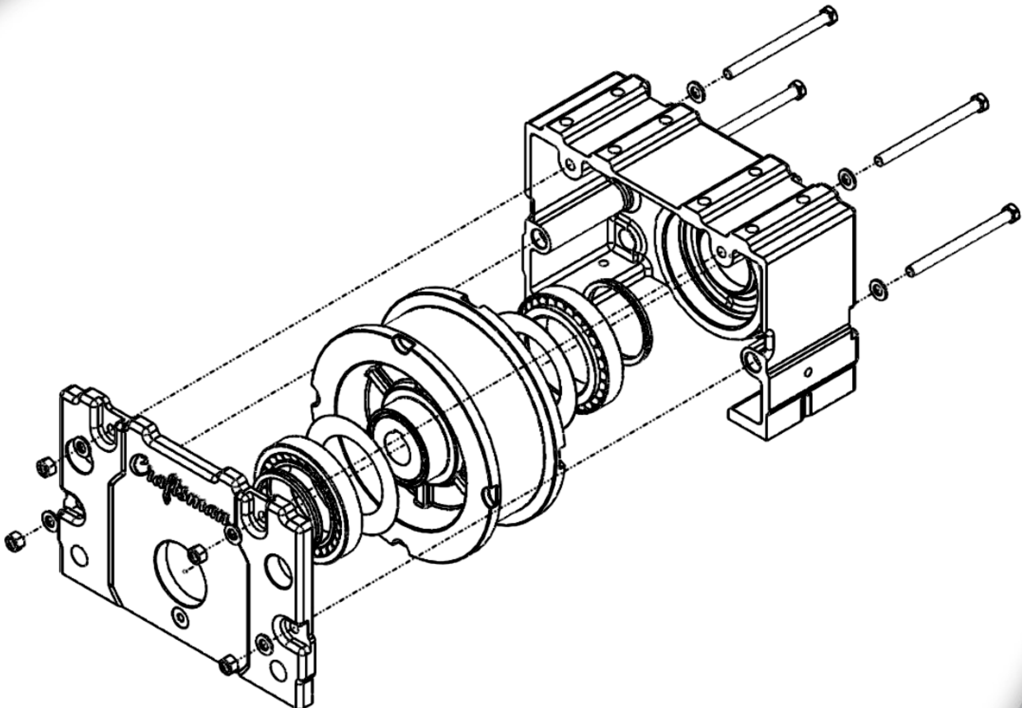
TECHNICAL MANUAL

Wheel Block System



ENGINEERING ADVANTAGE

www.craftsmanautomation.com

Printed version - September 2018

www.craftsmanautomation.com

TECHNICAL MANUAL
WHEEL BLOCK SYSTEM

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

1. - INTRODUCTION

Craftsman Wheel Block Systems (CRWB) are developed for unmatched performance and functional reliability by our team of experts & years of industry expertise. Modular wheel block system from Craftsman enables the fast and cost-effective solution to meet your individual requirements. CRWB Housing, Cover and Wheel was made of spheroidal graphite cast iron which ensures structural stability. Bearings are carefully selected to the suite with the practical load conditions and to have low maintenance. The wheel block systems are available in various load capacities which satisfies the fast-growing industrial requirements. The wheel block size ranges from diameter 112, 125, 160, 200, 250, 320, 400 and 500 with the corresponding load capacities from 3.5, 5, 7, 10, 16, 21, 30 and 40 tons respectively. This wheel block system is applicable for Top, Side, Pin & End mounting connections. Craftsman wheel block assembly is designed for wide ranges of applications cranes, hoist, storage systems, transfer carts, conveyors and lifting platforms.

Benefits of wheel block system:

- For crane manufacturers, it provides a ready-made solutions.
- With closer ranges of diameter with the number of variables in an organized way, which suits for specific applications in a cost-effective manner.
- Easy for assembly and disassembly.
- Time to market is very quick.

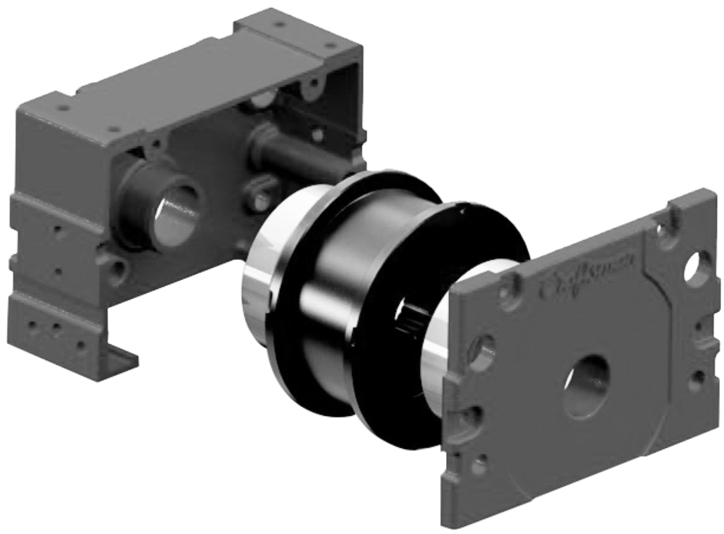


Fig 1 - Exploded view of Wheel block System

INTRODUCTION

1.1. - PRODUCT DESCRIPTION - CRWB 112 TO 200

Craftsman Wheel Block Systems CRWB 112 to 200, designed for up to a load of 10 tons, is to meet customer expectations, with comfortable ground clearances

The advantages of the system are

- Grey iron housings ensure the robustness of the product.
- Shielded internal bearing arrangement, which are self lubricated for life.
- Less maintenance, suitable for harsh environment and increased service life.
- Wheel block can be replaced easily with less effort.
- Flange wear indicator ensures preventive maintenance without risk.

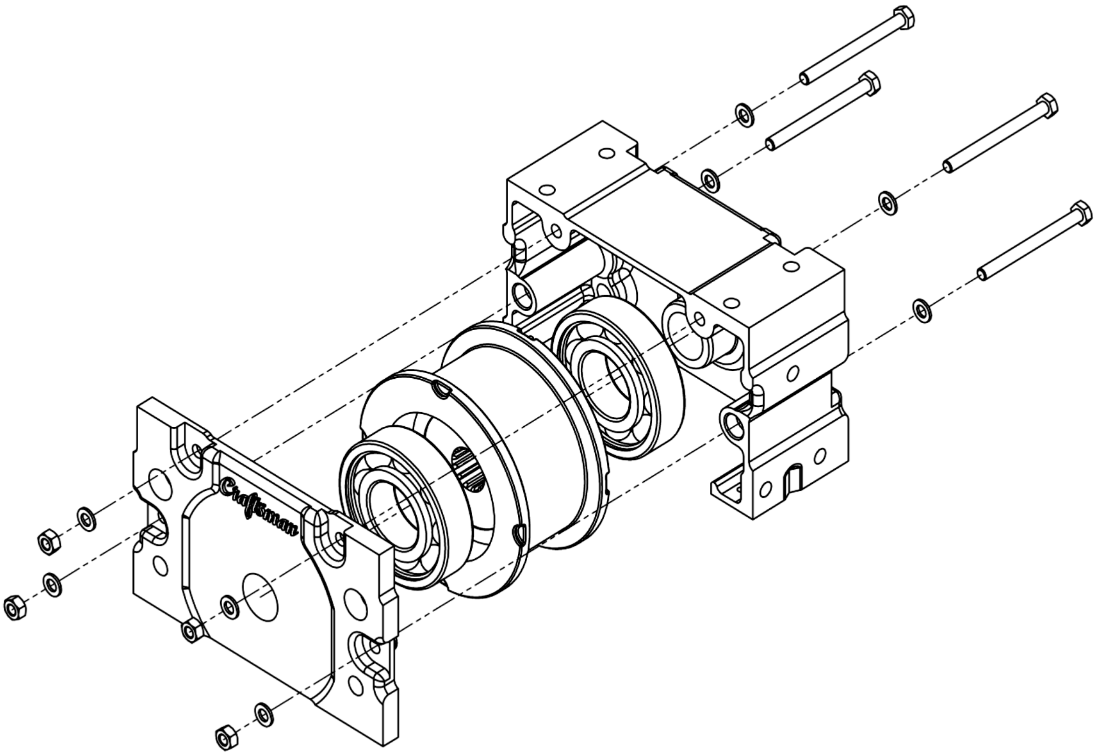


Fig 2 - Exploded view of Wheel block system CRWB 112 TO 200

INTRODUCTION

1.2. - PRODUCT DESCRIPTION - CRWB 250 TO 500

Craftsman Wheel Block Systems CRWB 250 to 500, designed for up to a load of 40 tons, is to meet customer expectations, with comfortable ground clearances

The advantages of the system are

- Grey iron housings ensure the robustness of the product.
- Less maintenance , suitable for harsh environment and increased service life.
- Wheel block can be replaced easily with less effort.
- Flange wear indicator ensures preventive maintenance without risk.
- Gearbox mounting flange & torque arm mounting which reduces the peak load as a result of travel wheel slip torque.

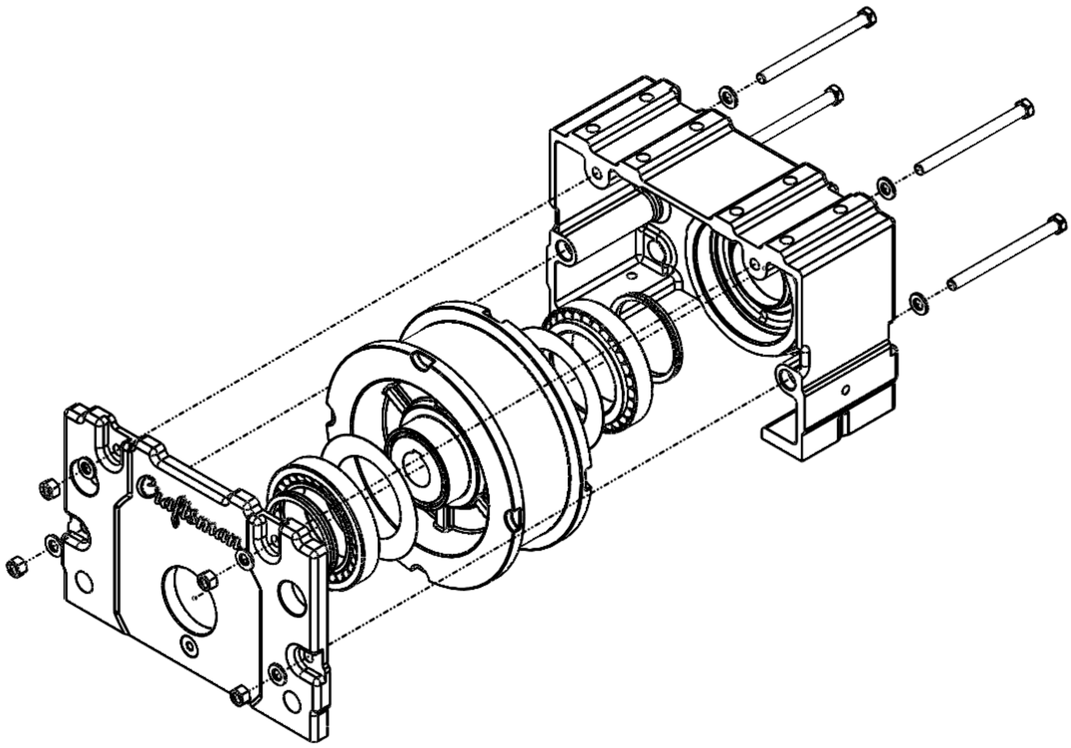


Fig 3 - Exploded view of Wheel block System CRWB 250 TO 500

INTRODUCTION

1.3. - ABOUT WHEEL BLOCK SYSTEM

1.3.1. - WHEEL BLOCK HOUSING

Wheel block housing is made out of spheroidal graphite cast iron grade 40 (SG 400 / GGG 40) and is finished with high precision machining processes ensures stability and dimensional accuracy.

1.3.2. - WHEEL

The wheel is made out of spheroidal graphite cast iron grade 70 (SG 700 / GGG 70) with guide flanges on both sides. This provides high wear resistance and low travel resistance. This material with good damping property ensures better running characteristics for the entire load carrying unit.

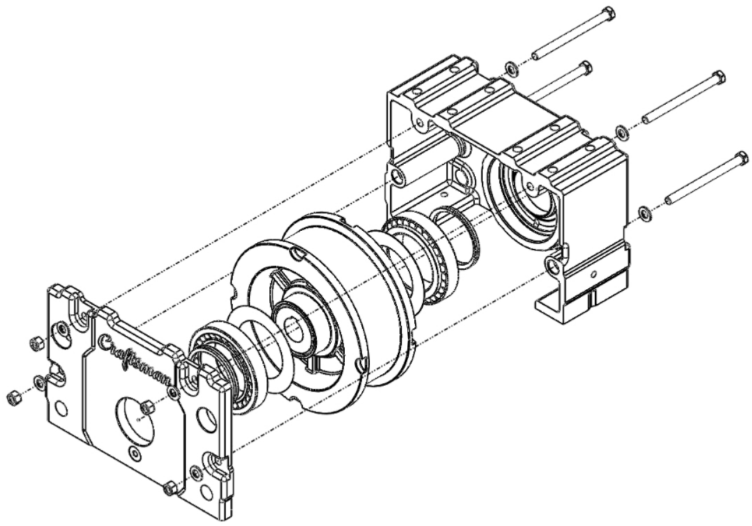
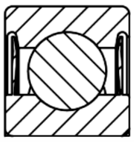


Fig 4 - Exploded view of Wheel block System

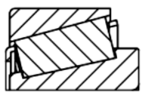
1.3.3. - WHEEL BLOCK ARRANGEMENT WITH DEEP GROOVE BALL BEARING

The load bearings of CRWB 112 – 200 are deep groove ball bearings which are lubricated for life and are sealed with two cover discs. These bearings are enclosed and arranged inside the wheel block housing which ensures low maintenance.



1.3.4. - WHEEL BLOCK ARRANGEMENT WITH TAPER ROLLER BEARING

The taper roller bearings of CRWB 250 – 500 are to withstand both high radial and axial loads. This compact arrangement is enclosed within the wheel block housing along with GREASE PAD(or NILOS ring) and V ring seals and is filled with grease ready for application.



INTRODUCTION

1.4. - WHEEL BLOCK CONNECTIONS

WHEEL BLOCK SYSTEM – TOP CONNECTION

- Top side of the wheel block is directly bolted to the end carriage with help of studs.
- Mounting flange is bolted at one side of the wheel block to support the gear box.

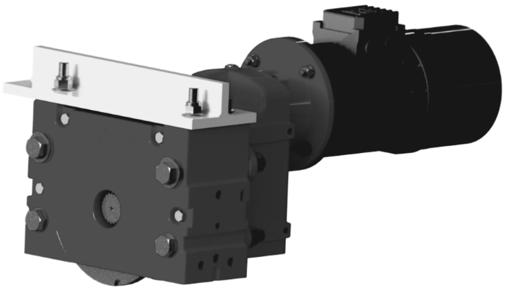


Fig 5 - Wheel block system - Top connection

WHEEL BLOCK SYSTEM – SIDE CONNECTION

- One side of wheel block is mounted to the end carriage with sleeve & flange washer.
- Mounting flange is bolted at one side of the structural plate to support the gear box.

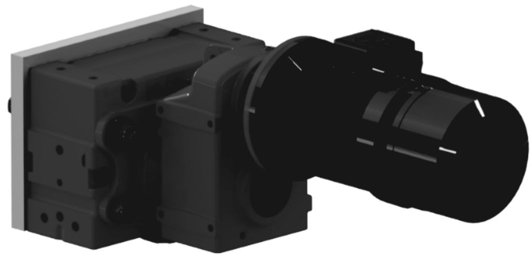


Fig 6 - Wheel block system - Side connection

WHEEL BLOCK SYSTEM – PIN CONNECTION

- A pin is used to mount the wheel block with the plates at two sides.
- Gear box is mounted with help of triangle bracket and a torque arm.

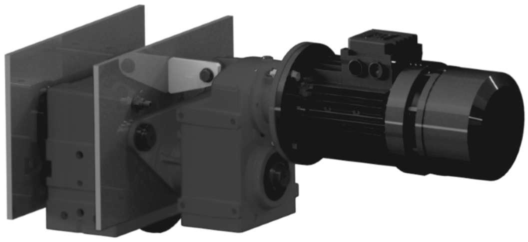


Fig 7 - Wheel block system - Pin connection

WHEEL BLOCK SYSTEM – END CONNECTION

- Similar to pin connection, wheel block is inserted to the hollow section and a pin is used to connect the wheel block with the end carriage.
- Gear box is mounted with help of triangle bracket and a torque arm.

