ≥ **6-pole**

Important: Simultaneous intermittent and temporary duty is not permitted.

Temporary duty

For special operating conditions (e.g. long travel path) the ON-time must only be long enough for the permissible limit temperatures not to be exceeded. In such cases, temporary duty is permitted in place of intermittent duty. In this operating mode, a travel motor which has cooled down to the temperature of the coolant may be operated for a certain time with the travel load.

Minimum values for the ON-time for low and high-pole windings are given for the individual groups of mechanisms in the table of minimum values. No more than 10 starts may occur during this ON-time.

Mixed duty

Intermittent duty and temporary duty alternate in mixed operation. The permissible limit temperatures must not be exceeded for this duty type.

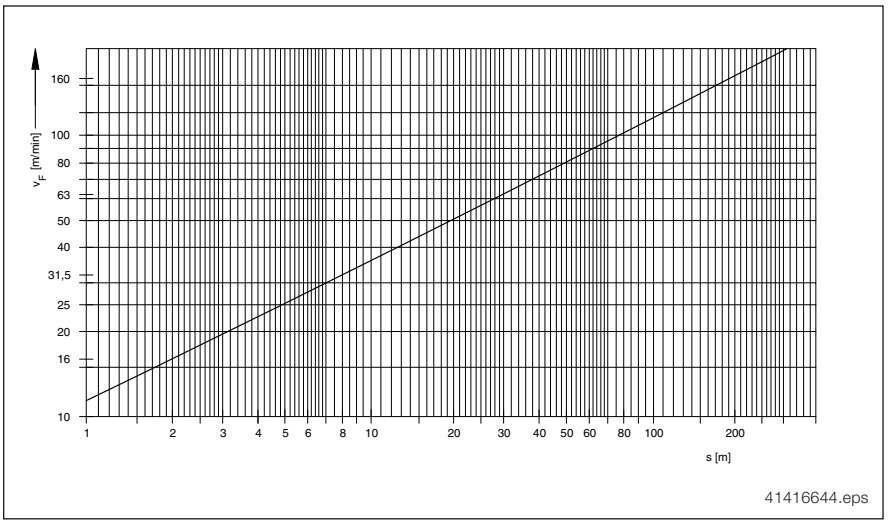
The table of minimum values applies for travel drives with one travel speed for intermittent duty. For travel motors for two travel speeds, the values apply for both windings taken together.

The following conditions are assumed:

	Low speed	High speed
Starting frequency	2/3	1/3
ON-time	1/3	2/3

The values for starts according to the table of minimum values apply to equal distribution over an hour. Other calculations are required for flick-switching (inching operation).

5.1.2 Efficient travel speed



Travel speed v of an installation should be selected on the basis of a reasonable ratio to travel distance s.
Travel distance s must be determined for the relevant application.

For crane installations the following generally applies:

Medium travel distance s = ½ crane runway length or crab runway length

The diagram shows the travel speed as a function of the average travel path for speed efficiency η = 0,85 and
acceleration/braking ≈ 0,2 m/s^2.

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5.1.3 Combination: travel wheel/travel speed/ transmission ratio

Motor speed in rpm	Travel speed in m/min.												
4-pole 1450	5	6,3	8	10	12,5	16	20	25	31,5	40	50	63	80
2-pole 2900	10	12,5	16	20	25	31,5	40	50	63	80	100	125	160
Travel wheel diameter in mm	**Required gearbox transmission ratio**												
112	102	82	64	51	41	32	25	20	16	13	10	8	6
125	114	91	71	57	46	36	28	23	18	14	11	9	7
160	146	117	91	73	58	46	36	29	23	18	15	12	9
200	182	146	114	91	73	58	46	36	29	23	18	15	11
250	228	182	142	114	91	72	57	46	36	28	23	18	14
315	287	230	179	143	115	91	72	57	46	36	29	23	18
400	364	292	228	182	146	116	91	73	58	46	36	29	23
500	456	364	285	228	182	145	114	91	72	57	46	36	28

For inverter operation with 4-pole motors in 87 Hz operation, the required gearbox transmission ratios must be multiplied with √ 3.

5.1.4 Full load hours based on the group of mechanisms

Group of mechanisms		Calculated total running time in hours (full load hours)
FEM	**ISO**	
1 Bm	M 3	400
1 Am	M 4	800
2 m	M 5	1600
3 m	M 6	3200
4 m	M 7	6300
5 m	M 8	12500

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5.2 Travel resistance (friction bearings)

5.2.1 GJS (GGG) spheroidal graphite cast iron travel wheels

DRS wheel block	Travel wheel dia. in mm	Specific travel resistance in N/t
112	112 126	155 140
125	125 145	141 123
160	160 183	112 99
200	200 226	92 82
250	250 270	75 70
315	315 340	61 57
400	400 440	49 45
500	500 545	40 37

5.2.2 Hydropur travel wheels

Travel wheels with Hydropur-elastomer rims 94 $^{\pm 2}$ Shore “A”

The traction resistance of travel wheels depends largely on the deformation at the point on which the wheel stands. In the case of Hydropur-elastomer wheels, the deformation varies as a function of load and time. The specific traction resistances are given for 3 possible cases of operation:

Case A: Traction resistance in the travel wheel after several revolutions in operation. Deformation from the rest state has been smoothed out.

Case B: Traction resistance after being at rest for 10 minutes under full load (initial traction resistance).

Case C: Traction resistance after being at rest for two days under full load (initial traction resistance.

DRS wheel block	Travel wheel dia. in mm	Specific travel resistance in N/t		
		Case A	Case B	Case C
112	130	158	219	268
125	140	150	211	264
160	180	126	186	253
200	225	108	167	243

5.2.3 Polyamide travel wheels

DRS wheel block	Travel wheel dia. in mm	Specific travel resistance in N/t
112	130	136
125	140	127
160	180	101
200	225	82

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5.2.4 Travel wheels for V rails

DRS wheel block	Travel wheel dia. in mm	Specific travel resistance in N/t
112	112	on request
125	125	
160	160	
200	200	
250	250	
315	315	
400	400	
500	500	

5.2.5 Concave travel wheels

DRS wheel block	Travel wheel dia. in mm	Specific travel resistance in N/t
112	112	on request
125	125	
160	160	
200	200	
250	250	
315	315	
400	400	
500	500	

5.3 Determining the maximum permissible wheel load

The maximum permissible wheel load for a wheel block is determined by the minimum of:

- the travel wheel – rail components, determined over the entire operating time in hours;
- the wheel block and connection components, determined on the basis of the number of load changes;
- the driven wheel block component at temperatures from 40° to 80° C

$$R_{max.\,perm} = \text{Minimum}\left[R_{perm\,(temperature)} : R_{perm\,(rail)} : R_{perm\,(wheel\,block)}\right]$$

$R_{max\,perm}$ = Permissible wheel load for one wheel block
$R_{perm\,(temperature)}$ = Permissible wheel load for temperatures above 40° C
$R_{perm\,(rail)}$ = Permissible wheel load for travel wheel/rail combination (sections 2.6.5 and 2.6.6)
$R_{perm\,(wheel\,block)}$ = Permissible wheel load for wheel block and connections (section 5.3.4)

5.3.1 Determining the mechanisms according to duty

The mechanisms are classified in groups depending on duty in order to apply the given calculation principles.

The group to which a mechanism belongs is determined by the factors

- operating time class,
- load spectrum,
- load cycle ranges.

Operating time class

The operating time class specifies the average operating time of a mechanism per day (see table 1). A mechanism is considered to be in operation when it is in motion.

For mechanisms which are not used regularly throughout a year, the average operating time per day is defined by the ratio of the annual operating time to 250 working days per year.

Higher operating time classes are only reached in multiple-shift operation (see example in section 5.5.3).

Table 1

Operating time class		Average daily operating time in hours
V 0,06	T 0	≤ 0,12
V 0,12	T 1	≤ 0,25
V 0,25	T 2	≤ 0,5
V 0,5	T 3	≤ 1
V 1	T 4	≤ 2
V 2	T 5	≤ 4
V 3	T 6	≤ 8
V 4	T 7	≤ 16
V 5	T 8	> 16

Load spectrum

The load spectrum defines to what degree to which a mechanism or a part of it is subject to its maximum load or only smaller loads.