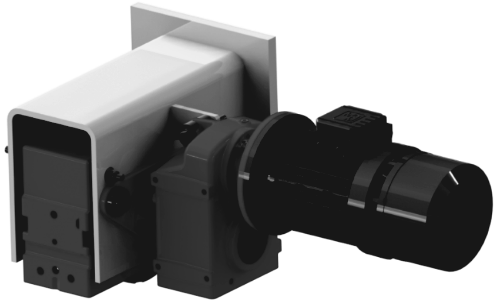
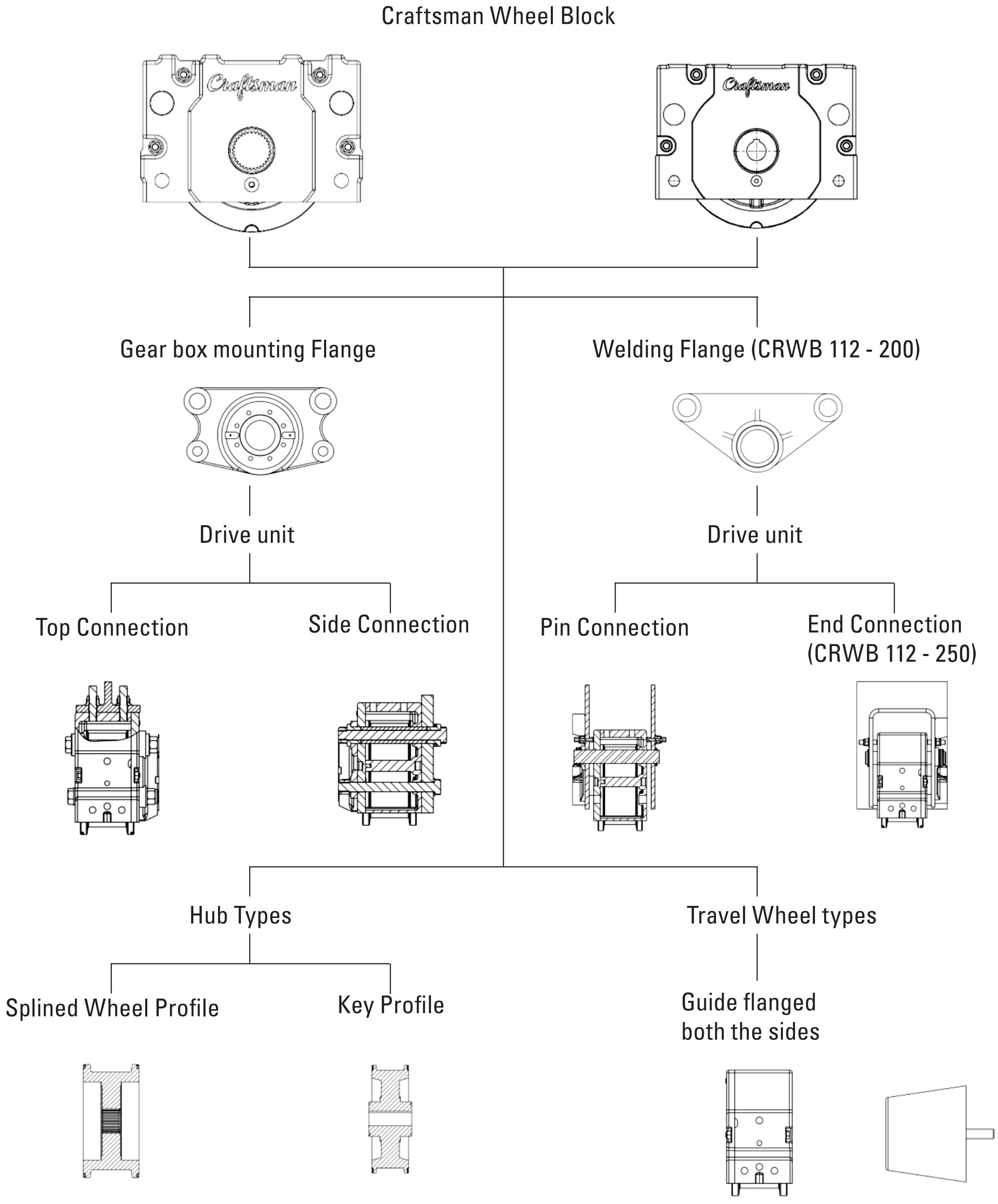


Fig 8 - Wheel block system - End connection

INTRODUCTION

1.5. - CRAFTSMAN WHEEL BLOCK SYSTEM (CRWB)



INTRODUCTION

1.6. - DRIVE ARRANGEMENTS

The drive arrangements consists of helical parallel shaft gearbox and its classified into two types,

- Gearbox mounting flange
- Torque arm mounting.

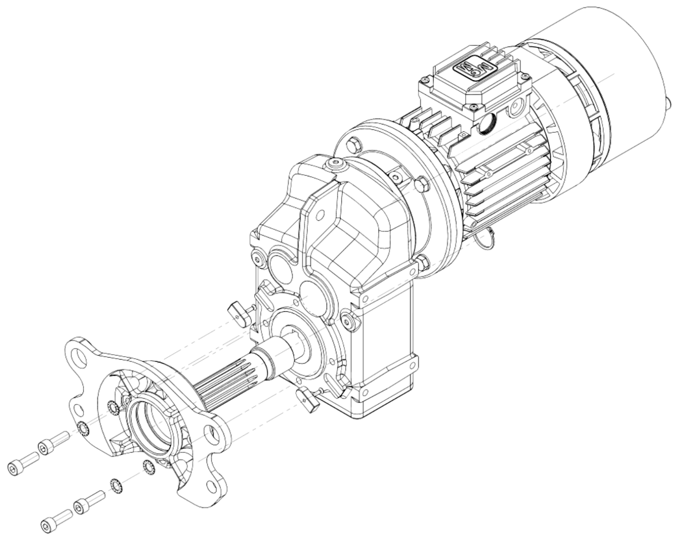


Fig 9 - Exploded view of parallel shaft gearbox with gearbox mounting flange

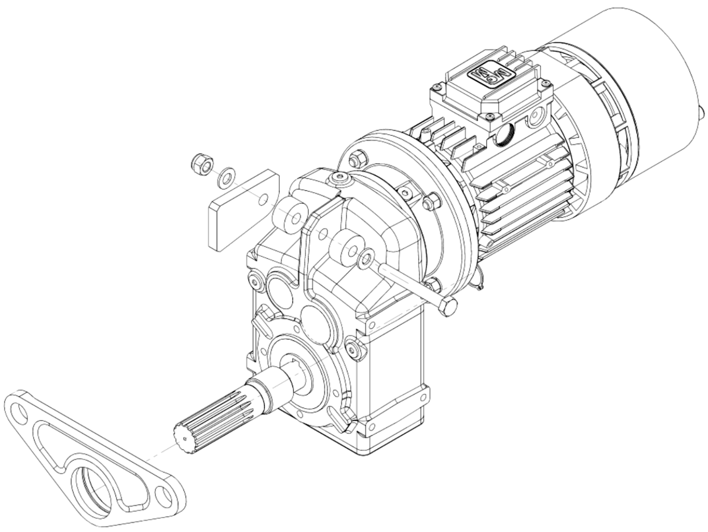
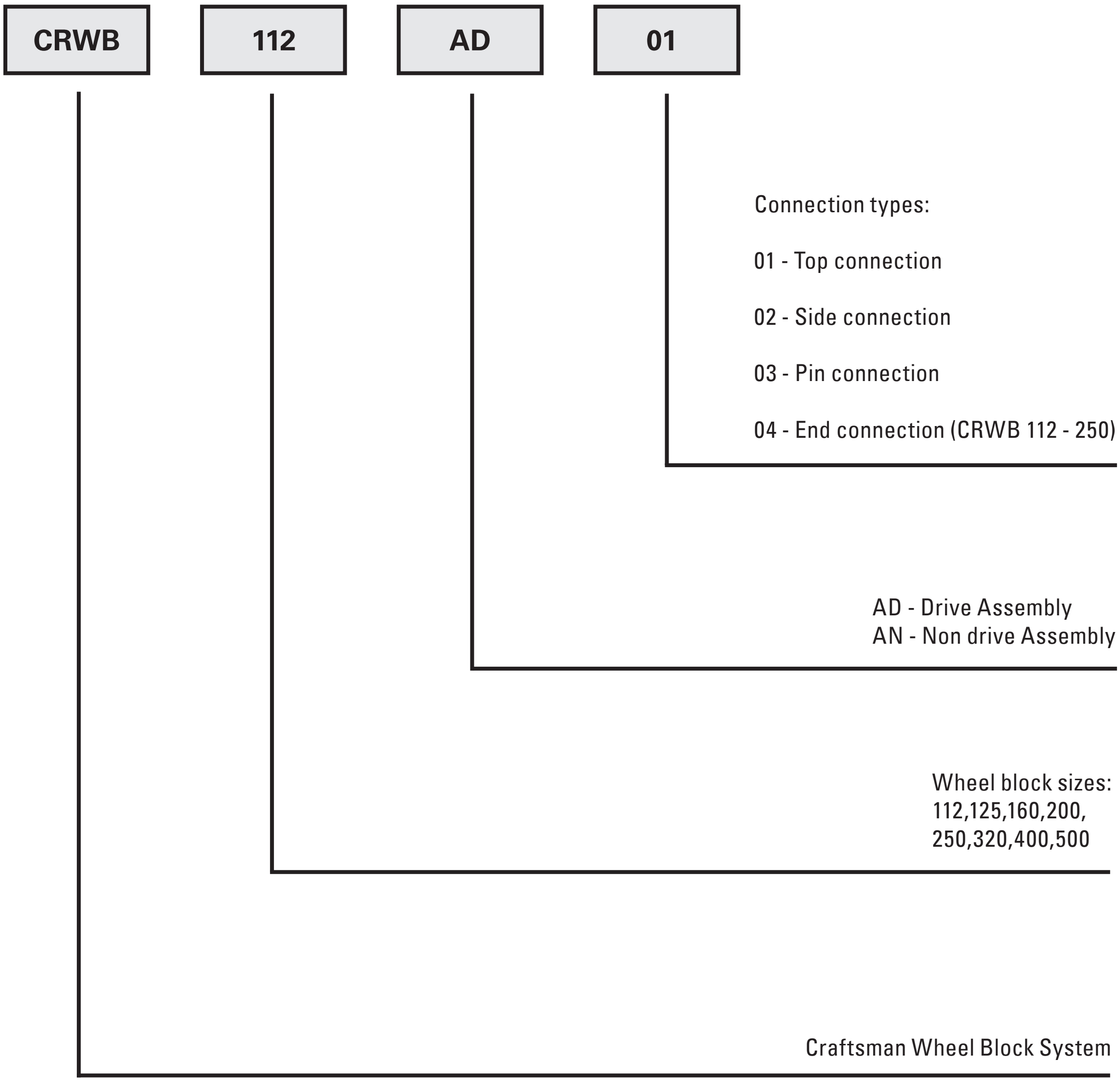


Fig 10 - Exploded view of parallel shaft gearbox with welding flange (CRWB 112 - 200)

INTRODUCTION

1.7. - WHEEL BLOCK DESIGNATION

Craftsman wheel block system are designated and its product variants shown below briefly.



INTRODUCTION

1.8. - PROHIBITED USAGE METHODS

Below working conditions malfunctions, failures and hazards may occur to life. For example such as below cases:

- Usage under dangerous explosive atmospheres
- Worked outside the permitted temperature range
- Exceeding the permissible wheel load & design service life
- Worked under prohibited ambient conditions
- Acidic, corrosive air as coolant
- Use of unspecified connecting elements for use with the wheel block
- Use of non-genuine Craftsman wheel block parts
- Non-compliance with the assembly instructions
- Improper tightening torque
- Improper assembly of connecting elements

Note: For special working conditions, please approach the manufacturers.

SELECTION

SELECTION OF WHEEL BLOCK SYSTEM

2. - SELECTION OF WHEEL BLOCK SYSTEM

2.1. - PROCEDURE FOR SELECTION OF WHEEL BLOCK SYSTEM

In order to choose a rail wheel, its diameter is determined by considering:

- The load on the wheel,
- The quality of the metal from which is made,
- The type of rail on which it runs,
- The speed of rotation of wheel,
- The group of classification of the mechanisms.

Selection procedure for selection of the wheel block system

- Determine the group of mechanisms class

    Determine the operating time class

    Determine the load spectrum

    Determine the group of mechanisms

    Wheel block selection

- Check the wheel block selection

    Determine the permissible wheel load for rail/travel wheel combination

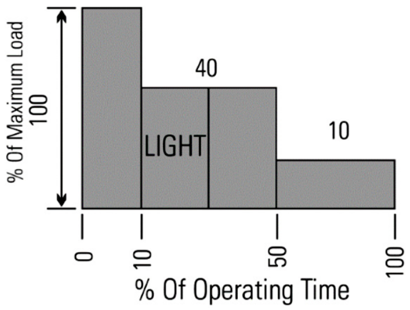
- Select the gear drive variant
- Required power calculation for drive unit
- Buffer selection

SELECTION OF WHEEL BLOCK SYSTEM

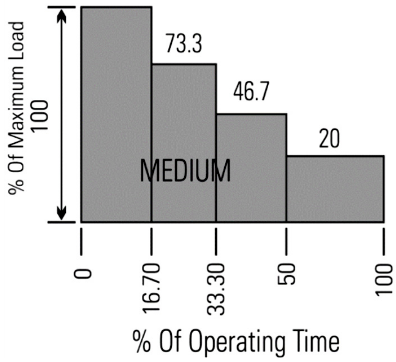
2.2. - GROUP OF MECHANISMS

k: cubical mean (calculation see FEM 9.511)

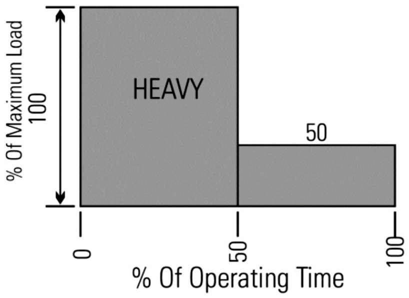
k_m: collective coefficient ($k_m = k^3$)



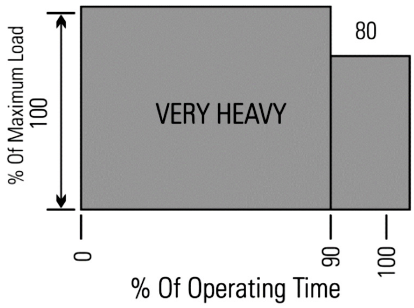
$k_m \leq 0.125$
$K \leq 0.5$



$k_m = 0.125$ to 0.25
$K = 0.5$ to 0.63



$k_m = 0.25$ to 0.5
$K = 0.63$ to 0.8



$k_m = 0.5$ to 1
$K = 0.8$ to 1

LOAD	SPECTRUM	DEFINITIONS
1 (Light)	L1	Mechanisms or part of thereof, usually subject to very small loads and in exceptional cases only to maximum loads.
2 (Medium)	L2	Mechanisms or part of thereof, usually subject to small loads but rather often to maximum loads.
3 (Heavy)	L3	Mechanisms or part of thereof, usually subject to medium loads but frequently to maximum loads.
4 (Very Heavy)	L4	Mechanisms or part of thereof, usually subject to maximum or almost maximum loads.

SELECTION OF WHEEL BLOCK SYSTEM

RUN TIME CLASSES									
FEM	V 0.06	V0.12	V0.25	V0.5	V1	V2	V3	V4	V5
ISO	T0	T1	T2	T3	T4	T5	T6	T7	T8

GROUP OF MECHANISMS								
FEM	I Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m
ISO	M 1	M 2	M 3	M4	M5	M6	M7	M8

LOAD	SPECTRUM	AVERAGE OPERATING PERIOD PER DAY IN HOURS					
L1	Light	<2	2-4	4-8	8-16	>16	-
L2	Medium	<1	1-2	2-4	4-8	8-16	>16
L3	Heavy	<0.5	0.5-1	1-2	2-4	4-8	8-16
L4	Very Heavy	<0.25	<0.5	0.5-1	1-2	2-4	4-8
GROUP OF MECHANISMS		1Bm	1Am	2m	3m	4m	5m
		M3	M4	M5	M6	M7	M8

2.3. - WHEEL - SIZING AND QUICK SELECTION

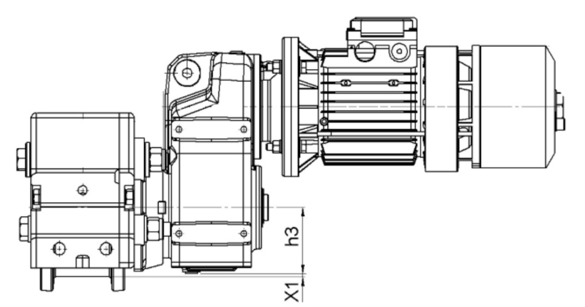
Guide Line for Wheel selection								
Wheel block size in mm	112	125	160	200	250	320	400	500
Max wheel load in Kg	3500	5000	7000	10000	16000	21000	30000	40000

Table 1 - WHEEL - SIZING AND QUICK SELECTION

SELECTION OF WHEEL BLOCK SYSTEM

2.4. - GROUND CLEARANCE

GEAR BOX - VERTICAL ARRANGEMENT



GEAR BOX - HORIZONTAL ARRANGEMENT

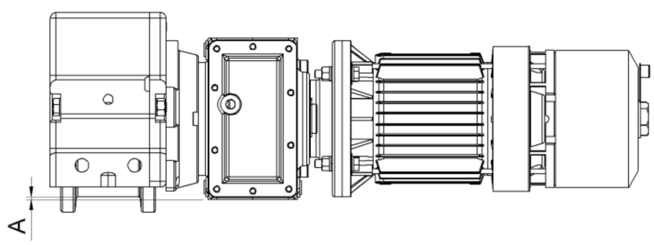


Fig 11 - Gear box - Vertical arrangement

Fig 12 - Gear box - Horizontal arrangement

Wheel block size	Gearbox Model No	Ground Clearance		
		X1	A	h3
112	PAG 090 025 000 063	5	-10	51
	PAG 090 037 000 071	5	-10	51
	PAG 090 055 000 071	5	-10	51
	PAG 090 025 006 071	5	-10	51
	PAG 090 037 009 080	5	-10	51
	PAG 090 055 012 080	5	-10	51
125	PAG 100 037 000 071	- 8.5	-11.5	71
	PAG 100 055 000 071	- 8.5	-11.5	71
	PAG 100 075 000 080	- 8.5	-11.5	71
	PAG 100 037 009 080	- 8.5	-11.5	71
	PAG 100 055 012 080	- 8.5	-11.5	71
	PAG 100 075 018 090	- 8.5	-11.5	71
160	PAG 112 055 000 071	6	-2.5	74
	PAG 112 075 000 080	6	-2.5	74
	PAG 112 110 000 080	6	-2.5	74
	PAG 112 037 009 080	6	-2.5	74
	PAG 112 055 012 080	6	-2.5	74
	PAG 112 075 018 090	6	-2.5	74
	PAG 112 110 025 090	6	-2.5	74

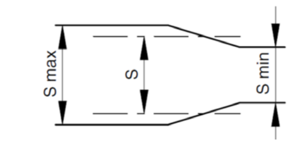
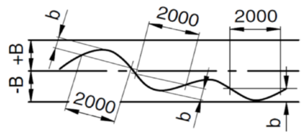
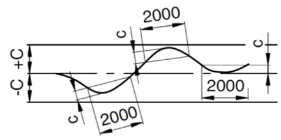
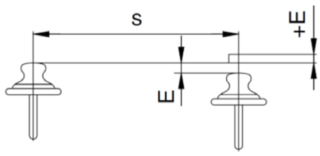
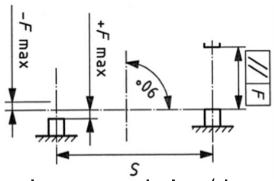
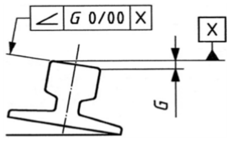
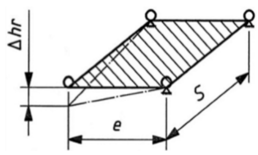
SELECTION OF WHEEL BLOCK SYSTEM

Wheel block size	Gearbox Model No	Ground Clearance		
		X1	A	h3
200	PAG 125 055 000 071	9	7	91
	PAG 125 075 000 080	9	7	91
	PAG 125 110 000 080	9	7	91
	PAG 125 150 000 090	9	7	91
	PAG 125 055 012 080	9	7	91
	PAG 125 075 018 090	9	7	91
	PAG 125 110 025 090	9	7	91
	PAG 125 130 030 090	9	7	91
250	PAG 140 075 000 080	25	24	100
	PAG 140 110 000 080	25	24	100
	PAG 140 150 000 090	25	24	100
	PAG 140 220 000 090	25	24	100
	PAG 140 075 018 090	25	24	100
	PAG 140 110 025 090	25	24	100
	PAG 140 130 030 090	25	24	100
	PAG 140 160 040 100	25	24	100
	PAG 140 220 050 100	25	24	100
320	PAG 160 150 000 090	40	51	110
	PAG 160 220 000 090	40	51	110
	PAG 160 300 000 100	40	51	110
	PAG 160 110 025 090	40	51	110
	PAG 160 130 030 090	40	51	110
	PAG 160 160 040 100	40	51	110
	PAG 160 220 050 100	40	51	110
	PAG 160 300 080 112	40	51	110
400	PAG 200 220 000 090	68	60	132
	PAG 200 300 000 100	68	60	132
	PAG 200 400 000 112	68	60	132
	PAG 200 220 050 100	68	60	132
	PAG 200 300 080 112	68	60	132
	PAG 200 400 110 132	68	60	132
500	PAG 250 300 000 100	95	82	155
	PAG 250 400 000 112	95	82	155
	PAG 250 550 000 132	95	82	155
	PAG 250 300 080 112	95	82	155
	PAG 250 400 110 132	95	82	155
	PAG 250 550 150 132	95	82	155

Table 2 - Ground Clearance of wheel Block

SELECTION OF WHEEL BLOCK SYSTEM

2.5. - MANUFACTURER'S TOLERANCES

S.No	Symbol	Description	Graphical representation
1	A	Tolerance of Span S of the crane rails related to rail center at each point travelling track	 S max = s + A Smin = s – A
2	B	Tolerance of horizontal Straightness of rail head at each point of travelling track	 Position of a crane rail in ground plan
3	b	Tolerance of horizontal Straightness related to test length of 2000mm (Sample value) at each point of rail head	
4	C	Tolerance of straightness related to height of crane rail center at each point of travelling track	 Height of crane rail (axial slope)
5	c	Tolerance of straightness related to test length of 2000mm (sample values) at each point of crane rail	
6	E	Tolerance of Height related to opposite measuring point at right angles at each point of travelling track	 Height of travelling track (lateral slope)
7	± Fmax	Tolerance of parallelism of end stops or buffers on travelling track at right angles to longitudinal axis with parallelism symbol //.	 Position in a ground plan (datum symbol in accordance with ISO 1101)
8	G	Tolerance of angularity related to crane rail cross-section at each point of travelling track with angularity symbol	
9	Δhr	Height tolerance of points of wheel contact of each point of travelling track.	

SELECTION OF WHEEL BLOCK SYSTEM

Tolerance Class 1	Tolerance Class 2	Tolerance Class 3	Tolerance Class 4	Symbol
A = ± 3mm Valid for all spans S ≤ 16m A = ± [3+0.25(S-16)] A = ± 10 max. Valid for spans S >16m, S in meters	A = ± 5mm Valid for all spans S ≤ 16m A = ± [5+0.25(S-16)] A = ± 15 max. Valid for spans S >16m, S in meters	A = ± 8mm Valid for all spans S ≤ 16m A = ± [8+0.25(S-16)] A = ± 20 max. Valid for spans S >16m, S in meters	A = ± 12.5mm Valid for all spans S ≤ 16m A = ± [8+0.25(S-16)] A = ± 25 max. Valid for spans S >16m, S in meters	A
B = ± 5 mm	B = ± 10 mm	B = ± 20 mm	B = ± 40 mm	B
b = 1 mm	b = 1 mm	b = 2 mm	b = 4 mm	b
C = ± 5 mm	C = ± 10 mm	C = ± 20 mm	C = ± 40 mm	C
c = 1 mm	c = 2 mm	c = 4 mm	c = 8 mm	c
E = ± 0.5S S in meters, E ≤ Emax E = ± 5mm max.	E = ± S S in meters, E ≤ Emax E = ± 10mm max	E = ± 2S S in meters, E ≤ Emax E = ± 20mm max.	E = ± 4S S in meters, E ≤ Emax E = ± 40mm max.	E
Fmax = ± 0.8S Fmax = ± 8 max S in meters, e.g. for S - 20m = Fmax.	Fmax = ± S Fmax = ± 10 max S in meters, e.g. for S - 20m = Fmax.	Fmax = ± 1.25S Fmax = ± 12.5 max S in meters, e.g. for S - 20m = Fmax.	Fmax = ± 1.6S Fmax = ± 16 max S in meters, e.g. for S - 20m = Fmax.	± Fmax
G = 4mm	G = 6mm	G = 9mm	G = 12mm	G
Δhr = 0.5S or 0.5e Δhr = 5 max. e and S in meters, insert e or S, whichever is the least	Δhr = 1.0S or 1.0e Δhr = 10 max. e and S in meters, insert e or S, whichever is the least	Δhr = 1.6S or 1.6e Δhr = 16 max. e and S in meters, insert e or S, whichever is the least	Δhr = 2.0S or 2.0e Δhr = 20 max. e and S in meters, insert e or S, whichever is the least	Δhr

Tolerance class 2 recommended

Table 3 - Manufacturer’s tolerances

SELECTION OF WHEEL BLOCK SYSTEM

2.6. - WHEEL AND RAIL WIDTH SELECTION

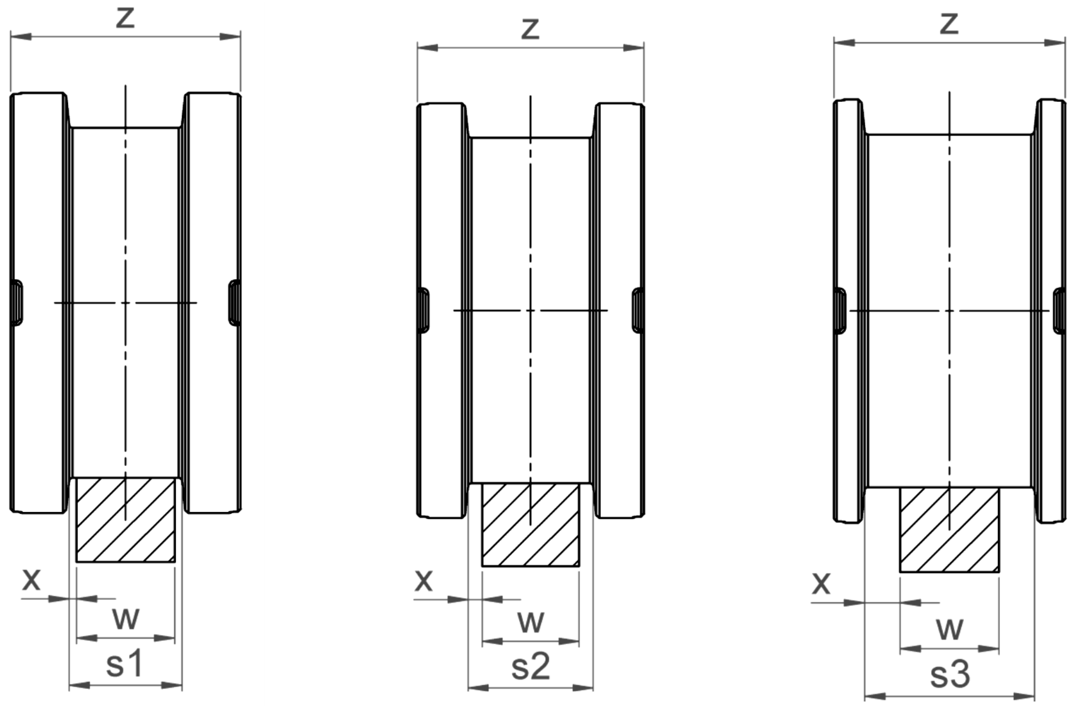


Fig 15- Wheel - sizing and selection

Wheel block size	Wheel tread width (s)			Distance per side (x)		Wheel width (z)	Rail width (w)
	s1	s2	s3	min	max		
112	50	62	-	3.5	9	82	32,40,45,50,55*
125	50	62	-	3.5	9	82	32,40,45,50,55*
160	50	65	-	5	9	97	32,40,45,50,55*
200	57	70	82	3.5	12.5	114	32,40,45,50,55,60,63,70,75*
250	57	70	85	5	11	117	40,45,50,55,60,63,70,75,80*
320	57	70	85	5	11	125	40,45,50,55,60,63,70,75,80*
400	70	86	110	5	15	150	50,60,63,70,75,80,90,100
500	86	110	-	5	15	150	70,75,80,90,100

* - Applicable other than cranes

Table 4 - Wheel - sizing and selection

SELECTION OF WHEEL BLOCK SYSTEM

2.7. - RAIL TYPES

FLAT RAIL DIN 1017

Flat Rail DIN 1017	Effective rail width k = k1	Flat Rail DIN 1017	Effective rail width k = k1
32 x 32	32	60 x 60	60
40 x 30	40	63 x 32	63
40 x 32	40	63 x 50	63
40 x 35	40	65 x 40	65
40 x 40	40	70 x 40	70
50 x 30	50	70 x 50	70
50 x 32	50	75 x 40	75
50 x 40	50	75 x 50	75
55 x 30	55	80 x 40	80
55 x 55	55	80 x 50	80
60 x 30	60	90 x 60	90
60 x 40	60	100 x 50	100
60 x 50	60	100 x 60	100

Table 5 - Flat Rail DIN 1017 - Effective Rail width

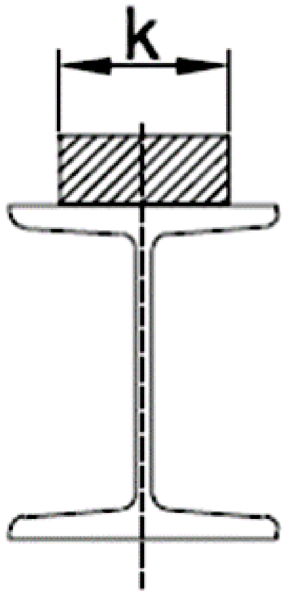
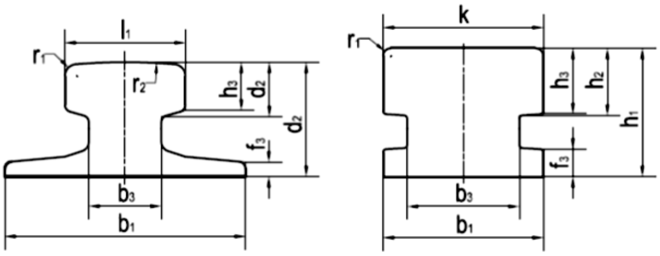


Fig 16 - Rail width

CRANE RAIL DIN 536



Crane rail design A

Crane rail design F

Fig 17 - Rail width

Size	K	b1	b3	h1	h2	h3	f3	r1	r2	Effective rail width k-2r1
A45	45	125	24	55	24	20	8	4	400	37
A55	55	150	31	65	28.5	25	9	5	400	45
A65	65	175	38	75	34	30	10	6	400	53
A75	75	200	45	85	39.5	35	11	8	500	59
A100	100	200	60	95	40	40	12	10	500	80
A120	120	220	72	105	47.5	47.5	14	10	600	100
A150	150	220	80	150	50	50	14	10	800	130
F100	100	100	70	80	41	41	17	10	-	80
F120	120	120	90	80	41	41	17	10	-	100

Table 6 - Crane Rail DIN 536 - Effective Rail width

SELECTION OF WHEEL BLOCK SYSTEM

TEMPERATURE REDUCTION FACTOR

REDUCTION FACTOR ON LOAD CARRYING ACCORDING TO WORKING TEMPERATURE				
All Wheel Blocks	-20°C to 50°C	Up to 60°C	Up to 70°C	Up to 80°C
Temperature co-efficient	1	0.9	0.88	0.85

Table 7 - Wheel load reduction facture for working temperature

RAIL MATERIAL REDUCTION FACTOR

REDUCTION FACTOR ON LOAD CARRYING ACCORDING TO RAIL MATERIAL				
MATERIAL	St 70-2/E 360	St 60-2/E 335	St 52-3/S 355 J 2 F G 3	St 37-2/S 235 J R
REDUCTION FACTOR	1	1	1	0.25

Table 8 - Rail Material Reduction Factor

2.8. - PERMISSIBLE WHEEL LOADS

For determining the permissible wheel load for Crane rail wheels made of spheroidal graphite iron GGG-70, we need to select the Duty Class according to the group of mechanisms, Speed of operation, According to the rail size and Permissible wheel loads in Kg.

For the crane, P_{max} and P_{min} to be determined from the varying operating positions of the crane trolley. In order to determine the mean loads, the procedure is to consider the maximum and minimum loads withstood by the wheel in the loading cases considered, i.e. with the appliance in normal duty but omitting the dynamic coefficients Φ when determining P_{mean}.

The values of P_{mean} are determined by the below Equation in the load combinations A and B.

$$P_{mean} = \frac{P_{min, A, B} + 2P_{max, A, B}}{3}$$

For Trolley construction and other driving systems where evenly distributed full load applies:

$P = P_{max} \leq P_{permissible}$.

After selecting permissible wheel load from following tables, the rail size should be identified considering the corner radius and effective Rail width ‘K’. Refer Tables 5 & 6.

Temperature reduction factor and Rail material reduction factors must be calculated before finalising the Permissible load capacity of the wheel and accounted properly. Refer Table 7 & 8 for Temperature and Rail material reduction factor. Considering the reduction factors final permissible load carrying capacity will be taken by selecting the minimum of permissible wheel load from permissible Load chart. permissible load with temperature co-efficient and permissible load with rail material co-efficient.

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 112 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min								
			10	12.5	16	20	25	31.5	40	50	63
3500	1Am / M4	30	2495	2715	2348	2250	2177	2055	1932	1835	1712
		35	2911	3168	2740	2625	2540	2397	2254	2140	1998
		40	3327	3168	3131	3001	2903	2740	2577	2446	2283
		45	3500	3500	3500	3376	3266	3082	2899	2446	2283
		50	3500	3500	3500	3500	3266	3082	2899	2446	2283
		55	3500	3500	3500	3500	3266	3082	2899	2446	2283
		60	3500	3500	3500	3500	3266	3082	2899	2446	2283
	2m / M5	30	2228	2162	2097	2009	1944	1835	1725	1638	1529
		35	2599	2523	2446	2344	2268	2140	2013	1911	1784
		40	2970	2883	2796	2679	2592	2446	2300	1911	1784
		45	3342	3243	3145	2679	2592	2446	2300	1911	1784
		50	3500	3500	3145	2679	2592	2446	2300	1911	1784
		55	3500	3500	3145	2679	2592	2446	2300	1911	1784
		60	3500	3500	3145	2679	2592	2446	2300	1911	1784
	3m / M6	30	2005	1946	1887	1808	1749	1651	1553	1474	1376
		35	2339	2270	2201	2110	2041	1926	1812	1720	1376
		40	2673	2595	2516	2110	2041	1926	1812	1720	1376
		45	2673	2595	2516	2110	2041	1926	1812	1720	1376
		50	2673	2595	2516	2110	2041	1926	1812	1720	1376
		55	2673	2595	2516	2110	2041	1926	1812	1720	1376
		60	2673	2595	2516	2110	2041	1926	1812	1720	1376
	4 m / M7	30	1765	1730	1677	1607	1555	1468	1380	1310	1223
		35	2059	2018	1957	1607	1555	1468	1380	1310	1223
		40	2059	2018	1957	1607	1555	1468	1380	1310	1223
		45	2059	2018	1957	1607	1555	1468	1380	1310	1223
		50	2059	2018	1957	1607	1555	1468	1380	1310	1223
		55	2059	2018	1957	1607	1555	1468	1380	1310	1223
		60	2059	2018	1957	1607	1555	1468	1380	1310	1223

Table 9 - Permissible Wheel Load - Dia 112

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 125 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min								
			10	12.5	16	20	25	31.5	40	50	63
5000	1Am / M4	30	2812	2730	2648	2566	2484	2375	2239	2075	1966
		35	3281	3185	3090	2994	2898	2771	2612	2421	2293
		40	3749	3640	3531	3422	3312	3167	2985	2766	2620
		45	4218	4095	3972	3849	3727	3563	3358	3112	2948
		50	4687	4550	4413	4277	4140	3959	3731	3458	3276
		55	5000	5000	4855	4705	4555	3959	3731	3458	3276
		60	5000	5000	5000	5000	4555	3959	3731	3458	3276
	2m / M5	30	2511	2438	2364	2291	2218	2121	1999	1853	1755
		35	2929	3843	2758	2673	2588	2474	2332	2161	2048
		40	3348	3250	3153	3055	2958	2826	2665	2470	2340
		45	3766	3656	3547	3437	3327	3181	2998	2779	2633
		50	4184	4062	3941	3819	3697	3181	2998	2779	2633
		55	4603	4469	3941	3819	3697	3181	2998	2779	2633
		60	5000	4469	3941	3819	3697	3181	2998	2779	2633
	3m / M6	30	2260	2194	2128	2062	1996	1909	1799	1667	1580
		35	2636	2559	2482	2406	2329	2227	2099	1945	1843
		40	3013	2925	2837	2750	2662	2545	2399	2223	2106
		45	3389	3291	3192	3093	2662	2545	2399	2223	2106
		50	3766	3656	3192	3093	2662	2545	2399	2223	2106
		55	3766	3656	3192	3093	2662	2545	2399	2223	2106
		60	3766	3656	3192	3093	2662	2545	2399	2223	2106
	4 m / M7	30	2009	1950	1892	1833	1775	1697	1599	1482	1404
		35	2343	2275	2207	2139	2070	1979	1866	1729	1638
		40	2678	2600	2522	2444	2070	1979	1866	1729	1638
		45	3013	2925	2522	2444	2070	1979	1866	1729	1638
		50	3013	2925	2522	2444	2070	1979	1866	1729	1638
		55	3013	2925	2522	2444	2070	1979	1866	1729	1638
		60	3013	2925	2522	2444	2070	1979	1866	1729	1638