The cubic average value k with reference to the load capacity is required for exact classification in the group. This value is calculated using the following equation:

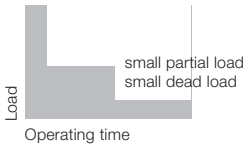
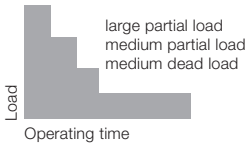
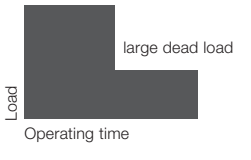
$$R_{average} = \sqrt[3]{(R_1 + R_0)^3 \cdot t_1 + (R_2 + R_0)^3 \cdot t_2 + (R_3 + R_0)^3 \cdot t_3 + ... + R_0{}^3 \cdot t\Delta}$$

$$k = \frac{R_{average}}{R_{max}}$$

$R_{average}$ = Average cubic load of the load spectrum
R_i = Partial load steps without dead load
R_0 = Dead load
t_i = Operating time of partial load step/total operating time
t_Δ = Operating time of dead load step/total operating time
R_{max} = Maximum permissible load of the load bearing medium
k = Cubic average value of the load

A distinction is made between four load spectra which are defined and indicated in table 2 by the ranges of the cubic average values k.

Table 2

Load spectrum	Definition	Cubic average value
L 1 (light) 	Mechanisms or parts thereof, usually subject to light loads and occasional maximum loads	k ≤ 0,50
L 2 (medium) 	Mechanisms or parts thereof, usually subject to light loads, but without a higher incidence of maximum load	0,50 < k ≤ 0,63
L 3 (heavy) 	Mechanisms or parts thereof, usually subject to medium loads, and frequently to maximum loads	0,63 < k ≤ 0,80
L 4 (very heavy) 	Mechanisms or parts thereof, usually subject to maximum loads or almost maximum loads	0,80 < k ≤ 1,00

Load cycle ranges

Depending on the operating conditions, the total number N of load cycles for the wheel block may be equal to the number of operating cycles or a multiple thereof; a load cycle is understood to be each single loading and unloading between pick-up and depositing of a load and an operating cycle is understood to be the movements required to carry out a complete handling operation.

Table 3

N 1	≤ $2 \cdot 10^5$ load cycles
N 2	≤ $6 \cdot 10^5$ load cycles
N 3	≤ $2 \cdot 10^6$ load cycles
N 4	≤ $6 \cdot 10^6$ load cycles

Load cycle ranges N1 to N3 are taken from DIN 15018 (calculation of steel supporting structures for cranes).

Table 4
Assignment of ISO definitions to FEM definitions

Operating time classes	**FEM**	V 0,06	V 0,12	V 0,25	V 0,5	V 1	V 2	V 3	V 4	V 5
	ISO	T 0	T 1	T 2	T 3	T 4	T 5	T 6	T 7	T 8
Load spectra	**FEM**	1	2	3	4					
	ISO	L 1	L 2	L 3	L 4					
Groups of mechanisms	**FEM**	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	
	ISO	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	

5.3.2 Determining according to the group of mechanisms

The group of mechanisms is determined for all parts of the wheel block whose failure parameters are measured according to the number of revolutions and/or the total operating time.

Using the operating time classes and the load spectra, the mechanisms are classified in 8 groups as shown in table 5:

Table 5
Group classification for mechanisms

Load spectrum		**Cubic average value**	**Operating time class**								
			V 0,06	**V 0,12**	**V 0,25**	**V 0,5**	**V 1**	**V 2**	**V 3**	**V 4**	**V 5**
			T 0	T 1	T 2	T 3	T 4	T 5	T 6	T 7	T 8
			Average operating time in hours								
			≤ 0,12	**≤ 0,25**	**≤ 0,5**	**≤ 1**	**≤ 2**	**≤ 4**	**≤ 8**	**≤ 16**	**> 16**
1	L 1	k ≤ 0,50	–	–	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m
2	L 2	0,50 < k ≤ 0,63	–	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m
3	L 3	0,63 < k ≤ 0,80	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	–
4	L 4	0,80 < k ≤ 1,00	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	–	–

Classification of mechanisms in groups according to table 4 makes it possible to define the same expected service life in years (≈ 10 years) for all load spectra and average daily operating times. This assumes that the service life of the individual components is dependent on the cubic number of the load.

Doubling the average daily operating times in the operating time classes or doubling the component parts service life is achieved

- by transferring to a lower load spectrum within a group (1,25 interval),
- by reducing the load capacity by a factor of 1,25 on changing to a higher group within a load spectrum.

Using the defined group of mechanisms, the corresponding permissible wheel load for the travel wheel/rail combination $R_{perm\ (rail)}$ can be found in sections 2.6.5 and 2.6.6.

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5.3.3 Determining the wheel block service life

Using section 5.1.4, it is possible to determine the wheel block service life on the basis of the classification according to groups of mechanisms.

$$L_{a\,(DRS)} = FEM/ISO \cdot \frac{\left(\frac{R_{max}}{R_{average}}\right)^3}{d_A \cdot t_{average}}$$

$L_{a\,(DRS)}$ = Nominal wheel block service life in years
FEM/ISO = Full load hours according to section 5.1.4
R_{max} = Maximum permissible wheel load of wheel blocks according to sections 2.6.5 and 2.6.6 for classification in group of mechanisms M3 (1Bm) at v = 40 m/min.
$R_{average}$ = Average cubic load of the load spectrum according to section 5.3.1
d_A = Number of working days per year (250 days acc. to FEM)
$t_{average}$ = Average daily operating time in hours according to section 5.3.1 with an example in section 5.5.3

5.3.4 Determining according to the number of service life load cycles for wheel blocks and connections to DIN 15018

The number of service life load cycles is determined for all parts of the wheel block whose failure parameters are measured according to the number of load changes.

$$R_{perm\,(wheel\,block)} = R_{max} \cdot f_a$$

$R_{perm\,(wheel\,block)}$ = Permissible wheel load for wheel block and connections
R_{max} = Maximum wheel load of the wheel block system (table 6)
f_a = Degree of utilization of the wheel block system (table 7)

Determining the utilization factor f_a on the basis of the load spectrum and the load cycle range represents the relationship between FEM 9.511 and DIN 15018.

Table 6

Maximum wheel loads of the wheel block system

DRS wheel block size	R_{max} in kg
112	3500
125	5000
160	7000
200	10000
250	16000
315	22000
400	30000
500	40000

5.3.5 Determining the number of load cycles

A number load changes x with pick-up and depositing of a load is assumed per operating cycle. This results in the wheel block duration of utilization from the number of load cycles as in section 5.3.4.

$$N = L_{a\,(DRS)} \cdot d_A \cdot n_{cycle} \cdot t_{average} \cdot x$$

$L_{a\,(DRS)}$ = Nominal wheel block service life in years
N = Selected number of load cycles over the total service life according to section 5.3.4, table 6
x = Number of load changes per operating cycle
n_{cycle} = Operating cycles per hour
$t_{average}$ = Average daily operating time in hours according to section 5.3.1 with an example in section 5.5.3
d_A = Number of working days per year (250 days acc. to FEM)

Table 7

Load spectrum	N 1 $\leq 2 \cdot 10^5$	N 2 $\leq 6 \cdot 10^5$	N 3 $\leq 2 \cdot 10^6$	N 4 $\leq 6 \cdot 10^6$
L 1	1	1	0,95	0,7
L 2	1	1	0,85	0,65
L 3	1	0,9	0,7	0,55
L 4	1	0,8	0,6	0,5

The utilization factor determines the maximum percentage utilization of the maximum wheel load as a function of load spectrum L and the number of load cycles selected on the basis of the total service life.