Table 10 - Permissible Wheel Load - Dia 125

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 160 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
7000	1Am / M4	30	3704	3599	3494	3390	3285	3180	3040	2865	2691	2516	2306
		35	4321	4199	4077	3954	3832	3710	3547	3343	3139	2935	2691
		40	4939	4799	4659	4519	4380	4240	4054	3821	3588	3355	3075
		45	5556	5399	5242	5084	4927	4770	4560	4298	4036	3774	3459
		50	6173	5999	5824	5649	5475	5300	5067	4776	4484	4193	3844
		55	6791	6599	6406	6214	6022	5830	5574	5253	4933	4613	4228
		60	7000	7000	6989	6779	6569	5830	5574	5253	4933	4613	4228
	2m / M5	30	3307	3214	3120	3026	2933	2839	2714	2558	2402	2246	2059
		35	3858	3749	3640	3531	3422	3312	3167	2985	2803	2621	2402
		40	4410	4285	4160	4035	3910	3786	3619	3411	3203	2995	2746
		45	4961	4820	4680	4540	4399	4259	4072	3838	3604	3370	3089
		50	5512	5356	5200	5044	4888	4732	4524	4264	4004	3744	3432
		55	6063	5892	5720	5548	5377	4732	4524	4264	4004	3744	3432
		60	6614	6427	6240	6053	5377	4732	4524	4264	4004	3744	3432
	3m / M6	30	2977	2892	2808	2724	2640	2555	2443	2303	2162	2022	1853
		35	3473	3374	3276	3178	3079	2981	2850	2686	2523	2359	2162
		40	3969	3856	3744	3632	3519	3407	3257	3070	2883	2696	2471
		45	4465	4338	4212	4086	3959	3833	3664	3454	3243	3033	2780
		50	4961	4820	4680	4540	4399	3833	3664	3454	3243	3033	2780
		55	5457	5302	4680	4540	4399	3833	3664	3454	3243	3033	2780
		60	5457	5302	4680	4540	4399	3833	3664	3454	3243	3033	2780
	4 m / M7	30	2646	2571	2496	2421	2346	2271	2172	2047	1922	1797	1647
		35	3087	2999	2912	2825	2737	2650	2533	2388	2242	2097	1922
		40	3528	3428	3328	3228	3128	3028	2895	2729	2563	2396	2196
		45	3969	3856	3744	3632	3519	3407	3257	3070	2883	2696	2471
		50	4410	4285	3744	3632	3519	3407	3257	3070	2883	2696	2471
		55	4851	4285	3744	3632	3519	3407	3257	3070	2883	2696	2471
		60	4851	4285	3744	3632	3519	3407	3257	3070	2883	2696	2471

Table 11 - Permissible Wheel Load - Dia 160

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 200 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
10000	1Am / M4	40	6348	6173	5999	5824	5649	5475	5300	5067	4776	4426	4193
		45	7142	6945	6749	6552	6355	6159	5962	5700	5373	4980	4717
		50	7935	7717	7498	7280	7062	6843	6625	6334	5970	5533	5242
		55	8729	8488	8248	8008	7768	7528	7287	6967	6567	6086	5766
		60	9522	9260	8998	8736	8474	8212	7950	7600	7164	6639	6290
		65	10000	10000	9748	9464	9180	8896	8612	8234	7760	7193	6814
		70	10000	10000	10000	10000	9886	9580	9275	8234	7760	7193	6814
		75	10000	10000	10000	10000	10000	9580	9275	8234	7760	7193	6814
	2m / M5	40	5668	5512	5365	5200	5044	4888	4732	4524	4264	3952	3744
		45	6377	6201	6026	5850	5675	5499	5324	5090	4797	4446	4212
		50	7085	6890	6695	6500	6305	6110	5915	5655	5330	4940	4680
		55	7794	7579	7365	7150	6936	6721	6507	6221	5863	5434	5148
		60	8502	8268	8034	7800	7566	7332	7098	6786	6396	5928	5616
		65	9211	8957	8704	8450	8197	7943	7690	6786	6396	5928	5616
		70	9919	9646	9373	9100	8197	7943	7690	6786	6396	5928	5616
		75	10000	10000	10000	9100	8197	7943	7690	6786	6396	5928	5616
	3m / M6	40	5101	4961	4820	4680	4540	4399	4259	4072	3838	3557	3370
		45	5739	5581	5423	5265	5107	4949	4791	4581	4317	4001	3791
		50	6377	6201	6026	5850	5675	5499	5324	5090	4797	4446	4212
		55	7014	6821	6628	6435	6242	6049	5856	5598	5277	4891	4633
		60	7652	7441	7231	7020	6809	6599	6388	5598	5277	4891	4633
		65	8289	8061	7833	7605	6809	6599	6388	5598	5277	4891	4633
		70	8927	8061	7833	7605	6809	6599	6388	5598	5277	4891	4633
		75	8927	8061	7833	7605	6809	6599	6388	5598	5277	4891	4633
	4 m / M7	40	4534	4410	4285	4160	4035	3910	3786	3619	3838	3162	2995
		45	5101	4961	4820	4680	4540	4399	4259	4072	4317	3557	3370
		50	5668	5512	5356	5200	5044	4888	4732	4524	4797	3952	3744
		55	6235	6063	5892	5720	5548	5377	5205	4976	4797	4347	4118
		60	6802	6614	6427	6240	5548	5377	5205	4976	4797	4347	4118
		65	7368	7166	6427	6240	5548	5377	5205	4976	4797	4347	4118
		70	7368	7166	6427	6240	5548	5377	5205	4976	4797	4347	4118
		75	7368	7166	6427	6240	5548	5377	5205	4976	4797	4347	4118

Table 12 - Permissible Wheel Load - Dia 200

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 250 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
16000	1Am / M4	40	8081	7935	7717	7498	7280	7062	6843	6625	6334	5897	5533
		45	9091	8927	8681	8436	8190	7944	7699	7453	7125	6634	6224
		50	10101	9919	9646	9373	9100	8827	8554	8281	7917	7371	6916
		55	11111	10911	10611	10310	10010	9710	9409	9109	8709	8108	7608
		60	12121	11903	11575	11248	10920	10592	10265	9937	9500	8845	8299
		65	13131	12895	12540	12185	11830	11475	11120	10765	10292	9582	8299
		70	14141	13887	13504	13122	12740	12358	11976	11593	11084	9582	8299
		75	15152	14879	14469	13122	12740	12358	11976	11593	11084	9582	8299
		80	16000	14879	14469	13122	12740	12358	11976	11593	11084	9582	8299
	2m / M5	40	7215	7085	6890	6695	6500	6305	6110	5915	5655	5265	4940
		45	8117	7971	7751	7532	7313	7093	6874	6654	6362	5923	5558
		50	9019	8856	8613	8369	8125	7881	7638	7394	7069	6581	6175
		55	9921	9742	9474	9206	8938	8669	8401	8133	7776	7239	6793
		60	10823	10628	10335	10043	9750	9458	9165	8873	8483	7898	7410
		65	11724	11513	11196	10879	10563	10246	9929	9612	8483	7898	7410
		70	12626	12399	12058	11716	11375	11034	10693	9612	8483	7898	7410
		75	13528	12399	12058	11716	11375	11034	10693	9612	8483	7898	7410
		80	13528	12399	12058	11716	11375	11034	10693	9612	8483	7898	7410
	3m / M6	40	6494	6377	6201	6026	5850	5675	5499	5324	5090	4739	4446
		45	7305	7174	6976	6779	6581	6384	6186	5989	5726	5331	5002
		50	8117	7971	7751	7532	7313	7093	6874	6654	6362	5923	5558
		55	8929	8840	8526	8285	8044	7802	7561	7320	6998	6515	6113
		60	9740	9565	9302	9038	8775	8512	8249	7985	7634	7108	6669
		65	10552	10362	9302	9038	8775	8512	8249	7985	7634	7108	6669
		70	11364	10362	9302	9038	8775	8512	8249	7985	7634	7108	6669
		75	11364	10362	9302	9038	8775	8512	8249	7985	7634	7108	6669
		80	11364	10362	9302	9038	8775	8512	8249	7985	7634	7108	6669
	4 m / M7	40	5772	5668	5512	5356	5200	5044	4888	4732	4524	4212	3952
		45	6494	6377	6201	6026	5850	5675	5499	5324	5090	4739	4446
		50	7215	7085	6890	6695	6500	6305	6110	5915	5655	5265	4940
		55	7937	7794	7579	7365	7150	6936	6721	6507	6221	5792	5434
		60	8658	8502	8268	8034	7800	7566	6721	6507	6221	5792	5434
		65	9380	8502	8268	8034	7800	7566	6721	6507	6221	5792	5434
		70	9380	8502	8268	8034	7800	7566	6721	6507	6221	5792	5434
		75	9380	8502	8268	8034	7800	7566	6721	6507	6221	5792	5434
		80	9380	8502	8268	8034	7800	7566	6721	6507	6221	5792	5434

Table 13 - Permissible Wheel Load - Dia 250

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 320 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
21000	1Am / M4	40	10530	10343	10157	9878	9598	9412	9039	8759	8480	8107	7641
		45	11846	11636	11427	11112	10798	10588	10169	9854	9540	9120	8596
		50	13162	12929	12696	12347	11997	11764	11299	10949	10600	10134	9551
		55	14478	14222	13966	13582	13197	12941	12428	12044	11660	11147	10506
		60	15795	15515	15236	14816	14397	14117	13558	13139	12720	12161	11462
		65	17111	16808	16505	16051	15597	15294	14688	14234	13780	13174	12417
		70	18427	18101	17775	17286	16796	16470	15818	15329	14840	14187	13372
		75	19743	19394	19044	18520	17996	17647	16948	16424	15900	15201	14327
		80	21000	20687	20314	19755	19196	17647	16948	16424	15900	15201	14327
	2m / M5	40	9402	9235	9069	8819	8570	8403	8070	7821	7571	7238	6822
		45	10577	10390	10202	9922	9641	9454	9079	8798	8518	8143	7675
		50	11752	11544	11336	11024	10712	10504	10088	9776	9464	9048	8528
		55	12927	12698	12470	12126	11783	11554	11097	10754	10410	9953	9381
		60	14102	13853	13603	13229	12854	12605	12106	11731	11357	10858	10234
		65	15278	15007	14737	14331	13926	13655	13114	12709	12303	11762	11086
		70	16453	16162	15870	15434	14997	14706	14123	13686	13205	12667	11939
		75	17628	17316	17004	16536	16068	15756	15132	14664	14196	13572	12792
		80	18803	18470	18138	17638	17139	15756	15132	14664	14196	13572	12792
	3m / M6	40	8461	8312	8162	7937	7713	7563	7263	7039	6814	6515	6140
		45	9519	9351	9182	8929	8677	8508	8171	7919	7666	7329	6908
		50	10577	10390	10202	9922	9641	9454	9079	8798	8518	8143	7675
		55	11634	11429	11223	10914	10605	10399	9987	9678	9369	8958	8443
		60	12692	12468	12243	11906	11569	11344	10895	10558	10221	9772	9210
		65	13750	13506	13263	12898	12533	12290	11803	11438	11073	10586	9978
		70	14808	14545	14283	13890	13497	13235	12711	12318	11925	11400	10745
		75	15865	15584	15304	14882	14461	14180	13619	13198	12776	12215	11513
		80	16923	16623	16324	15875	15425	14180	13619	13198	12776	12215	11513
	4 m / M7	40	7521	7388	7255	7055	6856	6723	6456	6257	6057	5791	5458
		45	8461	8312	8162	7937	7713	7563	7263	7039	6814	6515	6140
		50	9402	9235	9069	8819	8570	8403	8070	7821	7571	7238	6822
		55	10342	10159	9976	9701	9427	9244	8877	8603	8328	7962	7505
		60	11282	11082	10883	10583	10284	10084	9684	9385	9085	8686	8187
		65	12222	12006	11789	11465	11140	10924	10492	10167	9843	9410	8869
		70	13162	12929	12696	12347	11997	11764	11299	10949	10600	10134	9551
		75	14102	13853	13603	13229	12854	12605	12106	11731	11357	10134	9551
		80	15043	14776	14510	14111	13711	13445	12913	11731	11357	10134	9551

Table 14 - Permissible Wheel Load - Dia 320

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 400 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
30000	1Am / M4	60	19918	19743	19394	19044	18520	17996	17472	16948	16424	15900	15201
		65	21578	21389	21010	20632	20064	19496	18928	18360	17792	17224	16467
		70	23238	23034	22626	22219	21607	20996	20384	19772	19161	18549	17734
		75	24898	24679	24242	23806	23150	22495	21840	21185	20530	19874	19001
		80	26557	26324	25859	25393	24694	23995	23296	22597	21898	21199	20268
		90	29877	29615	29091	28567	27780	26994	26208	25422	24636	23849	22801
		100	30000	30000	30000	30000	30000	29994	29120	28246	27373	26499	25334
	2m / M5	60	17784	17628	17316	17004	16536	16068	15600	15132	14664	14196	13572
		65	19266	19097	18759	18421	17914	17407	16900	16393	15886	15379	14703
		70	20748	20566	20202	19838	19292	18746	18200	17654	17108	16562	15834
		75	22230	22035	21645	21255	20670	20085	19500	18915	18330	17745	16965
		80	23712	23504	23088	22672	22048	21424	20800	20176	19552	18928	18096
		90	26676	26442	25974	25506	24804	24102	23400	22698	21996	21294	20358
		100	29640	29380	28860	28340	27560	26780	26000	25220	24440	23660	22620
	3m / M6	60	16006	15865	15584	15304	14882	14461	14040	13619	13198	12776	12215
		65	17339	17187	16883	16579	16123	15666	15210	14754	14297	13841	13233
		70	18673	18509	18182	17854	17363	16871	16380	15889	15397	14906	14251
		75	20007	19832	19481	19130	18603	18077	17550	17024	16497	15971	15269
		80	21341	21154	20779	20405	19843	19282	18720	18158	17597	17035	16286
		90	24008	23798	23377	22955	22324	21692	21060	20428	19796	19165	18322
		100	26676	26442	25974	25506	24804	24102	23400	22698	21996	21294	20358
	4 m / M7	60	14227	14102	13853	13603	13229	12854	12480	12106	11731	11357	10858
		65	15413	15278	15007	14737	14331	13926	13520	13114	12709	12303	11762
		70	16598	16453	16162	15870	15434	14997	14560	14123	13686	13250	12667
		75	17784	17628	17316	17004	16536	16068	15600	15132	14664	14196	13572
		80	18970	18803	18470	18138	17638	17139	16640	16141	15642	15142	14477
		90	21341	21154	20779	20405	19843	19282	18720	18158	17597	17035	16286
		100	23712	23504	23088	22672	22048	21424	20800	20176	19552	18928	18096

Table 15 - Permissible Wheel Load - Dia 400

SELECTION OF WHEEL BLOCK SYSTEM

CRWB 500 — All Connection Types (Linear Contact)

The wheel loads are valid for the following conditions:

Rail material: St 50-2/E 295,St 52-3/S 355 J 2 G 3

- Wheel material GJS-700-2 (GGG-70)
- Temperature condition –20° up to 50°
- Total skewing angle ≤ 2 ‰
- Horizontal forces max. 10 % of the existing load

Perm Wheel load Max in kg	Group of Mech FEM / ISO	Usable Rail Head width in mm	Travel Speed in m/min										
			10	12.5	16	20	25	31.5	40	50	63	80	100
40000	1Am / M4	70	29302	29047	28792	28283	27773	27009	26244	25480	24716	23951	23187
		75	31395	31122	30849	30303	29757	28938	28119	27300	26481	25662	24843
		80	33488	33197	32906	32323	31741	30867	29994	29120	28246	27373	26499
		90	37674	37346	37019	36364	35708	34726	33743	32760	31777	30794	29812
		100	40000	40000	40000	40000	39676	38584	37492	36400	35308	34216	33124
	2m / M5	70	26163	25935	25708	25253	24798	24115	23433	22750	22068	21385	20703
		75	28031	27788	27544	27056	26569	25838	25106	24375	23644	22913	22181
		80	29900	29640	29380	28860	28340	27560	26780	26000	25220	24440	23660
		90	33638	33345	33053	32468	31883	31005	30128	29250	28373	27495	26618
		100	37375	37050	36725	36075	35425	34450	33475	32500	31525	30550	29575
	3m / M6	70	23546	23342	23137	22727	22318	21704	21089	20475	19861	19247	18632
		75	25228	25009	24789	24351	23912	23254	22596	21938	21279	20621	19963
		80	26910	26676	26442	25974	25506	24804	24102	23400	22698	21996	21294
		90	30274	30011	29747	29221	28694	27905	27115	26325	25535	24746	23956
		100	33638	33345	33053	32468	31883	31005	30128	29250	28373	27495	26618
	4 m / M7	70	20930	20748	20566	20202	19838	19292	18746	18200	17654	17108	16562
		75	22425	22230	22035	21645	21255	20670	20085	19500	18915	18330	17745
		80	23920	23712	23504	23088	22672	22048	21424	20800	20176	19552	18928
		90	26910	26676	26442	25974	25506	24804	24102	23400	22698	21996	21294
		100	29900	29640	29380	28860	28340	27560	26780	26000	25220	24440	23660

Table 16 - Permissible Wheel Load - Dia 500

DIMENSIONS & DETAILS

DIMENSIONS & DETAILS

3.0 DIMENSIONS & DETAILS

The dimensions and details part of the technical manual gives the detailed dimensions of the Wheel Blocks. This part will explain the different mounting possibilities of the Wheel Blocks and its dimensions when mounting.
The user should carefully check with the dimensions of the mounting hole pitches, bolt and thread dimensions after selection of wheel blocks.

The required hole pitches and accuracies has to be maintained by the user as specified in the manual on the receiving side (End Carriage) of the wheel blocks .

If the tolerance are not met some times, the user will face problems in Assembling and in the usage as well.

The dimensions and details part also includes information on the motor and the gear drives with different power and with different speed. User can also select after getting the travel power required and wheel size.

The central drive arrangement shown in the manual are optional. The user's are requested to contact Carlstahl Craftsman Team for finalizing the design parameter and dimensions of the central drive.

Wheel Size from Ø250 to Ø500 needs grease lubrication for friction free rotation of bearings. Refer grease specification and bolt tightening torque with wheel block assembly manual.

DIMENSIONS & DETAILS

3.1. - WHEEL BLOCK DIMENSIONS - CRWB 112 TO 200

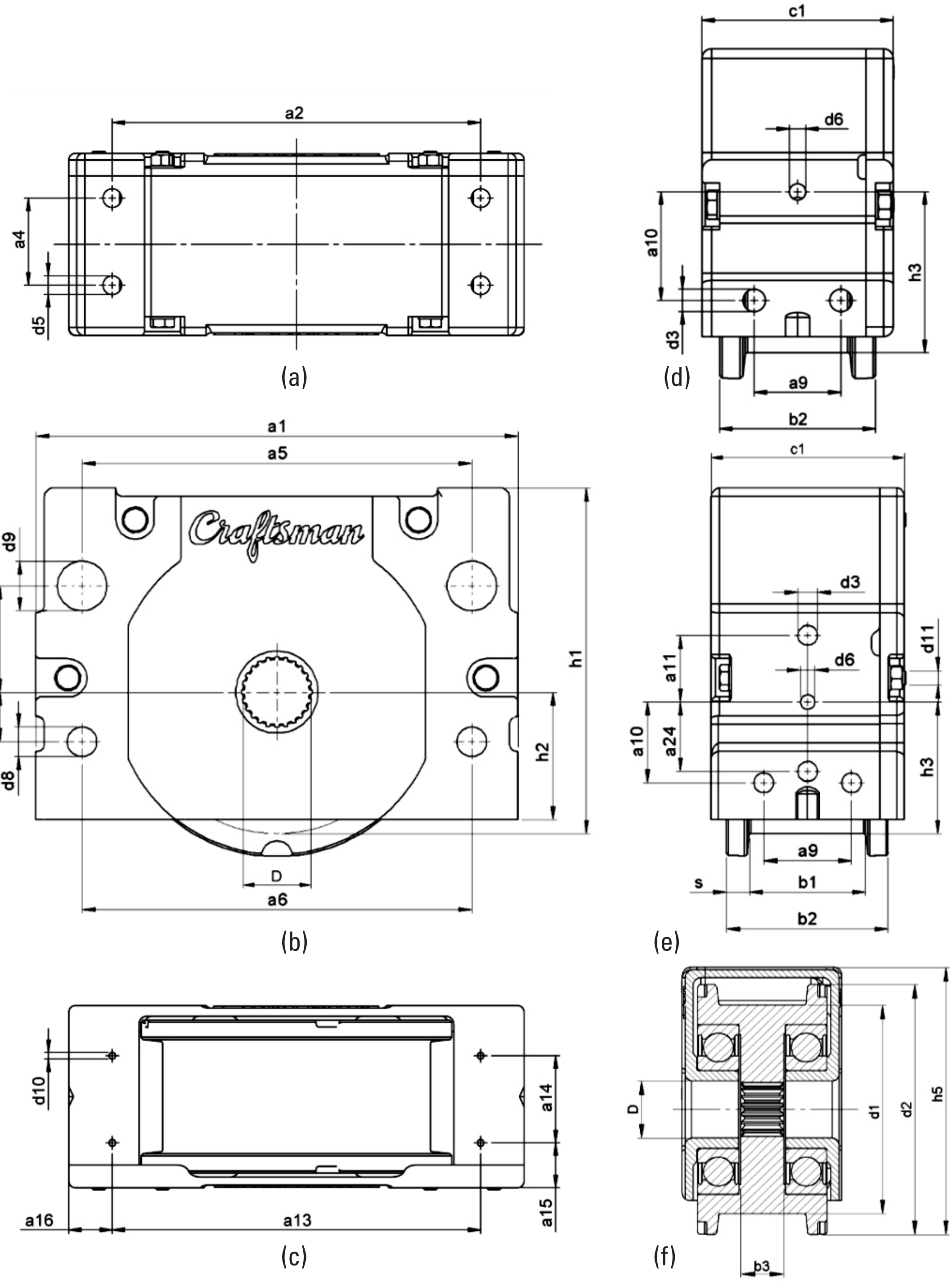


Fig 16 - Wheel block dimensions CRWB 112 TO 200

DIMENSIONS & DETAILS

WHEEL BLOCK DIMENSIONS - CRWB 112 TO 200

Wheel block size	Spline size (DIN 5480) D	a1	a2	a4	a5	a6	a7	a8	a9
112	NA 30	208	145	45	155	155	20	38	40
125	NA 30	230	170	55	180	180	20.5	40.5	50
160	NA 40	279	220	55	226	226	25	55	54
200	NA 50	340	275	65	275	275	35	75	62

Wheel block size	a10	a11	a13	a14	a15	a16	a24	b1	b2
112	54	-	160	40	31	24	-	50,62	82
125	74.5	-	184	50	26	23	-	50,62	82
160	67.5	-	-	-	-	-	-	50,65	97
200	57	47	-	-	-	-	49	57,70,82	114

Wheel block size	b3	c1	d1	d2	d3	d5	d6	d8
112	41	102	112	132	M12	M12	M12	11
125	30	102	125	150	M12	M12	M12	13
160	32	119	160	192	M16	M16	M12	17
200	37	136	200	240	M16	M16	M12	21

Wheel block size	d9	d10	d11	h1	h2	h3	h5	s
112	18	5 x 9 depth	M8	135	47	80	145	10,16
125	21	4.8 x 5 depth	M8	151	53.5	100	163.5	10,16
160	30	-	M10	189	70	100	205	16,23.5
200	35	-	M10	244	90	93	260	16,22,28.5

Table 17 - Wheel block dimensions - CRWB 112 - 200

*All dimensions are in mm

DIMENSIONS & DETAILS

3.2. - WHEEL BLOCK DIMENSIONS - CRWB 250 TO 500

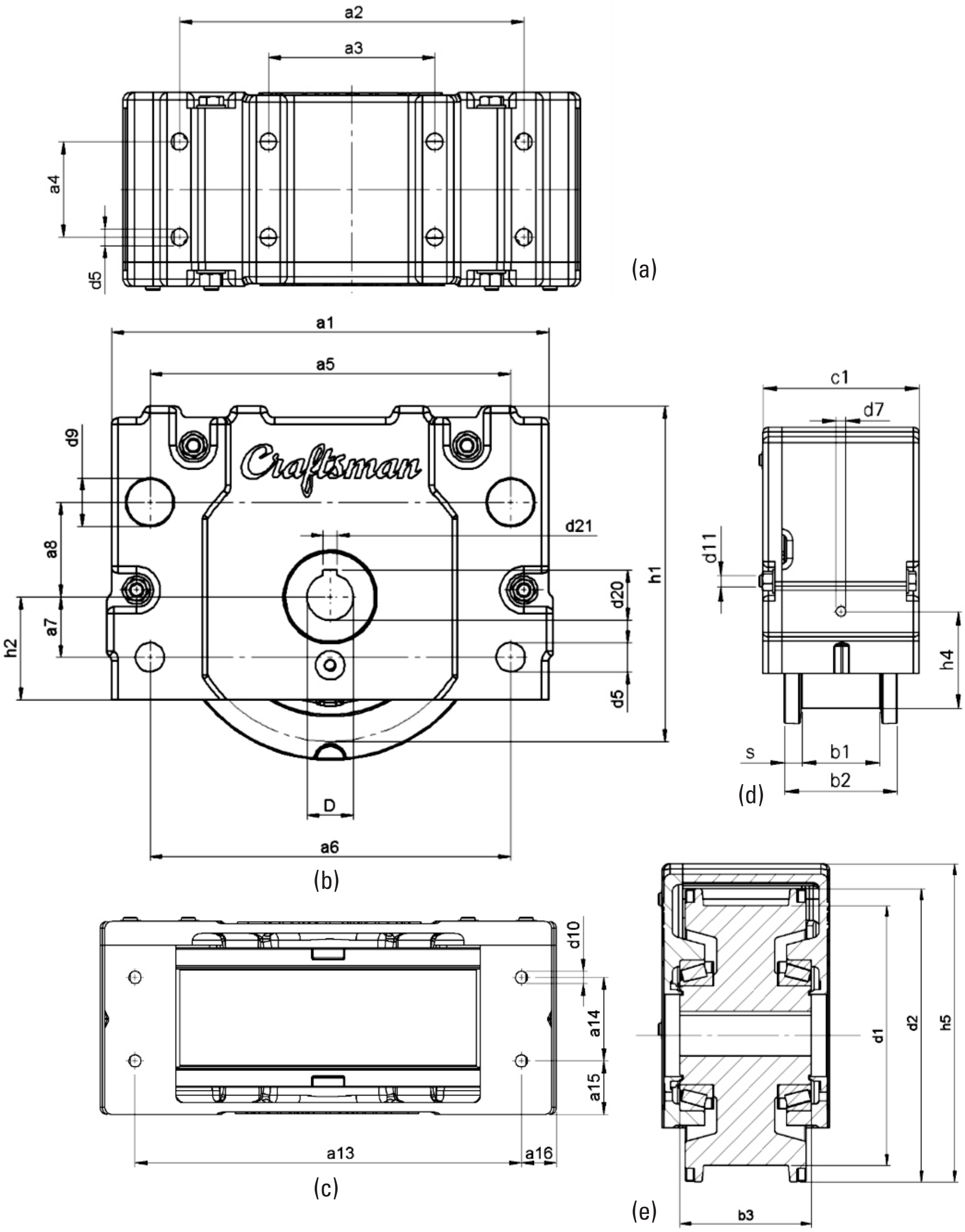


Fig 17 - Wheel block dimensions - CRWB 250 TO 500

DIMENSIONS & DETAILS

WHEEL BLOCK DIMENSIONS - CRWB 250 TO 500

Wheel block size	Bore size D	a1	a2	a3	a4	a5	a6	a7	a8
250	40	385	290	140	80	311	311	52	82
320	45	470	360	180	100	384	384	70	85
400	55	580	440	210	120	454	454	95	130
500	70	700	620	480	125	585	585	110	160

Wheel block size	a13	a14	a15	a16	b1	b2	b3	c1
250	326	70	45	29.5	57,70,85	117	127	161
320	405	80	55	32.5	57,70,85	125	156	190
400	501	100	55	39.5	70,86,110	150	175	214
500	600	110	68	50	86,110	150	201	246

Wheel block size	d1	d2	d5	d6	d7	d8	d9	d10
250	250	282	M16	M12	-	25	40	M12
320	320	360	M16	M12	M20	25	50	M20
400	400	440	M20	M12	M20	31	65	M24
500	500	540	M20	M12	M20	31	70	M24

Wheel block size	d11	d20	d21	h1	h2	h3	h4	h5	s
250	M12	43.3	12	290	89	100	-	306	16,23.5,30
320	M16	48.8	14	362	112	100	130	382	20,27.5,34
400	M16	59.3	16	448	138	100	130	468	20,32,40
500	M20	74.9	20	566	183	100	130	586	20,32

Table 18 - Wheel block dimensions - CRWB 250 - 500

*All dimensions are in mm

DIMENSIONS & DETAILS

3.3. - TOP CONNECTION - CRWB 112 TO 200

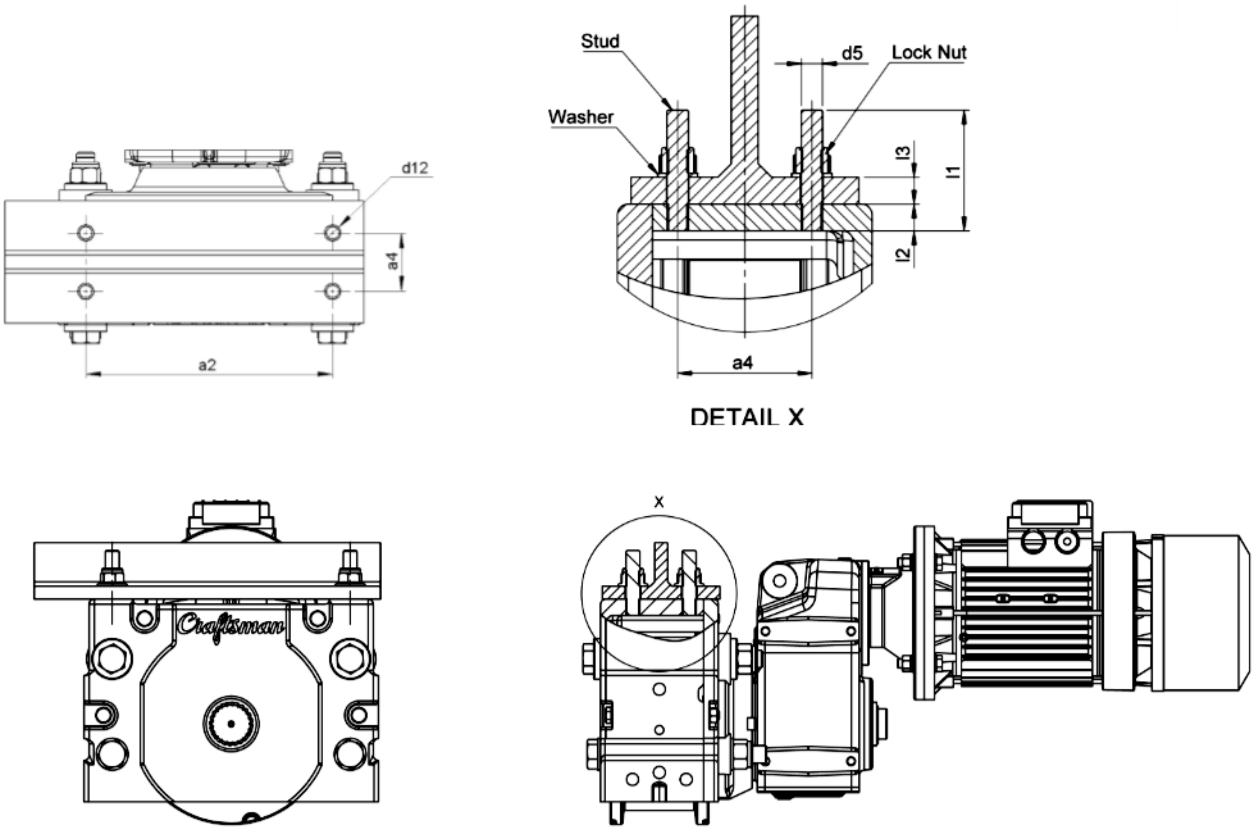


Fig 18 - Top connection - CRWB 112 TO 200

Wheel block size	a2	a4	d5	d12	l1	l2	l3
							min. - max.
112	145	45	M12	14	55	10	8-25
125	170	55	M12	14	60	12	8-25
160	220	55	M16	18	75	15	15-25
200	275	65	M16	18	75	19	15-25

Table 19 - Top connection - CRWB 112 TO 200

*All dimensions are in mm

DIMENSIONS & DETAILS

3.4. - TOP CONNECTION - CRWB 250 TO 500

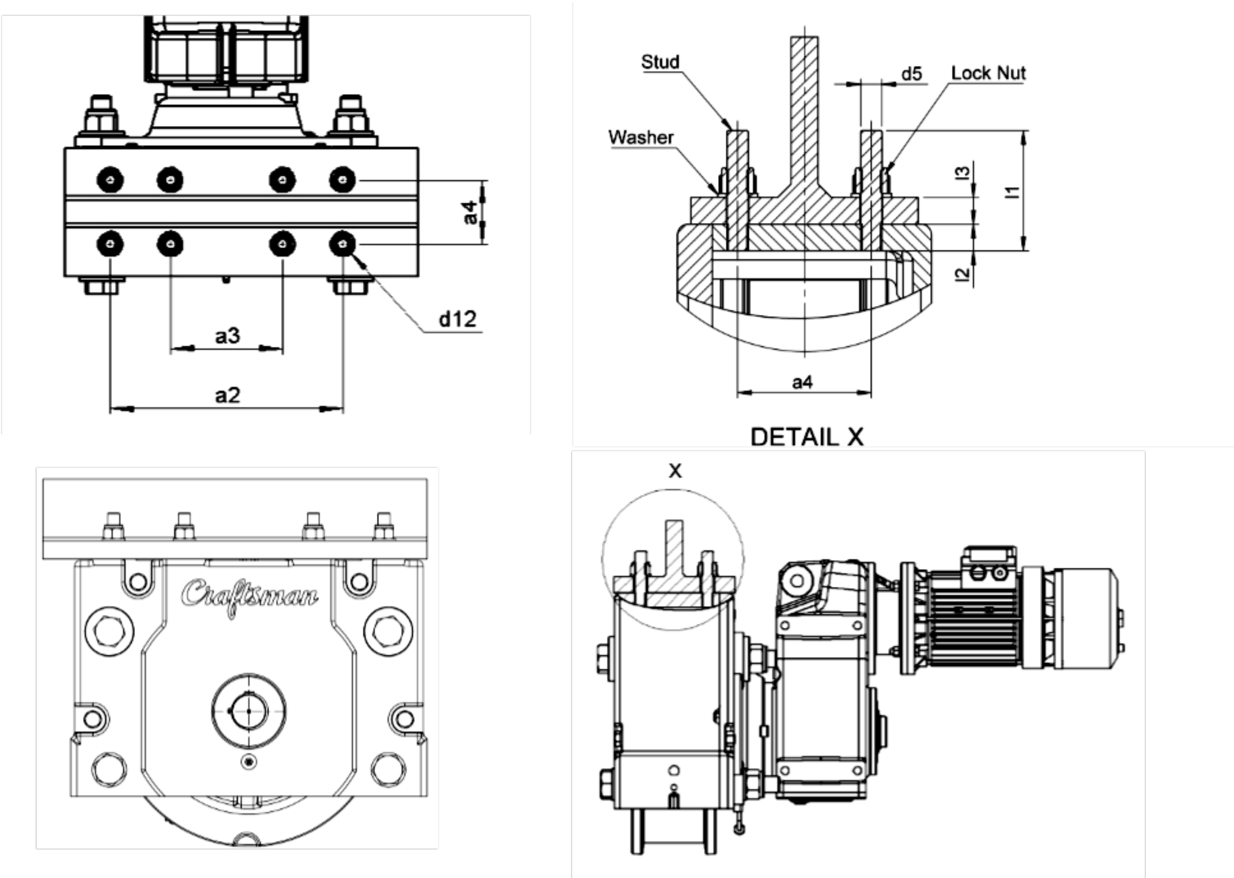


Fig 19 - Top connection - CRWB 250 TO 500

Wheel block size	a2	a3	a4	d5	d12	l1	l2	l3 min. - max.
250	290	140	80	M16	20	80	21	15-29
320	360	180	100	M16	20	90	20	15-40
400	440	210	120	M20	25	100	25	15-40
500	620	480	125	M20	25	120	27	20-40