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5.4 Selection example permissible wheel load

- DRS 125 with R_{max} = 5000 kg
- Permissible wheel load R = 2500 kg from v = 40 m/min, FEM 3m and A55 rail
- Permissible horizontal force for roller guide FH = 15 % of 2500 kg = 375 kN

DRS 125 wheel block size

Curve radius ≥ 305

Group of mechanisms		Permissible wheel load in kg											
FEM	ISO	Travel speed in m/min											
		12,5	16,0	20,0	25,0	31,5	40,0	50,0	63,0	80,0	100,0	125,0	160,0
1 Bm	M 3	4210								3970	3680	3420	3153
1 Am	M 4						3970	3680	3410	3150	2920	2710	2502
2 m	M 5			3970	3680	3410	3150	2920	2700	2500	2320	2150	1986
3 m	M 6	3680	3390	3150	2920	2700	2500	2320	2150	1980	1840	1710	1576
4 m	M 7	2940	2700	2510	2330	2160	1990	1850	1710	1580	1470	1360	1258
5 m	M 8	2340	2150	2000	1850	1720	1580	1470	1360	1260	1170	1080	1001

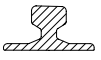
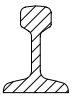
For temperature f_K

DRS wheel block size	– 20 °C up to + 40 °C	up to 50 °C	up to 60 °C	up to 70 °C	up to 80 °C
112 – 200	1	0,85	0,8	0,75	0,6
250 – 500	1	1	0,92	0,90	0,88

Factor f_{st}

	Material	Factor f_{St} Point contact	Standard
Rail	St 70-2/E 360	1	DIN EN 10025
	St 60-2/E 335	0,44	
	St 52-3/S 355 J 2 G 3	0,38	
	St 37-2/ S 235 J R	0,01	

Rail type

	DIN	Rail type	Rail head curve radius in mm
 41409244.eps	536 part 1	A 45	400
		A 55	400
		A 65	400
		A 75	500
		A 100	500
		A 120	600
		A 150	800
 41409344.eps	5901	S 10	140
		S 14	160
		S 18	180
		S 20	200
		S 30	305
		S 33	225
		S 41	400
		S 49	300

Factor f_{Rs}

Curve radius	DRS wheel block size			
in mm	112	125	160	200
< 140	–	–	–	–
> 140	0,61	0,41	0,39	0,40
> 160	0,69	0,47	0,44	0,42
> 180	0,76	0,53	0,50	0,47
> 210	0,87	0,60	0,58	0,55
> 225	0,92	0,64	0,62	0,59
> 300	1	0,81	0,79	0,78
> 305	1	0,82	0,81	0,79
> 400	1	1	1	1
> 500				

Permissible wheel load (rail) = perm. R (point) x f_{St} x f_{Rs}

$R_{perm\ (rail)}$ in kg = 2500 kg x 0,44 x 1 = 1100 kg

Permissible wheel load $_{(temperature)}$ in kg= $R_{perm\ (point)}$ x f_K

$R_{perm\ (temperature)}$ = 2500 kg x 0,85

= 2125 kg

$R_{max\ perm}$ = Minimum [$R_{perm\ (rail)}$: $R_{perm\ (temperature)}$]

= Minimum [1100 kg : 2125kg]

= 1100 kg

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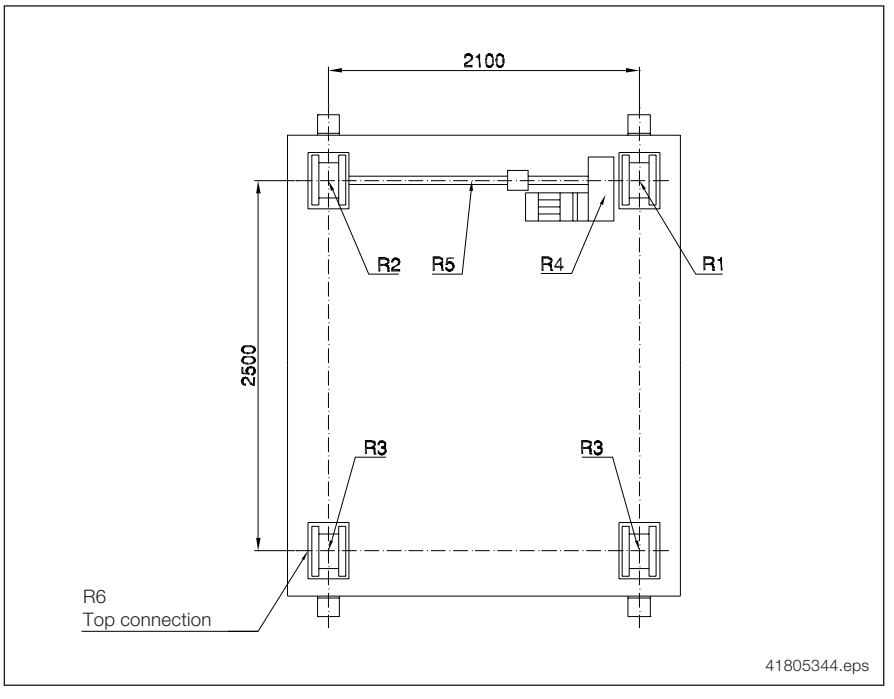
5.5 Selection example Wheel block components

5.5.1 Project description

Project for a tool-changing carriage corresponding to the diagram below.



The carriage is to transport casting tools of various weights. The carriage is to have four wheels, the wheel load is to be distributed evenly over the four wheels.

5.5.2 Known data

Deadweight of the carriage:	m_{dead} = 10000 kg
Maximum payload:	m_{load} = 22000 kg
Total weight:	m_{tot} = 32000 kg
Required travel speed:	v_1 = 20 m/min
Positioning speed:	v_2 = 5 m/min
Travel path length:	l_{path} = 12,5 m
Average travel path:	s = 7,5 m
Rail type:	50 x 40 flat steel, DIN 1017, material (S 355 J2 G3) St 52-3 (see also section 2.6.5)
Travel wheel type:	GJS cast iron travel wheel with 2 flanges
Temperature range:	room temperature – 10°C to + 40° C
Connection type:	top connection K
Total service life:	approx. 10 years
Daily operating time:	8 hours
Operating days p. a.:	250 days

Note:

If the travel wheel and rail assignment is unknown, refer to the notes in section 2.6.
If the travel speed is unknown, select an efficient travel speed as in section 5.1.2.

5.5.3 Determine the group of mechanisms and the number of service life load cycles

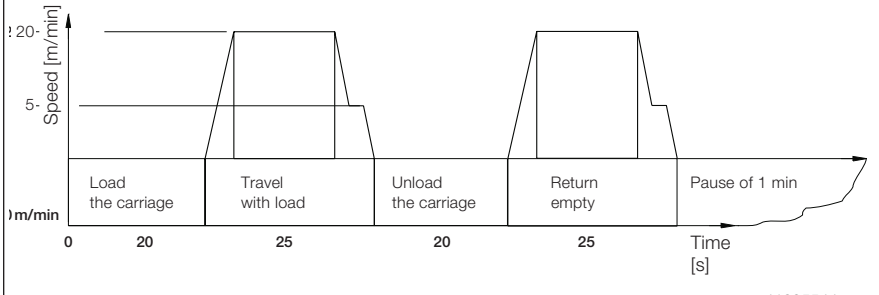
The permissible wheel loads to DIN 15018 (calculation according to the number of load cycles) and FEM 9.511 (calculation according to revolutions) are determined on the basis of the group of mechanisms and the number of service life load cycles.

Determine the operating time class

Time to load the carriage:	t_{load} = 20 s
Carriage travel time:	t_{run} = 25 s
Load transfer time:	t_{trans} = 20 s
Carriage return trip without load:	t_{ret} = 25 s
Pause between two cycles	t_{pause} = 60 s

This operating cycle is used in single-shift operation, i.e. the daily operating period is t_{day} = 8 h

Operating cycle of a pole-changing travel motor



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Assumed average speed: v_m = 18 m/min

Travel path per cycle: s_{cycle} = 15 m

Total travel time of carriage per cycle: $t_{run} = \frac{s_{cycle}}{v_m} = 50\,s$

Total cycle time: $t_{cycle} = t_{load} + t_{run} + t_{trans} = 90\,s$

Number of cycles per hour: $n_{cycle} = \frac{1h}{(t_{cycle} + t_{pause})} = 24$

Average carriage daily operating time: $t_{average} = t_{run} \cdot n_{cycle} \cdot t_{day} = 2{,}67h$

Operating time class		Average daily operating time in hours
V 0,06	T 0	≤ 0,12
V 0,12	T 1	≤ 0,25
V 0,25	T 2	≤ 0,5
V 0,5	T 3	≤ 1
V 1	T 4	≤ 2
V 2	T 5	≤ 4
V 3	T 6	≤ 8
V 4	T 7	≤ 16
V 5	T 8	> 16

According to section 5.3.1, $t_{average} \leq 4h$ implies **operating time class V2/T5.**

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Determine the load spectrum

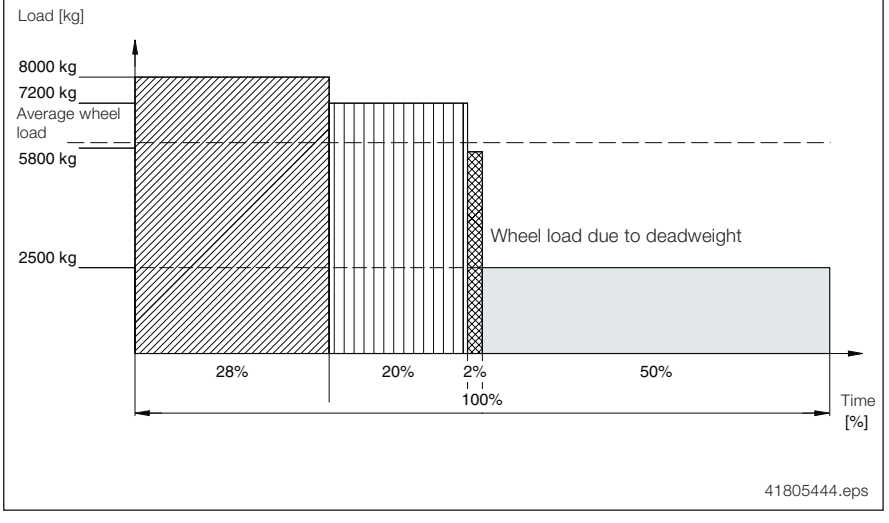
The load spectrum indicates to what degree a mechanism is subject to its maximum load or smaller loads.