Table 20 - Top connection - CRWB 250 TO 500

*All dimensions are in mm

DIMENSIONS & DETAILS

3.5. - SIDE CONNECTION - CRWB 112 TO 200

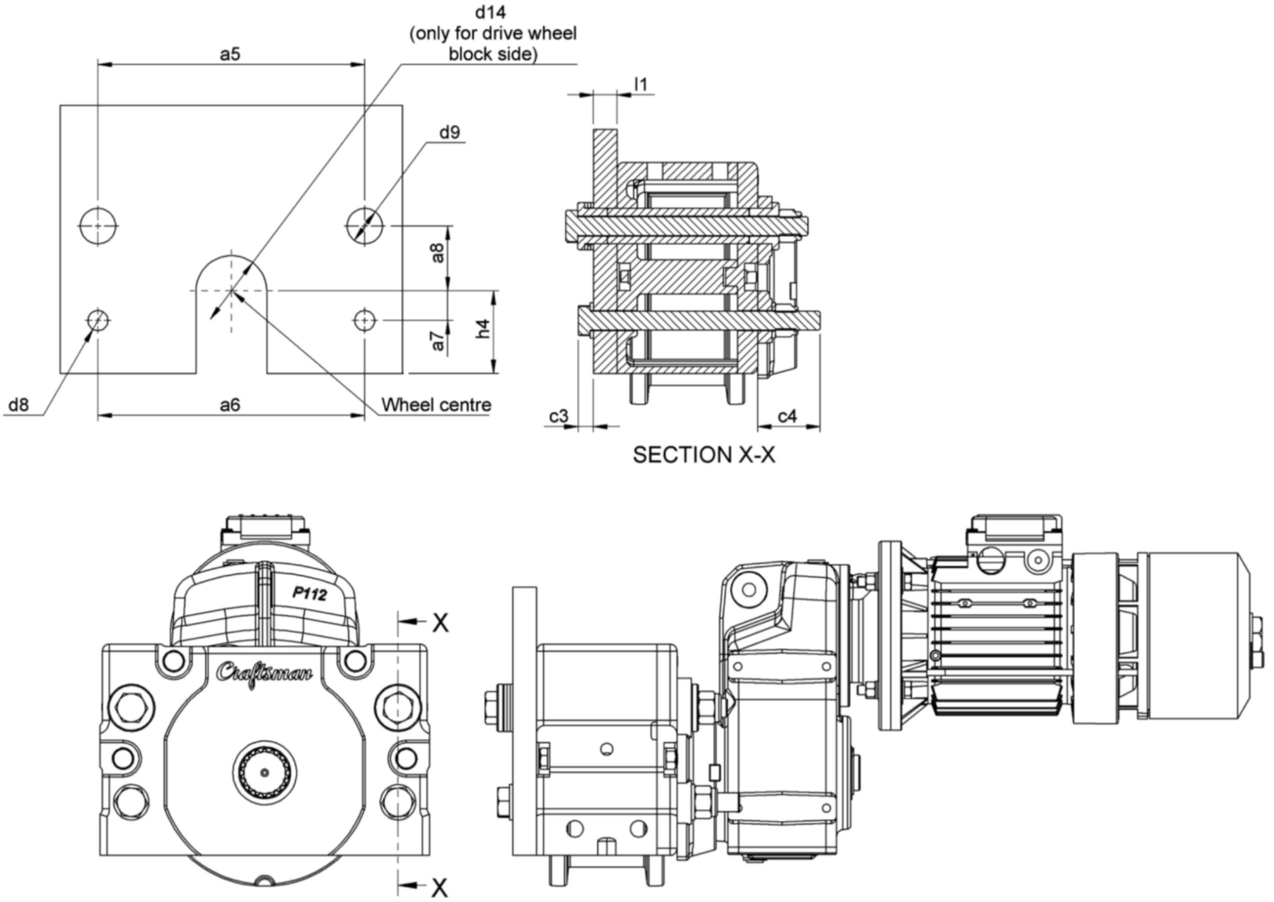


Fig 20 - Side connection - CRWB 112 TO 200

Wheel block size	a5 ± 0.05	a6 ± 0.1	a7 ± 0.1	a8 ± 0.1	c3	c4	d8	d9 D9/h8	d14	h4	l1 min.- max.
112	155	155	20	38	8.4	26	11	18	40	47	8-25
125	180	180	20.5	40.5	10	37.5	13	21	60	53.5	8-25
160	226	226	25	55	13	53	17	30	60	70	15-25
200	275	275	35	75	15.5	40	21	35	65	90	15-25

Table 21 - Side connection - CRWB 112 TO 200

*All dimensions are in mm

DIMENSIONS & DETAILS

3.6. - SIDE CONNECTION - CRWB 250 TO 500

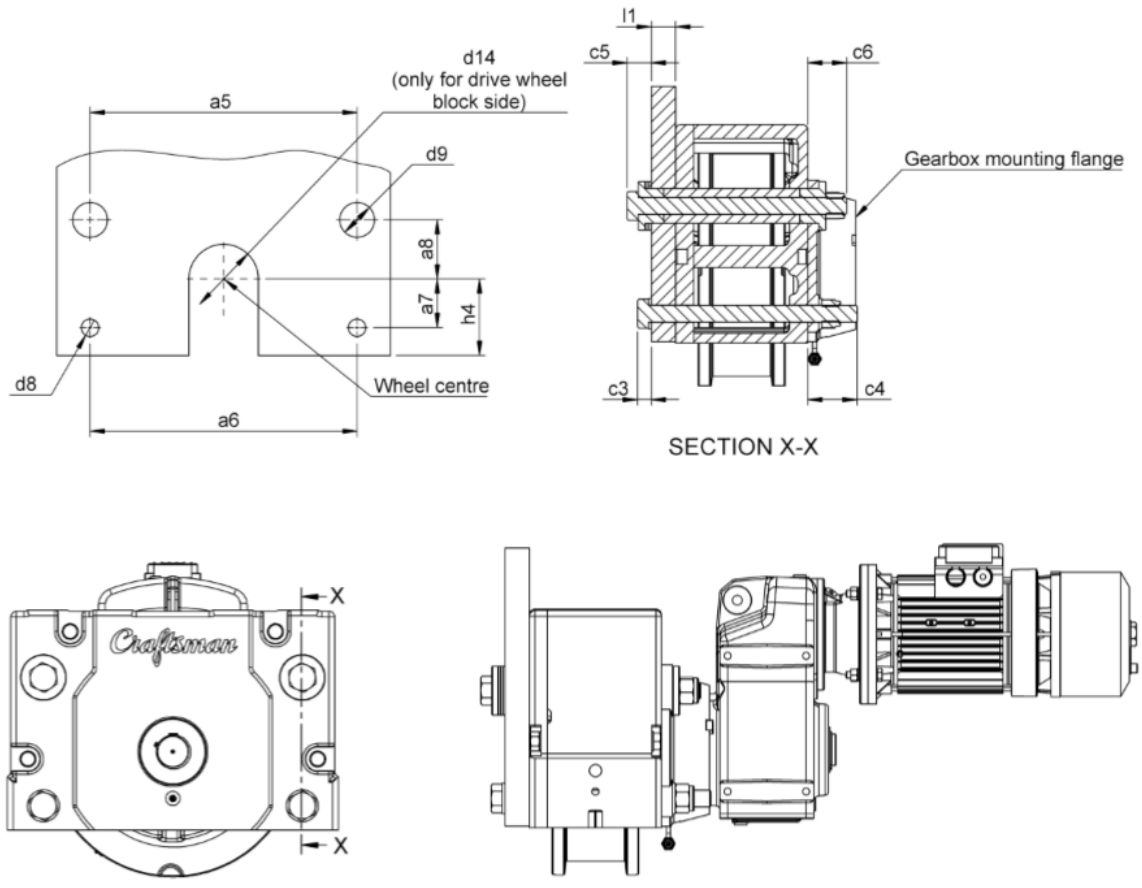


Fig 21 - Side connection - CRWB 250 TO 500

Wheel block size	a5 ± 0.05	a6 ± 0.1	a7 ± 0.1	a8 ± 0.1	c3	c4	d8	d9 D9/h8	d14	h4	l1 min.- max.
250	311	311	52	82	20	64	25	40	100	83	20-25
320	384	384	70	85	20	66	25	50	100	110	25-35
400	454	454	95	130	23.8	82	32	65	120	138	30-35
500	585	585	110	160	23.8	80	31	70	140	183	30-40

Table 22 : Side connection - CRWB 250 TO 500

*All dimensions are in mm

DIMENSIONS & DETAILS

3.7. - PIN CONNECTION - CRWB 112 TO 200

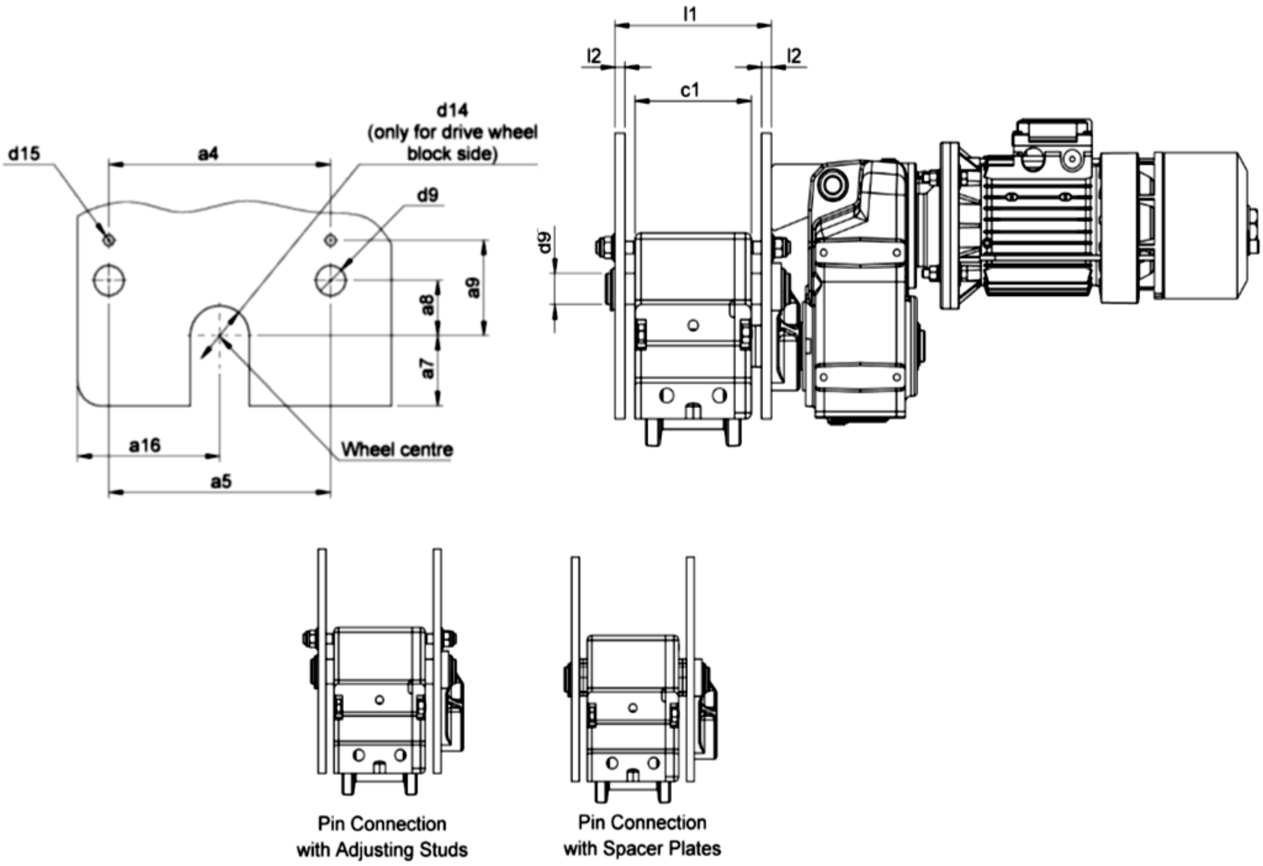


Fig 22 - Pin connection - CRWB 112 TO 200

Wheel block size	a4	a5 ± 0.05	a7	a8 ± 0.1	a9	a16	c1	d9 D9/h8	d14	d15	l1	l2
											min.- max.	min.
112	155	155	47	38	67	105	102	18	40	M10	135 - 150	8
125	180	180	46	40.5	72	115	102	21	60	M10	135 - 150	8
160	226	226	70	55	95	145	119	30	60	M12	155 - 170	10
200	275	275	60	75	120	170	136	35	65	M12	170 - 200	10

Table 23 - Pin connection - CRWB 112 TO 200

*All dimensions are in mm

DIMENSIONS & DETAILS

3.8. - PIN CONNECTION - CRWB 250 TO 500

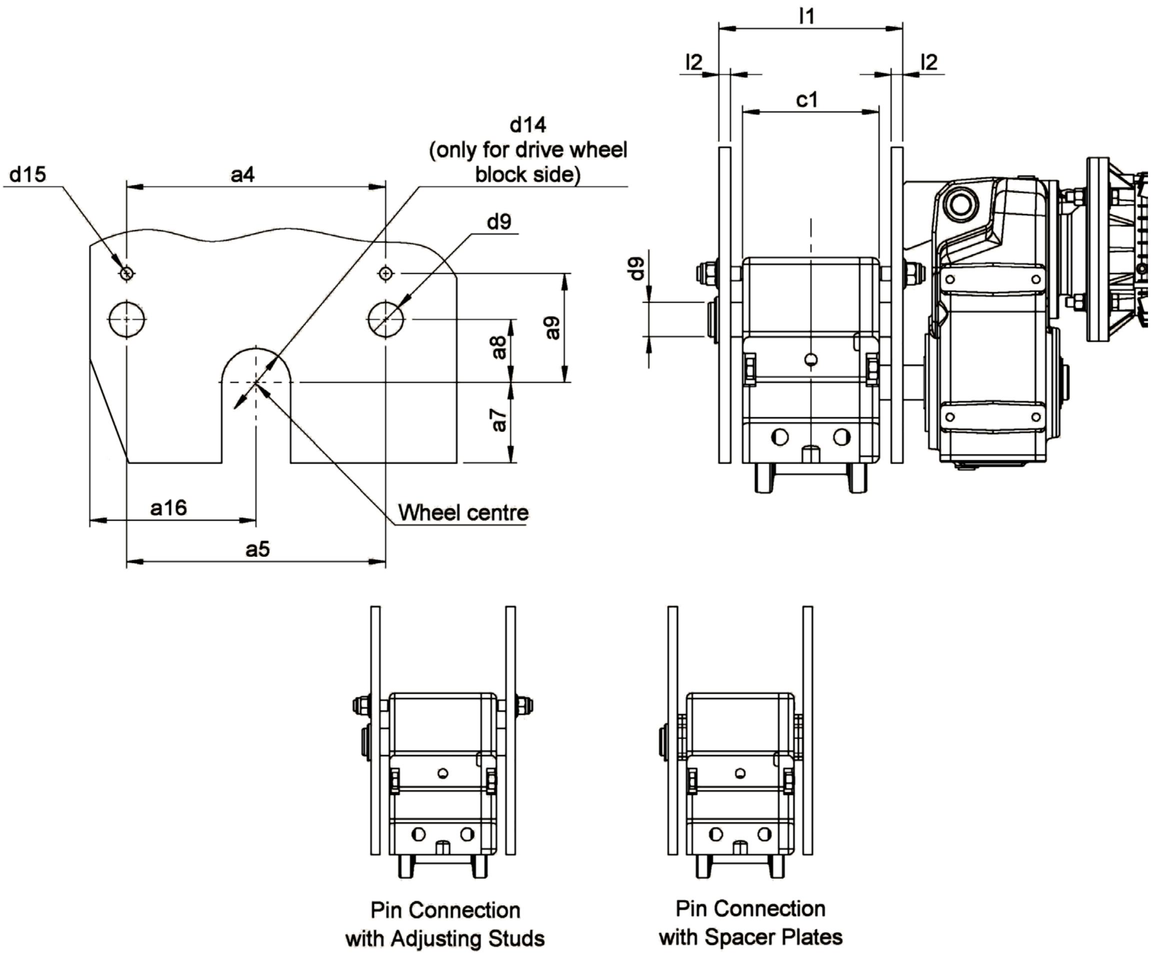


Fig 23 - Pin connection - CRWB 250 TO 500

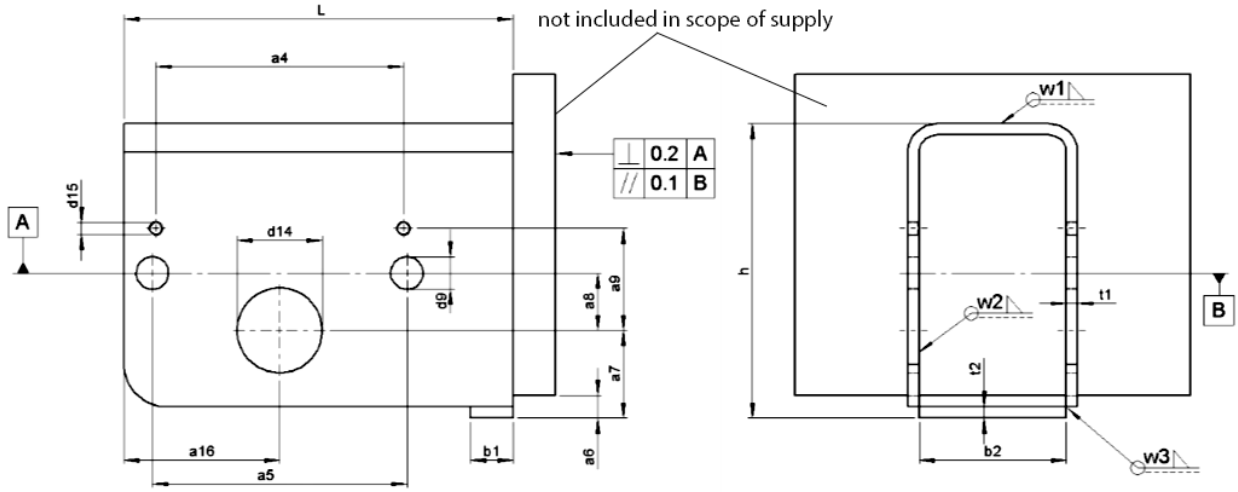
Wheel block size	a4	a5 ± 0.05	a7	a8 ± 0.1	a9	a16	c1	d9 D9/h8	d14	d15	l1	l2
											min.- max.	min.
250	311	311	70	82	135	195.5	161	40	100	M16	195 - 215	10
320	384	384	110	85	145	250	190	50	100	M16	230 - 260	10
400	454	454	138	130	210	285	214	65	120	M20	260 - 290	12
500	585	585	183	160	250	362.5	246	70	140	M20	298 - 320	12

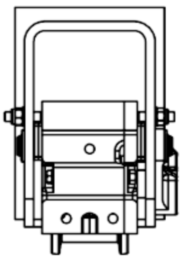
Table 24 : Pin connection - CRWB 250 TO 500

*All dimensions are in mm

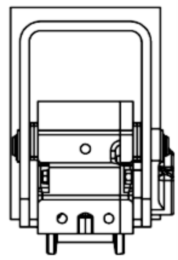
DIMENSIONS & DETAILS

3.9. - END CONNECTION - CRWB 112 TO 200





End Connection
with Adjusting Studs



End Connection
With Spacer Plates

Fig 24 - End connection - CRWB 112 TO 200

Wheel block size	a4	a5 ± 0.05	a6	a7	a8 ± 0.1	a9	a16	d9 D9/h8	d14	d15
112	155	155	7	47	38	68	105	18	40	M10
125	180	180	8	46	40.5	72	115	21	60	M10
160	226	226	10	70	55	95	145	30	60	M12
200	275	275	10	90	75	120	170	35	80	M12

Wheel block size	b1	b2	h	L	t1	t2	w1	w2	w3
112	30	120	200	250	8	8	4	4	4
125	40	120	200	280	8	8	4	4	4
160	50	135	250	350	10	10	4	4	5
200	50	150	300	400	10	10	4	4	5

Table 25 - End connection - CRWB 112 TO 200

*All dimensions are in mm

DIMENSIONS & DETAILS

3.10. - END CONNECTION - CRWB 250

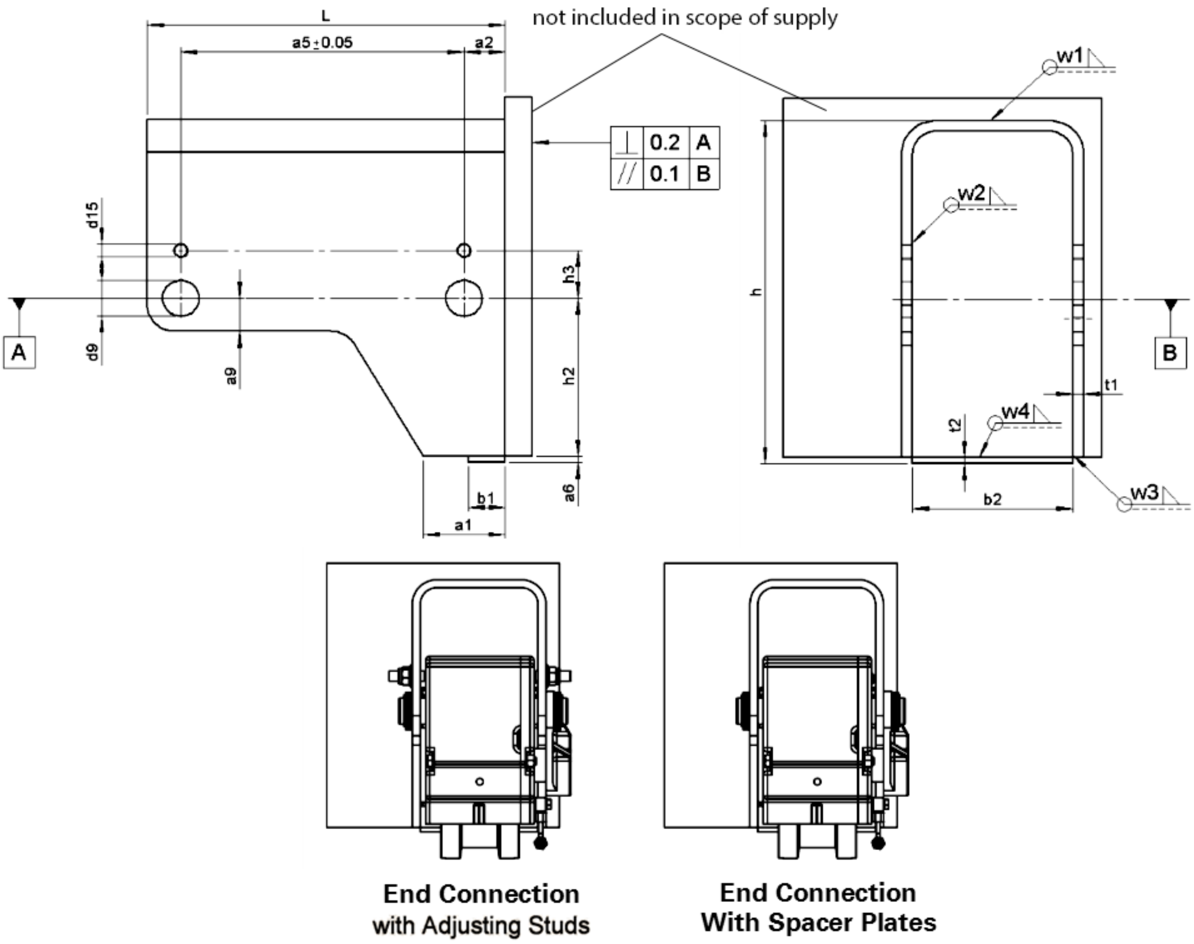


Fig 25 - End connection - CRWB 250

Wheel block size	a1	a2	a5 ± 0.05	a6	a9	d9 D9/h8	d14	d15	b1	b2
250	90	95	311	8	40	40	100	M16	50	175
	h_{min}	h2	h3	L	t1	t2	w1	w2	w3	w4
	382	176	53	450	12	12	5	5	5	5

Table 26 - End connection - CRWB 250

*All dimensions are in mm

DIMENSIONS & DETAILS

3.11. - AXIAL RETAINING ARRANGEMENTS

3.12. - SPACER PLATES

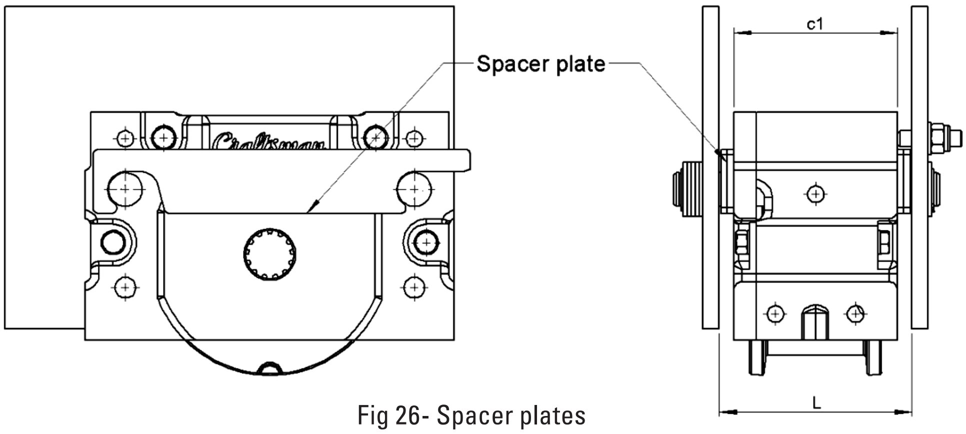


Fig 26- Spacer plates

Wheel block size	C1	L	Spacer plate thickness/Qty		
		max.	Thick 2	Thick 3	Thick 5
112	102	118	2	4	4
125	102	118	3	4	4
160	119	138	2	4	4
200	136	168	4	5	5
250	161	183	6	3	4
320	190	220	6	6	6
400	214	246	6	6	6
500	246	270	4	6	6

Table 27 - Spacer plate Qty

3.13. - THREADED PINS

Wheel block size	Threaded Pin	Tightening torque (Nm)
112	M10 x 40	60
125		
160	M12 X 50	104
200		
250	M16 x 60	250
320		
400	M20 x 80	490
500		

Table 28 - Threaded pins

*All dimensions are in mm

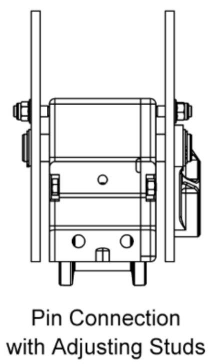


Fig 27- Threaded pins

DIMENSIONS & DETAILS

3.14 . - PIN & PIN SPACERS

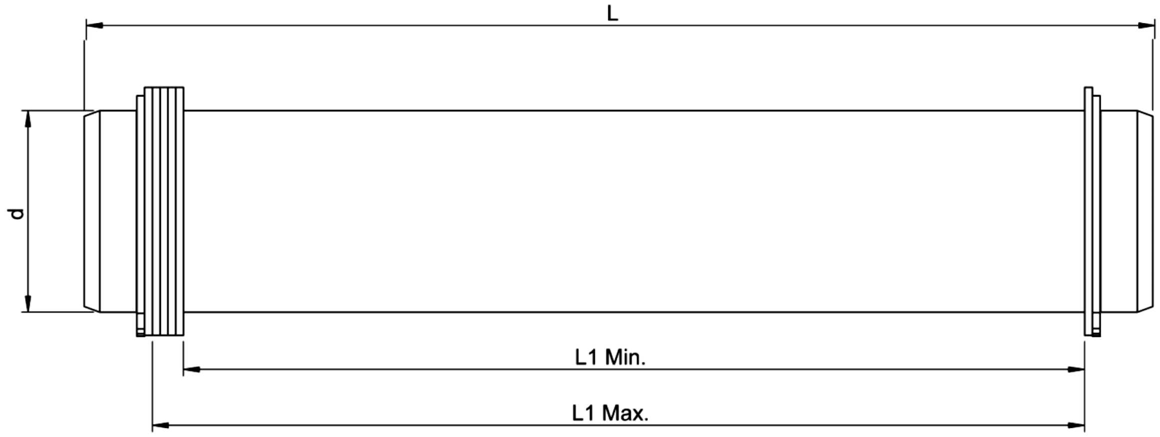


Fig 28- Pin & Spacers

Wheel Size	Weight (kg)	d h8	L	L1		Pin Spacer thickness/Qty		
				min.	max.	1 Thick	2 Thick	2.5 Thick
112	0.33	18	166	135	150	4	6	8
125	0.45	21	166	135	150	6	6	8
160	1.04	30	189	155	170	6	6	8
200	1.65	35	220	170	200	8	8	10
250	2.43	40	252	195	215	4	8	8
320	4.57	50	288	230	260	10	10	12
400	8.8	65	335	260	290	10	10	12
500	11.51	70	365	298	320	6	10	12

Table 29 - Pin & Pin Spacers Qty

*All dimensions are in mm

DIMENSIONS & DETAILS

3.15. - CRWB 112 - WHEEL BLOCK WITH GEARBOX AND MOTOR

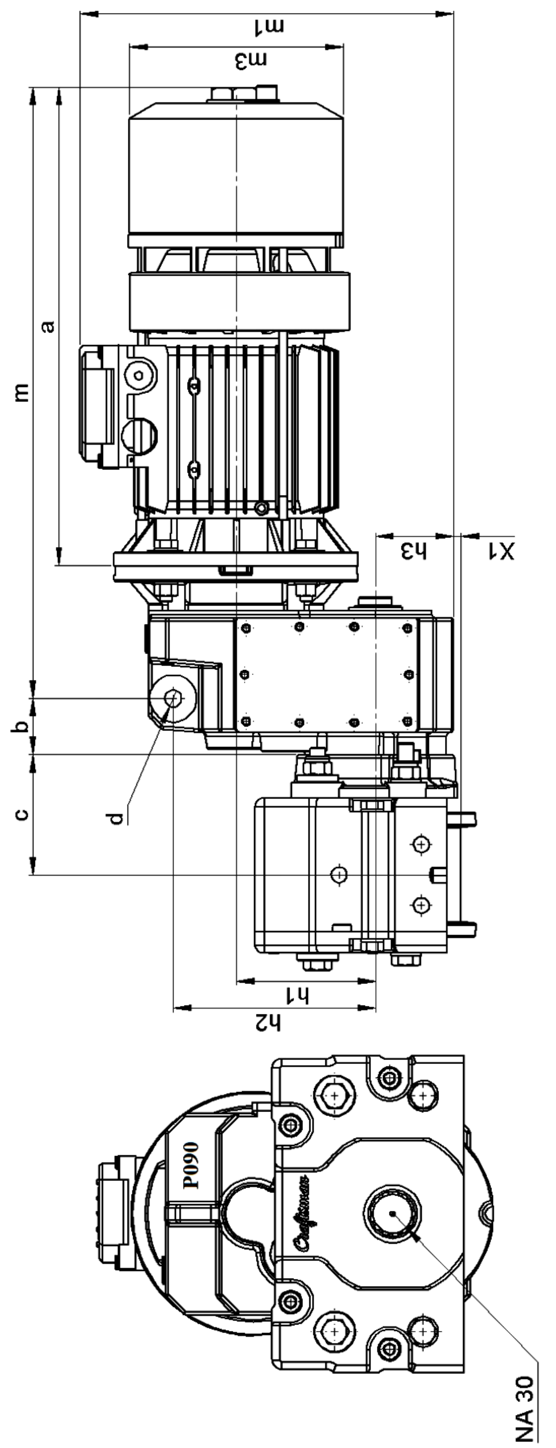


Fig 29- Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor: Type	Motor: Power (kw)	Motor: Frame Size	Dimensions: m	m1	m3	a	b	c: Top & Side	c: Pin & End	d	h1	h2	h3	X1
112	PAG 090 025 000 063	Single Speed with Inverter	0.25	63	324	240	121	237	37	79	93-103	11	91.5	133	51	5
	PAG 090 037 000 071		0.37	71	352	248	136	265								
	PAG 090 055 000 071		0.55													
	PAG 090 025 006 071	Dual Speed with Contactor	0.25/0.06													
	PAG 090 037 009 080		0.37/0.09	80	389	256	153	294								
	PAG 090 055 012 080		0.55/0.12													

Table 30 - CRWB 112 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.16. - CRWB 125 - WHEEL BLOCK WITH GEARBOX AND MOTOR

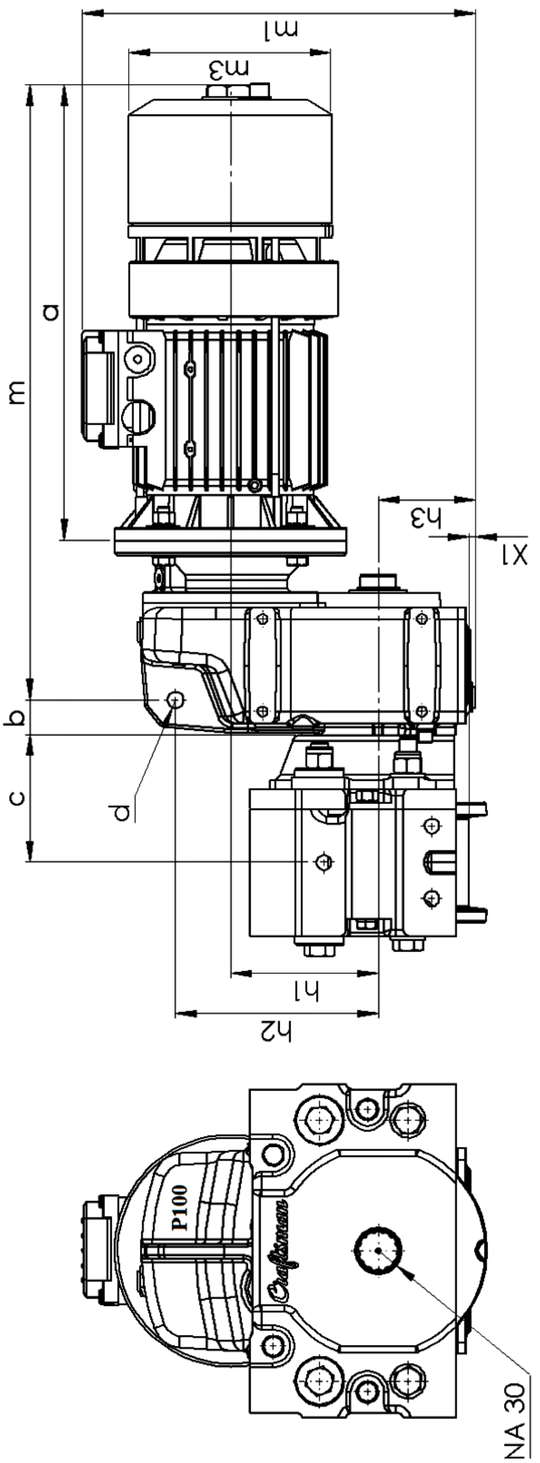


Fig 30 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor: Type	Motor: Power (kw)	Motor: Frame Size	Dimensions: m	m1	m3	a	b	c: Top & Side	c: Pin & End	d	h1	h2	h3	x1
125	PAG 100 037 000 071	Single Speed with Inverter	0.37	71	424	278	145	314	48	88	96-104	11	102	140	71	-8.5
	PAG 100 055 000 071		0.55													
	PAG 100 075 000 080		0.75	80	469	286	160	340								
	PAG 100 037 009 080	Dual Speed with Contactor	0.37/0.09													
	PAG 100 055 012 080		0.55/0.12													
	PAG 100 075 018 090		0.75/0.18	90	501	300	180	362								

Table 31 - CRWB 125 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.17. - CRWB 160 - WHEEL BLOCK WITH GEARBOX AND MOTOR