The cubic average value k referring to the load capacity is required for exact classification in a group. The ratio of the average cubic load, from the load spectrum, to the maximum load capacity must be calculated.

The wheel loads for operation of the carriage are to be distributed as follows:

Wheel loads in kg	Frequency in %
8000	28
7200	20
2500	50
5800	2

Load spectrum of a travel wheel



The average wheel load amounts to:

$$R_{average} = \sqrt[3]{(8000^3 \cdot 0{,}28) + (7200^3 \cdot 0{,}2) + (5800^3 \cdot 0{,}02) + (2500^3 \cdot 0{,}5)} \text{ kg}$$

$$R_{average} = 6124 \text{ kg}$$

Wheel block selection

The maximum wheel load for this application is 8000 kg. A DRS 250 is initially selected from the load capacity tables with a max. load capacity R_{max} = 10000 kg (section 5.3.4, table 7).

The cubic average amounts to:

$$k = \frac{R_{average}}{R_{max}} = \frac{6124 \text{ kg}}{10000 \text{ kg}} = 0{,}612$$

Determine the group of mechanisms

According to FEM 9.511, classification into groups of mechanisms results in a service life of approx. 10 years.

Load spectrum		Cubic average value	Operating time class								
			V 0,06	V 0,12	V 0,25	V 0,5	V 1	V 2	V 3	V 4	V 5
			T 0	T 1	T 2	T 3	T 4	T 5	T 6	T 7	T 8
			Average daily operating time in hours								
			≤ 0,12	≤ 0,25	≤ 0,5	≤ 1	≤ 2	≤ 4	≤ 8	≤ 16	> 16
1	L 1	k ≤ 0,50	–	–	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m
2	L 2	0,50 < k ≤ 0,63	–	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m
3	L 3	0,63 < k ≤ 0,80	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	–
4	L 4	0,80 < k ≤ 1,00	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	–	–

Load spectrum L1 and operating time class L1 result in **Group of mechanisms 2 m**.

5.5.4 Check the wheel block selection

Determine the permissible wheel load for the rail/travel wheel combination

From section 2.6.5 with

- Speed v1 = 20 m/min
- Group of mechanisms 2 m
- Rail width 50 mm
- Straight travel wheel on flat rail.

Group of mechanisms		Useful rail head width in mm	Permissible wheel load in kg											
			Travel speed in m/min											
FEM	ISO		12,5	16	20	25	31	40	50	63	80	100	125	160
2 m	M 5	30	5750	5340	4990	4670	4360	4050	3790	3540	3290	3080	2880	2670
		35	6710	6230	5830	5450	5080	4730	4420	4130	3840	3590	3360	3120
		40	7670	7120	6660	6230	5810	5410	5060	4720	4390	4110	3840	3570
		45	8630	8010	7490	7010	6540	6080	5690	5310	4940	4620	4325	4010
		50	9580	8900	8320	7780	7260	6760	6320	5900	5490	5130	4800	4460
		≥ 55	10000	9790	9160	8560	7990	7440	6950	6490	6040	5650	5280	4900

According to section 2.6.5 a maximum permissible wheel load from linear contact is given

$R_{perm\ (rail)} = R_{perm\ (line\ contact)} \times f_{St}$

$= 8320\ kg \times 1,0$

$= 8320\ kg$

Rail	Material	Factor f_{St}
	St 70-2/E 360	1
	St 60-2/E 335	1
	St 52-3/S 355 J 2 G 3	1
	St 37-2/ S 235 J R	0,25

According to section 1.11 a maximum permissible wheel load from temperature is given $R_{perm\ (temperature)} = R_{perm\ (line\ contact)} \times f_K$

$= 8320\ kg \times 1,0$

$= 8320\ kg$

This results in a maximum wheel load

$R_{max\ perm} = Minimum\ [\ R_{perm\ (rail)} : R_{perm\ (temperature)}\ ]$

$= Minimum\ [\ 8320\ kg : 8320 kg\ ]$

$= 8320\ kg$

$R_{max} \leq R_{max\ perm}$

$8000\ kg < 8320\ kg.$

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Wheel block service life

On the basis of 1600 hours of full load service life in group of mechanisms 2 m (see section 5.1.4) acc. to section 5.3.3.

$$L_{a\,(DRS)} = FEM/ISO \cdot \frac{\left(\frac{R_{max}}{R_{average}}\right)^3}{d_A \cdot t_{average}}$$

$$L_{a\,(DRS)} = FEM/ISO \cdot \left(\frac{R_{max}}{R_{average}}\right)^3$$

$$L_{a\,(DRS)} = 1600 \cdot \left(\frac{10000}{6124}\right)^3$$

$$= 6966\ h$$

250 working days are assumed per year according to FEM:

$$L_{a\,(DRS)} = \frac{6966}{250 \cdot 2{,}67}$$

$$= 10{,}5\ years$$

The next larger wheel block must be selected if a higher service life is required.

5.5.5 Determining the number of service life load cycles

$$N = L_{a\,(DRS)} \cdot d_A \cdot n_{cycle} \cdot t_{average} \cdot x$$

$$= 10{,}5\ years \cdot 250\ days/year \cdot 24 \cdot 2{,}67 \cdot 3$$

$$= 504.630\ cycles$$

Determine the number of service life load cycles

A theoretical load changing operation with load pick-up and load depositing is carried out for each operating cycle. For practical purposes (e.g. for aligning the tool on the carriage and depositing it at an intermediate position) x = 3 load changing operations per operating cycle is assumed.

N 1	$\leq 2 \cdot 10^5$ load cycles
N 2	$\leq 6 \cdot 10^5$ load cycles
N 3	$\leq 2 \cdot 10^6$ load cycles

N = 504.630 load cycles ≤ 600.000 cycles ≙ N2.

5.5.6 Determining the permissible wheel load

Load spectrum	N 1 ≤ 2 · 10^5	N 2 ≤ 6 · 10^5	N 3 ≤ 2 · 10^6	N 4 ≤ 6 · 10^6
L 1	1	1	0,95	0,7
L 2	1	1	0,85	0,65
L 3	1	0,9	0,7	0,55
L 4	1	0,8	0,6	0,5

According to section 5.3.4, table 6, this results in a maximum utilization factor of $f_a = 1,0$.

The maximum permissible wheel load for the DRS 200 is 10000 kg.
Accordingly, the maximum permissible load amounts to

$R_{perm\ (wheel\ block)}$ = 1,0 · 10000 kg = 10000 kg.

With a maximum actual wheel load of $R_{max\ exist}$ = 8320 kg,
the connection arrangement of the DRS 200 is adequately dimensioned.

5.5.7 Buffer selection

DPZ cellular foam buffers are the standard buffers for the DRS wheel block system.
From section 4.5.5 this implies for:

Travel speed of 20 m/min
Cross travel (no speed reduction measures)
Maximum mass to be buffered 32000 kg distributed on 2 buffers per side

without counterbuffer: Buffer size DPZ 160, 16000 kg
with counterbuffer: Buffer size DPZ 130, 8000 kg

DPZ cellular plastic buffer

Cellular buffer		Travel speed in m/min.												
Limit switch k=70%		to 14,3	to 17,9	to 22,9	to 28,6	to 35,7	to 45,0	to 57,1	to 71,4	to 90,0	to 114,3	to 142,9	to 178,6	to 228,6
Long travel k=85%		to 11,8	to 14,7	to 18,8	to 23,5	to 29,4	to 37,1	to 47,1	to 58,8	to 74,1	to 94,1	to 117,6	to 147,1	to 188,2
Cross travel k=100%		to 10,0	to 12,5	to 16,0	to 20,0	to 25,0	to 31,5	to 40,0	to 50,0	to 63,0	to 80,0	to 100,0	to 125,0	to 160,0
DRS wheel block size	Buffer	Max. mass which can be buffered in kg with counterbuffer												
112 – 400	DPZ 70	6400	4170	2600	1710	1120	730	480						
112 – 400	DPZ 100	22230	14500	9080	5980	2960	2610	1710	1160					
160 – 400	DPZ 130	48480	31670	19660	12900	8500	5560	3610	2460					
200 – 400	DPZ 160	87300	66760	34720	22740	14960	9760	6330	7270					
400	DPZ 210	130140	84730	67730	34560	22760	14780	9660	6500	7360				

With counterbuffer:
The maximum mass which can be buffered is doubled when a counterbuffer of the same size is used.
The values given in the table are masses which can be buffered. It must be considered that the minimum mass to be buffered must not be less than 20 % of the table value (40 % when a counterbuffer is used) due to the acceleration which occurs in the event of a buffer impact.

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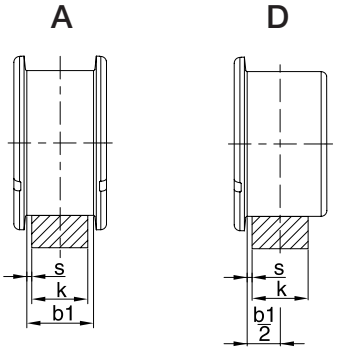
5.5.8 Guide arrangement

The carriage is to be fitted with travel wheels with flanges. A travel wheel tread of b = 65 mm is required for a 55 x 30 flat rail.

GJS-700-2 (GGG 70) spheroidal graphite cast iron travel wheel



Distance s on each side minimum 1 mm, maximum 5 mm in tolerance classe 2 to VDI 3576

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Travel wheel diameter	Travel wheel width	Travel wheel type				Distance s per side 1)		Rail width
		A			D			
		Travel wheel tread b1 2)						
		from	to 3)	Standard	Standard	min.	max.	k
112	80	60	62	**47, 60**	**47**	1	5	40, 45, 50, 55, 60
125	80	60	62	**47, 60**	**47, 60**	1	5	40, 45, 50, 55, 60
160	89	65	67	**47, 60, 65**	**47, 65**	1	5	40, 45, 50, 55, 60, 65
200	101	67	75	**65, (75 3))**	**65**	1	5	50, 55, 60, 70
250	110	77	-	**52, 65, 75**	**65, 75**	1	5	50, 55, 60, 70, 75
315	130	90	-	**80, 90**	**80, 90**	1	5	60, 70 75, 80, 90
400	155	110	-	**80, 90, 110**	**80, 110**	1	5	65, 70, 75, 80, 90, 100
500	170	110	-	**90, 110**	**90, 110**	1	5	70, 75, 80, 90, 100

If an exact guide arrangement is required, we recomend the carriage be fitted with wheel blocks featuring guide flanges or a roller guide arrangement (rail head width +2 mm) on one side.

1) Tolerance class 2 to VDI 3576
2) DRS 112 – 500 available in steps of 1 mm to order
3) Travel wheels hardened (running surfaces and flanges), flanges have no wear indicators

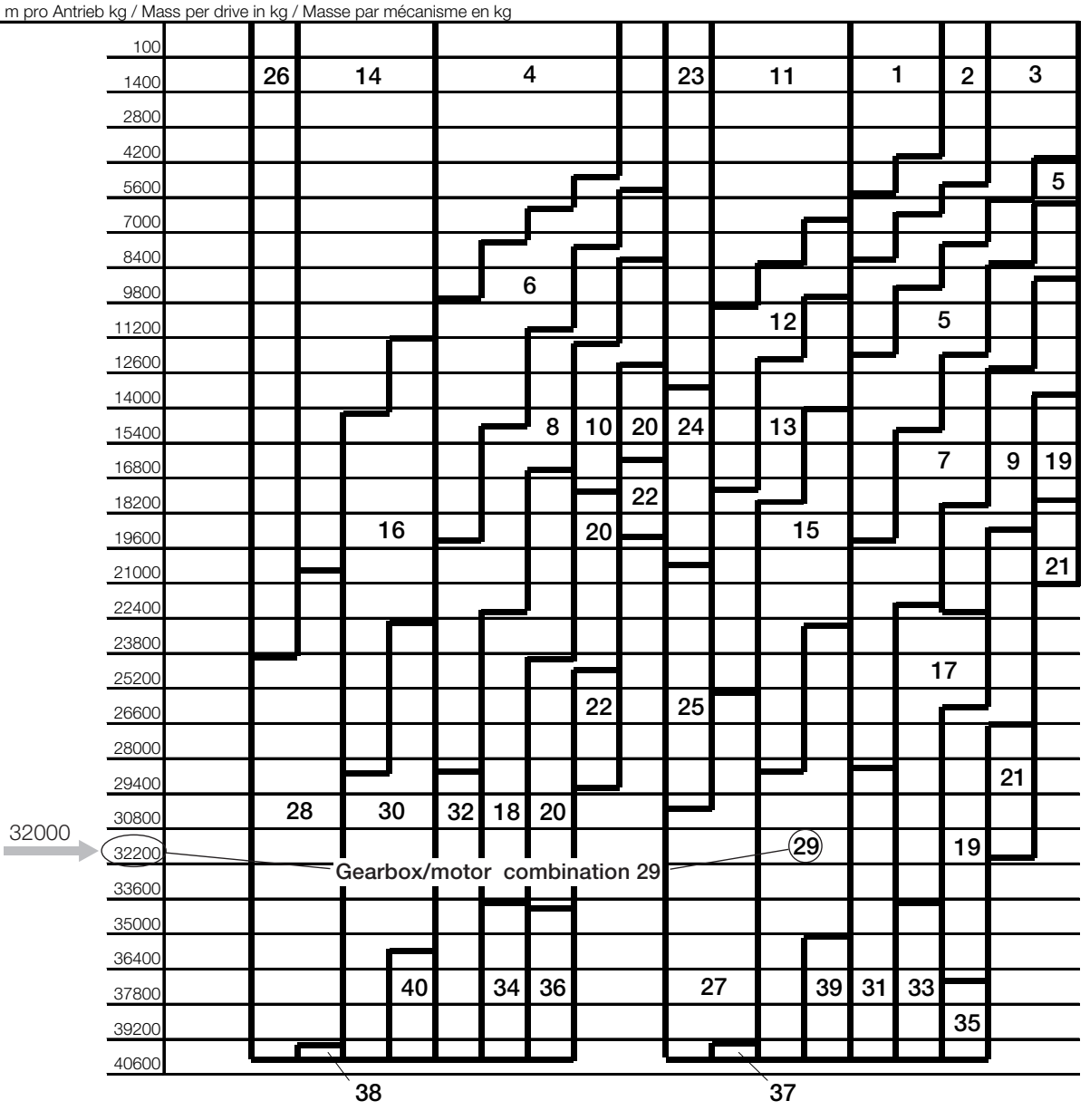
5.5.9 Select the drive variant

Make a preliminary selection using the quick selection table for gearbox/motor combinations (see Volume 3, section 1.5).

5,0/20,0

v [m/min.]				1,6/ 10	2/ 12,5	2,5/ 16	3,15/ 20	4/ 25	5/ 31,5	6,3/ 40	8/ 50	10/ 63	2,5/ 10	3,15/ 12,5	4/ 16	5/ 20	6,3/ 25	8/ 31,5	10/ 40	12,5/ 50	16/ 63,0
Getriebe Gearbox Réducteur	A . . 30	i			156	109	86,4	71,9	55,7	45,5	36,1	29,2		1) 135 2) 156	109	86,4	71,9	55,7	45,5	36,1	29,2
	A . . 40	i		184	150	115	91,1	73,8	55,7	44,3	36,1	28,1	184	150	115	91,1	73,8	55,7	44,3	36,1	28,1
	A . . 50	i			142		87,4		56,4	46,7				142		87,0		56,4	46,7		

Masse m pro Antrieb kg / Mass per drive in kg / Masse par mécanisme en kg



1) DRS 200 - AME 30 TD - ZBF 63 A 8/2

2) DRS 200 - AME 30 TD - ZBF 71 (80) A 8/2

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Gearbox/motor combination: 29

Combination no.	Gearbox	Motor	CDF %	Output kW	Speed rpm
27	AME 40 TD	ZBF 90 B 8/2	40	0,20/0,80	690/2765
29		ZBF 100 A 8/2		0,29/1,20	685/2760
31		ZBF 112 A 8/2		0,46/1,90	705/2855

Check the gearbox/motor combination as in section 2.4 ZI central drive unit, inside arrangement

Motor size		DRS wheel block size													
		112		125		160		200		250		315		400	
		A offset gearbox size													
		10	20	20	30	30	40	40	50	50	60	60	70	70	80
ZBF	ZBA														
63A, 71A	63A/B, 71A/B	●	●	●	●	●	●	●							
80A	80A/B, 90A		●	●	●	●	●	●	●	●	●		●	●	●
90B, 100A	90B, 100A/B				●	●	●	●	●	●	●	●	●	●	●
112A, 132A/B	112A, 132A/B/C								●	●	●	●	●	●	●
	160A/B,180A											●	●	●	●
	180B,200A														●
	225A/B														●

Drive combination selected:

Selected: Gearbox AME 40 T with i = 91
Section 2.4 indicates that this design is possible.

Check the motor with the motor technical key data as in Volume 2, section 4.3.2

Key data for 8/2-pole motors
40/40 % CDF

Typ Type Type	P_N kW	n_N 1/min rpm t/mn	M_N Nm	I_N 400 V A	cos φ N	I_A / I_N	M_A / M_N	M_H Nm	J_{mot} kgm²	A h^{-1}	Bremse Brake Frein Typ Type Type	M_{BStd} Nm	Gewicht Weight Poids Kg
ZBF 63 A 8/2	0,06	675	0,85	0,66	0,59	1,40	2,20	1,7	0,00459	720	**B003**	1,4	10
	0,25	2745	0,87	0,95	0,71	2,65	2,10	1,5		550			
ZBF 71 A 8/2	0,09	675	1,25	0,76	0,61	1,60	2,70	2,5	0,00690	620	**B003**	1,9	12,2
	0,34	2785	1,15	1,00	0,73	3,50	2,60	2,5		500			
ZBF 80 A 8/2	0,13	630	1,95	1,20	0,64	1,20	2,10	3,5	0,01275	620	**B020**	3,3	19,5
	0,50	2790	1,70	1,40	0,73	4,50	2,60	4,0		500			
ZBF 90 B 8/2	0,20	690	2,80	1,50	0,50	1,95	2,50	6,5	0,02169	580	**B020**	4,4	28,2
	0,80	2765	2,80	2,30	0,79	3,60	2,40	6,2		450			
ZBF 100 A 8/2	0,29	685	4,00	2,10	0,50	1,80	2,50	9,0	0,03092	460	**B050**	8,3	35
	1,20	2760	4,20	3,20	0,82	4,00	2,50	9,5		350			
ZBF 112 A 8/2	0,46	705	6,20	2,50	0,49	2,50	2,40	15	0,04374	460	**B050**	11	56,4
	1,90	2855	6,40	4,30	0,85	5,30	2,40	14,5		350			
ZBF 132 A 8/2	0,72	700	9,80	3,10	0,53	2,45	2,00	20	0,07267	400	**B140**	18	74
	2,90	2815	9,80	6,70	0,91	5,50	2,40	23		320			
ZBF 132 B 8/2	0,88	700	12,00	4,10	0,50	2,55	2,20	26	0,09286	360	**B140**	23	76
	3,50	2860	11,70	7,70	0,86	6.00	2,70	30		300			

Required balancing power at full load

with a specific traction resistance for a DRS 200 GJS (GGG) of 92 N/t from section 5.2.1

DRS wheel block size	Travel wheel dia. in mm	Specific traction resistance in N/t
200	200	92

for the traction resistance for a clean rail:

$$F_w = \frac{w_{sp} \cdot m}{1000}$$

$$F_w = \frac{92\,N/t \cdot 32000\,kg}{1000}$$

$$F_w = 2944\,N$$

with a total efficiency for travel units with offset gearboxes of

$$\eta = 0,85$$

results in the minimum required drive output (balancing output)

P_{Bal} zu

$$P_{Bal} = \frac{F_w \cdot v}{60000 \cdot \eta}$$

$$P_{Bal1} = \frac{2944\,N \cdot 5\,m/min}{60000 \cdot 0,85} = 0,288\,kW$$

$$P_{Bal2} = \frac{2944\,N \cdot 20\,m/min}{60000 \cdot 0,85} = 1,15\,kW$$

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Acceleration and braking

Certain intermediate calculations are required to calculate the acceleration and deceleration rates:

with drive force

$$F_a = A_M \cdot M_H \cdot \frac{n}{v} \cdot 2 \cdot \pi \cdot \eta$$

$$F_{a1} = 1 \cdot 9\,Nm \cdot \frac{685\,rpm}{5\,m/min} \cdot 2 \cdot \pi \cdot 0{,}85 = 6585\,N$$

$$F_{a2} = 1 \cdot 9{,}5\,Nm \cdot \frac{2800\,rpm}{20\,m/min} \cdot 2 \cdot \pi \cdot 0{,}85 = 7103\,N$$

and motor mass

$$m_M = 4 \cdot \pi^2 \cdot A_M \cdot J_{Mot} \cdot \left(\frac{n}{v}\right)^2$$

$$m_{M1} = 4 \cdot \pi^2 \cdot 1 \cdot 0{,}03092\,kgm^2 \cdot \left(\frac{685\,rpm}{5\,m/min}\right)^2 = 22910\,kg$$

$$m_{M2} = 4 \cdot \pi^2 \cdot 1 \cdot 0{,}03092\,kgm^2 \cdot \left(\frac{2800\,rpm}{20\,m/min}\right)^2 = 23925\,kg$$

$$m_{MH} = m_M \cdot \eta$$

$$m_{MH1} = 22910\,kg \cdot 0{,}85 = 19474\,kg$$

$$m_{MH2} = 23925\,kg \cdot 0{,}85 = 20336\,kg$$

$$m_{Br} = \frac{m_M}{\eta}$$

$$m_{Br1} = \frac{22910\,kg}{0{,}85} = 26953\,kg$$

$$m_{Br2} = \frac{23925\,kg}{0{,}85} = 28147\,kg$$

and brake force

$$F_{BR} = A_M \cdot M_{Br} \cdot \frac{n}{v} \cdot 2 \cdot \pi \cdot \frac{1}{\eta}$$

$$F_{BR1} = 1 \cdot 8{,}3\,Nm \cdot \frac{685\,rpm}{5\,m/min} \cdot 2 \cdot \pi \cdot \frac{1}{0{,}85} = 8405\,N$$

$$F_{BR2} = 1 \cdot 8{,}3\,Nm \cdot \frac{2800\,rpm}{20\,m/min} \cdot 2 \cdot \pi \cdot \frac{1}{0{,}85} = 8589\,N$$

results in an acceleration of

$$a = \frac{F_a - F_w}{m_{MH} + m}$$

$$a_1 = \frac{F_{a_1} - F_w}{m_{MH_1} + m} \qquad a_1 = \frac{6585\,N - 2944\,N}{22910\,kg + 32000\,kg} = 0{,}066\,m/s^2$$

$$a_2 = \frac{F_{a_2} - F_w}{m_{MH_2} + m} \qquad a_2 = \frac{7103\,N - 2944\,N}{20336\,kg + 32000\,kg} = 0{,}08\,m/s^2$$

and a mechanical deceleration rate of

$$a_{Br} = \frac{F_{Br} - F_W}{M_{MBr} + m}$$

$$a_{Br_1} = \frac{F_{Br_1} - F_W}{M_{MBr_1} + m} \qquad a_{Br_1} = \frac{8405\,N + 2944\,N}{26953\,kg + 32000\,kg} = 0{,}19\,m/s^2$$

$$a_{Br_2} = \frac{F_{Br_2} - F_W}{M_{MBr_2} + m} \qquad a_{Br_2} = \frac{8589\,N + 2944\,N}{28147\,kg + 32000\,kg} = 0{,}19\,m/s^2$$

Motor starting frequency

Starting-up via the 8-pole winding (starting at slow speed) results in a starting-up time from slow speed V_1 to fast speed V_2

$$t = \frac{V_2 - V_1}{60 \cdot a_2}$$

$$t = \frac{20\,m/min - 5\,m/min}{60 \cdot 0{,}08\,m/s^2}$$

$$t = 3{,}1\,s$$

results in a starting frequency for the 2-pole winding of

$$c = \frac{A}{t}$$

$$c = \frac{350\,\frac{1}{h} \cdot 1\,s}{3{,}1\,s} = 113\,\frac{1}{h}$$

for the slow speed with the starting-up time from 0 to V_1

$$t_1 = \frac{v_1}{60 \cdot a_1}$$

$$t_1 = \frac{5\,m/min}{60 \cdot 0{,}066\,m/s^2}$$

$$t_1 = 1{,}26\,s$$

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results in the following possible starting frequency:

$$c = \frac{A}{t_1}$$

$$c = \frac{460\frac{1}{h}\cdot 1\,s}{1{,}26\,s}$$

$$c = 365\frac{1}{h}$$

A cycle time of 24 per hour was required in the application. This requires a starting frequency for the 2-pole winding, i.e. for the high speed, of 48 per hour.

The motor is suitable for 113 starts per hour and is, therefore, adequately dimensioned.

The final step is to check the brake, with the moment of inertia of the mass displaced with reference to the motor shaft

and load torque

$$J_{Load} = \frac{m\cdot v^2}{4\cdot\pi^2\cdot n^2}\cdot\eta$$

$$J_{Load} = \frac{32000\,kg\cdot(20\,m/min)^2}{4\cdot\pi^2\cdot(2800\,rpm)^2}\cdot 0{,}85$$

$$J_{Load} = 0{,}0351\,kgm^2$$

$$J_{tot} = J_{mot} + J_{load}$$

$$J_{tot} = 0{,}03092\,kgm^2 + 0{,}0351\,kgm^2$$

$$J_{tot} = 0{,}066\ kgm^2$$

$$M_L = \frac{P_{Bal2}\cdot\eta}{n}\cdot 9550$$

$$M_L = \frac{1{,}15\,kW}{2880}\cdot 9550$$

$$M_L = 3{,}92\,Nm$$

resulting in friction of

$$W_R = \frac{J_{tot}\cdot\Delta n^2}{182{,}4}\cdot\frac{M_B}{M_B + M_L}$$

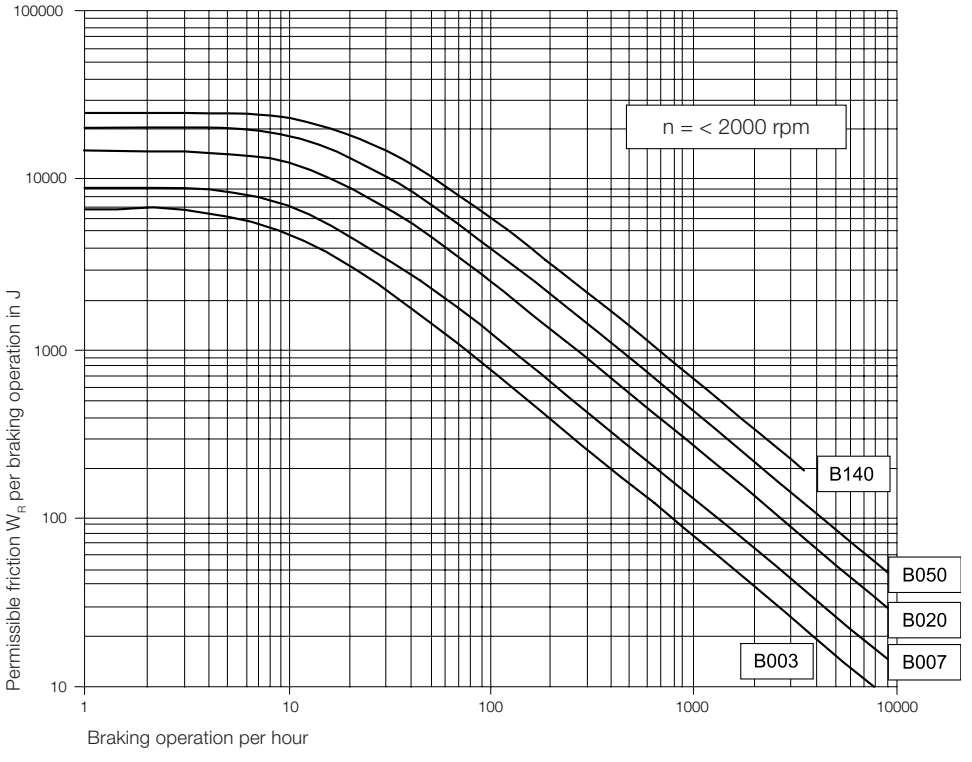
$$W_R = \frac{0{,}066\,kgm^2\cdot(2800\,rpm)^2}{182{,}4}\cdot\frac{8{,}3\,Nm}{8{,}3\,Nm + 3{,}92\,Nm}$$

$$W_R = 1927\,Ws$$

With friction of approx. 2000 Ws and brake B050, the following diagram (n = 2000-3600 rpm) indicates approx. 170 permissible braking operations per hour from maximum speed to standstill.

48 braking operations were required in the application. Additional braking operations from the low speed no longer have to be checked separately since the friction energy is 16 times smaller than for braking from the high speed, which would result in more than 3000 possible braking operations.

Permissible friction per braking operation depending on starting frequency per hour



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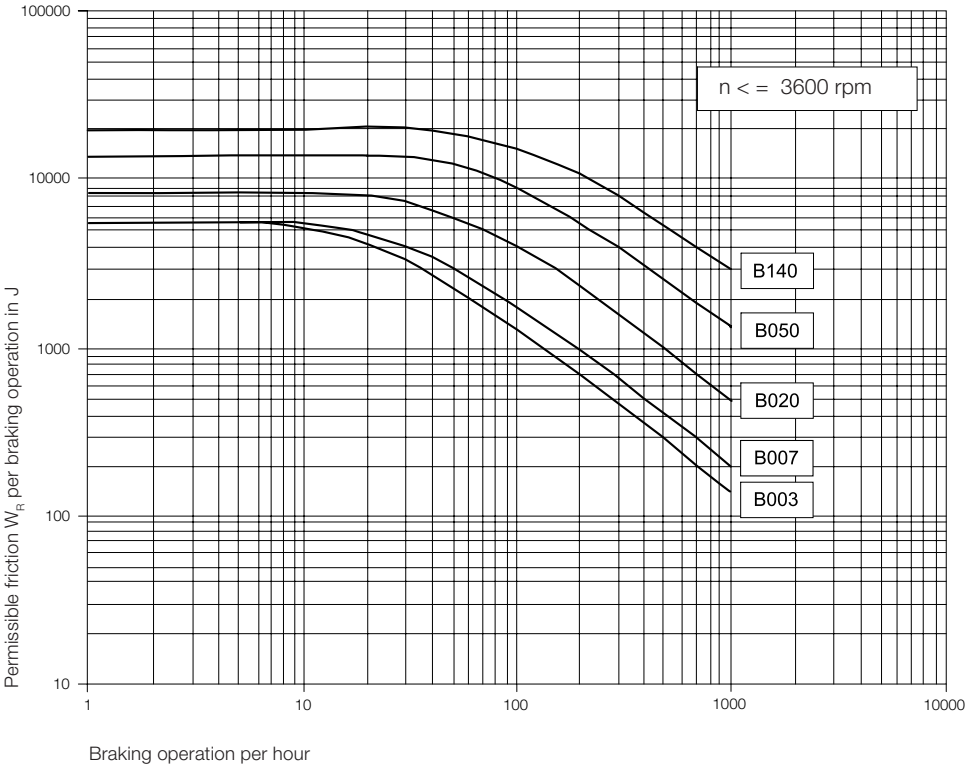
Permissible friction per braking operation depending on starting frequency per hour



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5.5.10 Travel wheel slip torque for crane and cross travelling

For a geared motor selected in this way, the gearing is durable, the service life is only limited by the antifriction bearings, the sealing rings or the lubricant.

In addition, the gearbox must be checked for a gearbox limit load which may occur when the travel wheels slip or if the travel unit collides with the buffers.

With uniform distribution of the weight, this results in

$$R_{max} = \frac{\text{Total weight}}{\text{Number of wheels}}$$

$$R_{max} = \frac{32000\ \text{kg}}{4}$$

$$R_{max} = 8000\ \text{kg}$$

and, therefore, with an adhesion coefficient for cast iron travel wheels of μ = 0,2, this results in a travel wheel slipping torque of

$$M_{pu} = R_{max} \cdot \mu \cdot 9{,}81 \cdot \frac{d}{2} \cdot \frac{\text{Number of wheels}}{\text{Number of motors}}$$

$$M_{pu} = 8000\ \text{kg} \cdot 0{,}2 \cdot 9{,}81 \cdot \frac{0{,}2\text{m}}{2} \cdot \frac{4}{2}$$

$$M_{pu} = 3140\ \text{Nm}$$

The gearbox limit torque of the A...50 gearbox (from travel wheel slip torque) with the transmission ratio (for transmission ratio see table in Volume 3, section 3, i = 87,4) from Volume 2 results in

DRS 200			DRS 200		
A 40			A 50		
i gear	M gear. limit	perm. wheel load	i gear	M gear. limit	perm. wheel load
81,5	1980	10092	78,0	3450	17584
91,1	1980	10092	87,4	3450	17584
101	1980	10092	99,6	3450	17584

$M_{gear.\ limit}$ = 3450 Nm, corresponds to permissible wheel load 17584 kg

Therefore, $M_{pu} < M_{limit}$ and the gearbox is adequately dimensioned for the application.

From limit torque perm. wheel load ≥ Rmax
17584 kg ≥ 8000 kg

Without travel wheel slip torque

Note

For reasons of simplification, a specified standard speed is assumed for this calculation. The actual speeds in the application are dependent on the actual transmission ratio, the motor load and, therefore, on the resulting motor speed. This results in a speed of 688/2815 rpm at full load for this example. Therefore, the actual speed ranges between 4,75 - 5,04 / 19,4 - 20,3 m/min.

According to Volume 2, section 2.1, the offset gearbox model code is specified as

ADK 50 ABK 50 TD – M1 – 11 – 1 – 91,1

5.5.11 Select the drive shaft

For the track gauge of 2100 mm and the drive selected in accordance with section 3.11, the following drive shaft set should be selected:

Drive shaft: included in the gearbox
Coupling type G: part no. 860 303 44

The intermediate shaft is suitable for a maximum track gauge of 2240 mm and can be shortened appropriately to the actual track gauge dimension.

5.5.12 Determine the type key

The following type key is selected for the four wheel blocks according to section 2.7:

1 x DRS 200 – A 50 – A 65 – K – X – A40
1 x DRS 200 – MA 50 – A 65 – K – X – X
2 x DRS 200 – NA – A 65 – K – X – X

5.5.13 Special measures

The tool-changing carriage is operated indoors at normal ambient temperatures and under clean operating conditions. Special measures are not, therefore, required.

5.5.14 Select the components

Quantity	Designation	Item
1	DRS 200 – A50 – A65 – K – X – A40	R1
1	DRS 200 – MA50 – A65 – K – X – X	R2
2	DRS 200 – NA – A65 – K – X – X	R3
1	Geared travel motor ADK 40TD – M1 – 11 – 1 – 91,1 / ZBF 100 A 8/2 B050	R4
1	Torque bracket MA 200-2 (part no. 753 190 44)	R4
1	Connecting shaft type G (part no. 860 303 46)	R5
4	Top connection set (part no. 752 520 44)	R6

6 Appendix

6.1 Notes on ordering

Kindly read the following remarks concerning orders to ensure that your orders are processed smoothly and rapidly.

If you have any questions, please contact your drive supplier or our technical department.

6.1.1 Ordering on the basis of a quote or drive calculation

Please refer to our quote/calculation with project no. and date. Please mark any changes or additions clearly.

6.1.2 Ordering drives selected by you or your customers

Please use the fax on the following pages to ensure that your order is complete and to avoid the need for any further clarification.

6.1.3 Replacement drive

To clearly identify the original delivery, we require the serial/motor no. stamped on the rating plate. Further technical details are not required.

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6.2 Enquiry/order

Fax service

Your hotline for wheel block systems
Fax no. see section 6.4

Demag DRS wheel block system Enquiry/order

Demag Cranes & Components

Please send the offer to

Company

P.O. Box/street

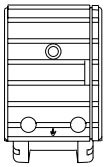
Post code/town, city

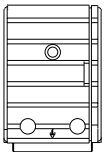
Contact

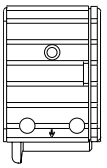
Telephone/extension

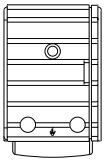
Telefax

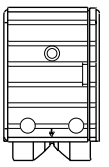
Travel wheel type

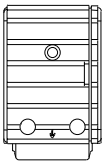

☐ Flange on both sides

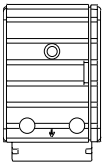

☐ With guide rollers, no flanges


☐ Flange on one side


☐ Polyamide, no flanges


☐ For V-rail


☐ Hydropur, no flanges


☐ With larger diameter, no flanges

Number of wheel blocks

No drive	With individual drive unit	Wheel block pairs with central drive unit

Motor type	max. wheel load in kg	Travel rail, type/dimensions	Travel speed m/s

Connection type

☐ Top connection ☐ Side connection ☐ Pin connection ☐ Alignable pin connection

Additional information

Operation ☐ under cover ☐ outdoors

Deadweight of superstructure ____ kg

Useful load ____ kg

Travel path length ____ mm

Required stopping accurancy ____ mm

Operating voltage ____ V ____ Hz

Control required ☐ yes ☐ no

Control voltage ____ V ____ Hz

☐ Please send an offer ☐ I still have questions, please call me

6.3 Project data sheet

Demag DRS wheel block system
Project data sheet

Fax no.
(see section 6.4)

From company: _____ Date: _____

Mr./Ms.: _____ Telephone: _____

Department: _____ Telefax: _____

Address: _____

_____ Required delivery date: _____

Enquiry data:

Mass to be displaced:	of which deadweight:
Travel speed:	Positioning speed:
Acceleration:	Deceleration:
CDF:	Starting frequency:
Operating hours per day:	
Travel path:	Travel wheel diameter:
Number of wheels:	of which driven:
Number of motors:	Stopping accuracy:
Travel path gradient:	Wind force:
Rail/rail head width:	

Travel wheel material:

❑ Cast iron ❑ Polyamide ❑ Hydropur

Travel wheel type (only for cast iron wheels):

❑ Flange on both sides	Tread width:
❑ Flange on one side	Running surface width:
❑ No flanges	❑ Concave travel wheel
❑ Special travel wheel	Specification:

Connection variants:

❑ Top connection ❑ Side connection ❑ Pin connection
❑ Pin connection, alignable

Drive variants:

❑ Individual drive unit ❑ Central drive unit Track gauge:

Accecories:

❑ Torque bracket	❑ Buffer	❑ Shaft protection
❑ Guide rollers	Shafts + accecories:	

❑ Standard RAL 7001 ❑ Special paint finish:

Environment:

Ambient temperature: ❑ Operation outdoors
Special ambient conditions:

Geared motor data:

Voltage:	Frequency:	CDF:
❑ Offset gearbox	❑ Angular gearbox	
Special design:		

6.4 Drive representatives and agencies abroad

Land Country Pays	Firmenname Company Société	Postanschrift Postal address Adresse postale	Firmenanschrift Company address Adresse société	Telefon und Telefax Telephone telefax Téléphone et téléfax
Argentinien	Demag Cranes & Components S. A.		Guayaquil 523 (1611) Don Torcuato Provincia de Buenos Aires Argentinien	Tel.: 0054-11-47487000 Fax: 0054-11-47418666
Australien	Demag Cranes & Components Pty. Ltd.	Locked Bag 7 Wetherill Park NSW 2164 Australien	92, Long Street Smithfield, N.S.W. 2164 Australien	Tel.: 0061-2-96099500 Fax: 0061-2-96097168
Brasilien	Demag Cranes & Components Ltda.	Caixa Postal 806-0 CEP 06700-000 Cotia – SP Brasilien	Rodovia Raposo Tavares, km 31 CEP 06700-000 Cotia – SP Brasilien	Tel.: 005511-2145-7800 Fax: 005511-4616-0112
China, Volksrepublik	Demag Cranes & Components (Shanghai) Co., Ltd.		125 Zhuang Road, Zhuanghang Town, Fengxian District Shanghai Shanghai 201415, V.R. China	Tel.: 0086-21-57463222 Fax: 0086-21-574464558
Dänemark	Demag Cranes & Components A/S		Måløv Teknikerby 2 DK-2760 Måløv	Tel.: 0045-44828400 Fax: 0045-44828402
Finnland	ALGOL Technics Oy, Materials Handling	PL 13, FIN-02611 Espoo 00880 Helsinki	Sahaajankatu 3 FIN-00880 Helsinki	Tel.: 00358-9-50991 Fax: 00358-9-784792
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