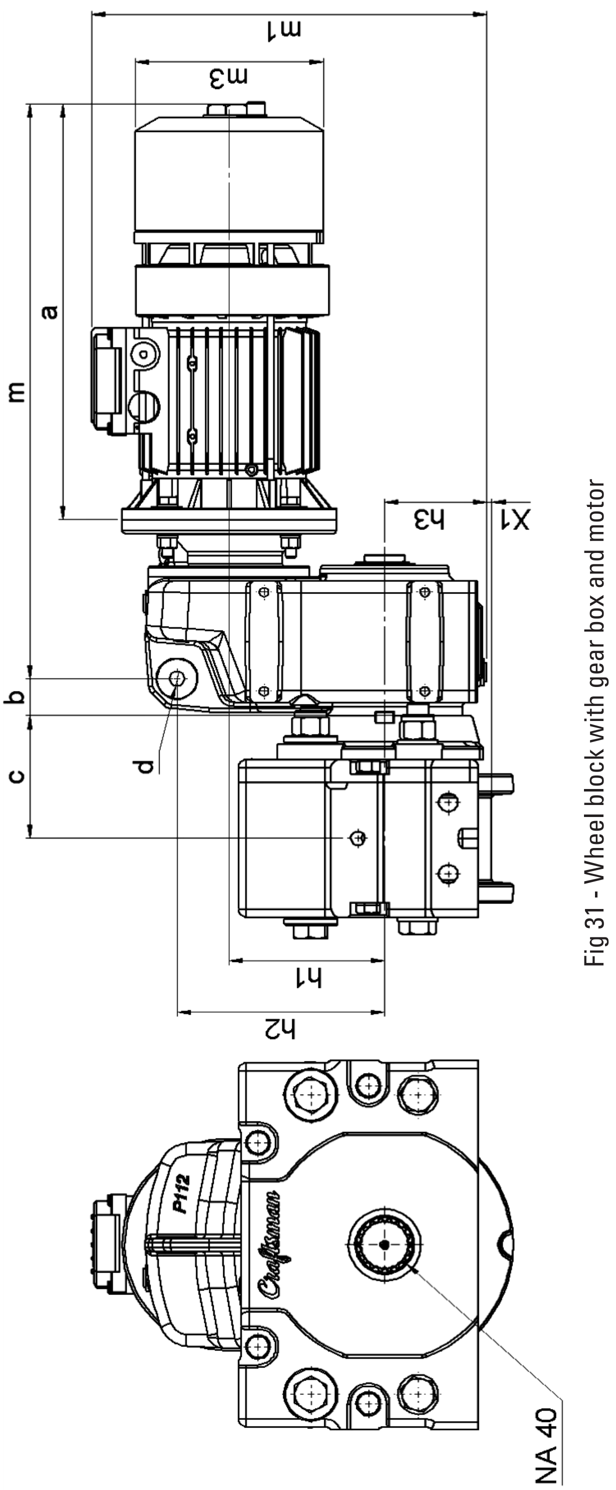


Fig 31 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions											
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c: Top & Side	c: Pin & End	d	h1	h2	h3	x1
160	PAG 112 055 000 071	Single Speed with Inverter	0.55	71	434	295	145	314	28	136	105.5-115	11	116	155	74	6
	PAG 112 075 000 080		0.75	80	479	303	160	340								
	PAG 112 110 000 080		1.1													
	PAG 112 037 009 080	Dual Speed with Contactor	0.37/0.09													
	PAG 112 055 012 080		0.55/0.12													
	PAG 112 075 018 090		0.75/0.18	90	511	317	180	362								
	PAG 112 110 025 090		1.1/0.25		535			386								

Table 32 - CRWB 160 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.18. - CRWB 200 - WHEEL BLOCK WITH GEARBOX AND MOTOR

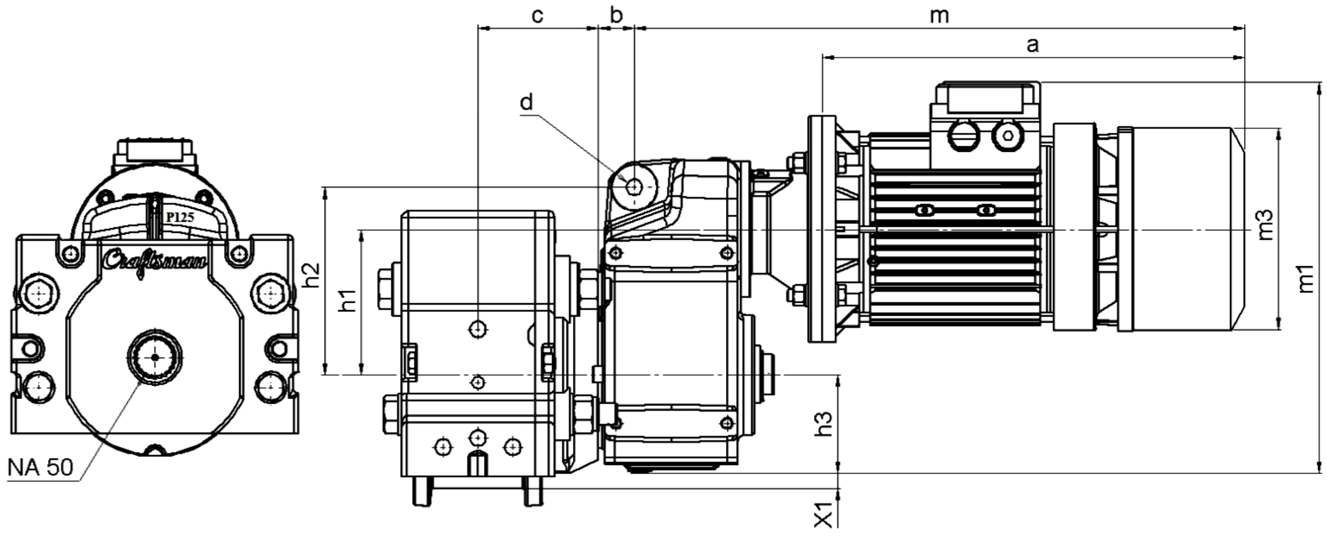


Fig 32 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions												
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c Top & Side	c Pin & End	d	h1	h2	h3	x1
200	PAG 125 055 000 071	Single Speed with Inverter	0.55	71	452	324	145	314	63	107	128-138	14	128	165	91	9
	PAG 125 075 000 080		0.75	80	497	332	160	340								
	PAG 125 110 000 080		1.1													
	PAG 125 150 000 090		1.5	90	529	346	180	362								
	PAG 125 055 012 080	Dual Speed with Contactor	0.55/0.12	80	497	332	160	340								
	PAG 125 075 018 090		0.75/0.18	90	529	346	180	362								
	PAG 125 110 025 090		1.1/0.25		553			386								
	PAG 125 130 030 090		1.3/0.3													

Table 33 - CRWB 200- Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.19. - CRWB 250 - WHEEL BLOCK WITH GEARBOX AND MOTOR

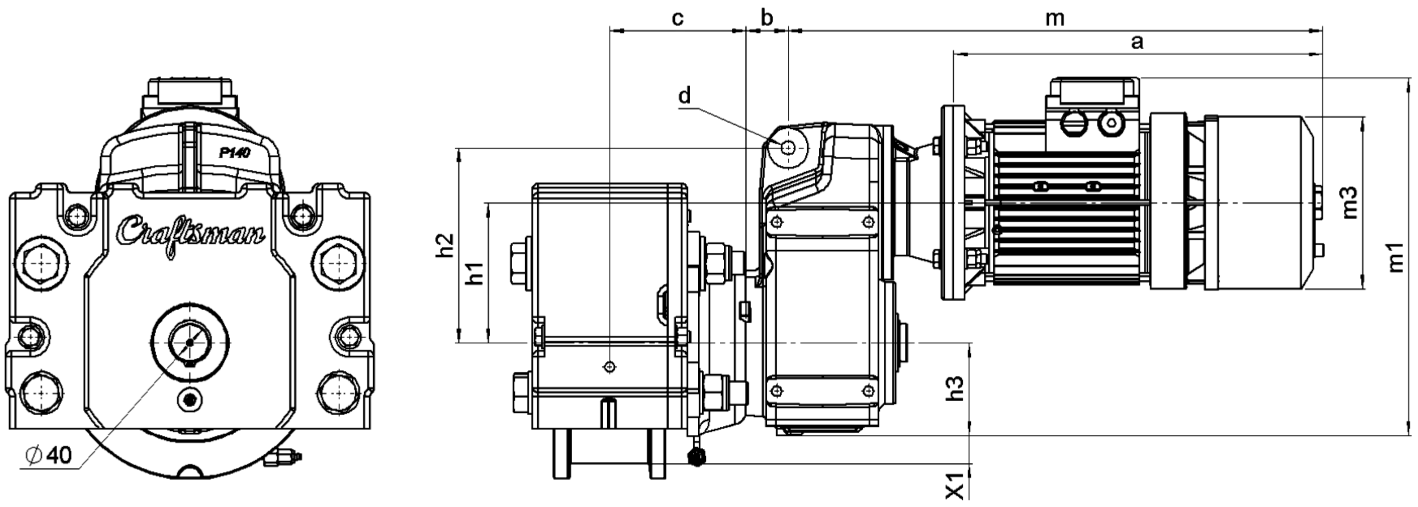


Fig 33 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions											
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c		d	h1	h2	h3	x1
										Top & Side	Pin & End					
250	PAG 140 075 000 080	Single Speed with Inverter	0.75	80	503	358	160	340	73	144	137.5-151	14	145	202	100	25
	PAG 140 110 000 080		1.1													
	PAG 140 150 000 090		1.5	90	535	372	180	362								
	PAG 140 220 000 090		2.2		579			386								
	PAG 140 075 018 090	Dual Speed with Contactor	0.75/0.18		525			362								
	PAG 140 110 025 090		1.1/0.25		549			386								
	PAG 140 130 030 090		1.3/0.3													
	PAG 140 160 040 100		1.6/0.4	100	600	383	196	427								
	PAG 140 220 050 100		2.2/0.5													

Table 34 - CRWB 250 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.20. - CRWB 320 - WHEEL BLOCK WITH GEARBOX AND MOTOR

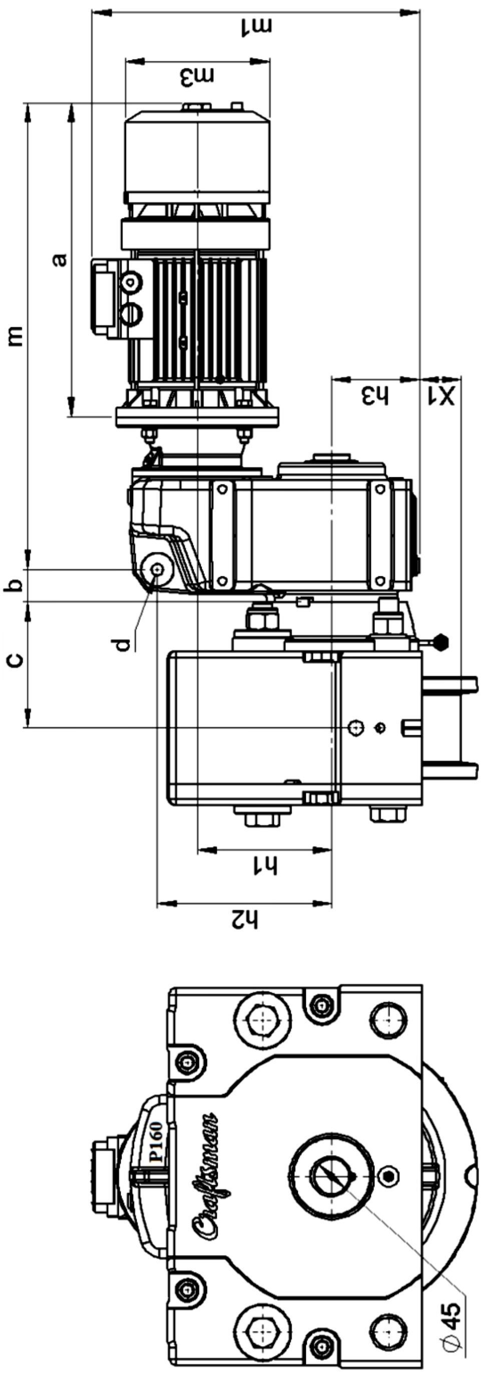


Fig 34 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions											
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c		d	h1	h2	h3	x1
										Top & Side	Pin & End					
320	PAG 160 150 000 090	Single Speed with Inverter	1.5	90	550	403	180	362	69	155	139-155	14	166	215	110	40
	PAG 160 220 000 090		2.2		574			386								
	PAG 160 300 000 100		3	100	635	414	196	427								
	PAG 160 110 025 090		1.1/0.25	90	574	403	180	386								
	PAG 160 130 030 090	Dual Speed with Contactor	1.3/0.3													
	PAG 160 160 040 100		1.6/0.4	100	635	414	196	427								
	PAG 160 220 050 100		2.2/0.5													
	PAG 160 300 080 112		3/0.8	112	653	434	218	445								

Table 35 - CRWB 320 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.21. - CRWB 400 - WHEEL BLOCK WITH GEARBOX AND MOTOR

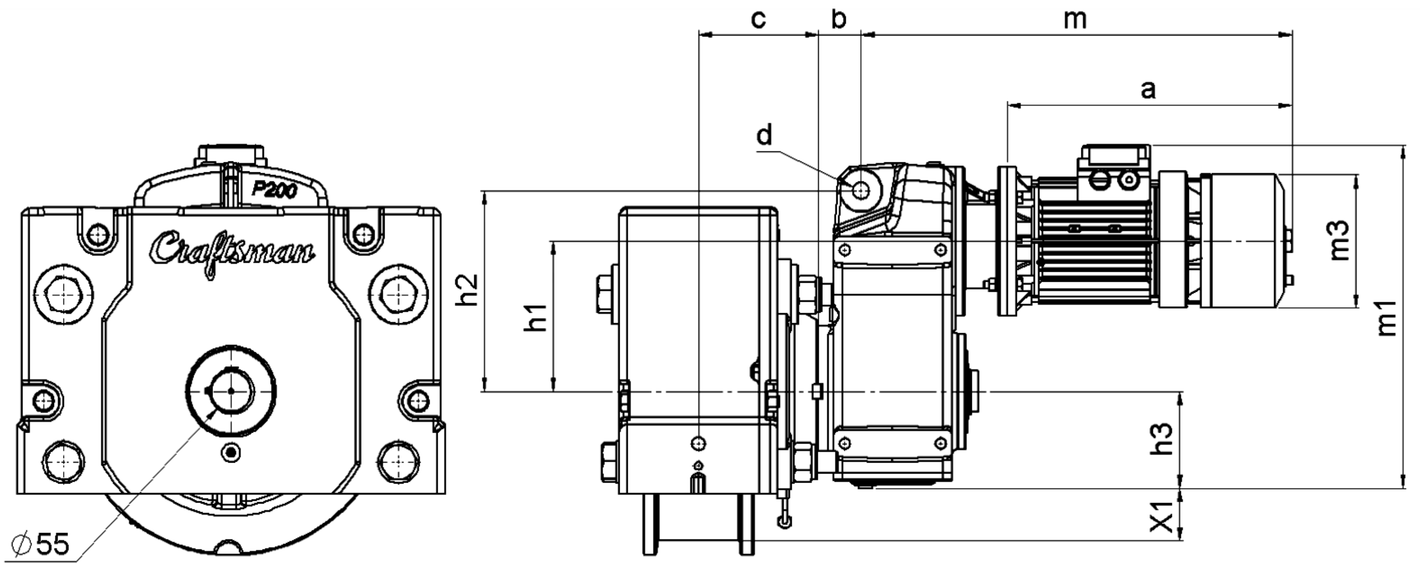


Fig 35 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions												
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c		d	h1	h2	h3	x1
										Top & Side	Pin & End					
400	PAG 200 220 000 090	Single Speed with Inverter	2.2	90	586	461	180	386	100	155	139-155	22	202	270	132	68
	PAG 200 300 000 100		3	100	647	472	196	427								
	PAG 200 400 000 112		4	112	665	492	218	445								
	PAG 200 220 050 100	Dual Speed with Contactor	2.2/0.5	100	647	472	196	427								
	PAG 200 300 080 112		3.0/0.8	112	665	492	218	445								
	PAG 200 400 110 132		4.0/1.1	132	740	492	265	520								

Table 36 - CRWB 400 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.22. - CRWB 500 - WHEEL BLOCK WITH GEARBOX AND MOTOR

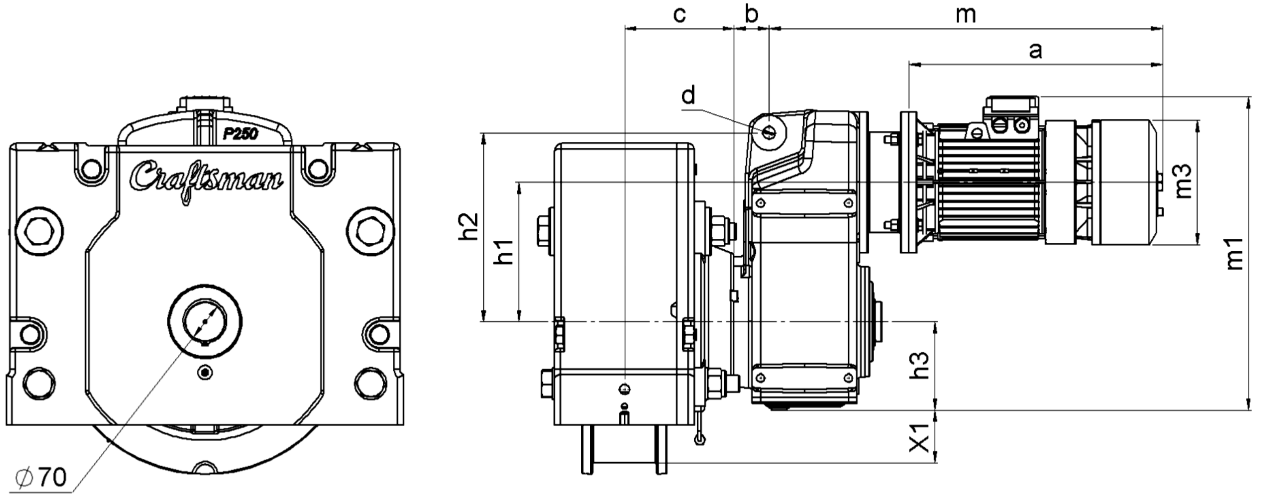


Fig 36 - Wheel block with gear box and motor

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions											
		Type	Power (kw)	Frame Size	m	m1	m3	a	b	c		d	h1	h2	h3	x1
										Top & Side	Pin & End					
500	PAG 250 300 000 100	Single Speed with Inverter	3	100	674	540	196	427	100	155	139-155	22	247	335	155	95
	PAG 250 400 000 112		4	112	692	560	218	445								
	PAG 250 550 000 132		5.5	132	795	562	265	520								
	PAG 250 300 080 112	Dual Speed with Contactor	3.0/0.8	112	692	540	218	445								
	PAG 250 400 110 132		4.0/1.1	132	795	562	265	520								
	PAG 250 550 150 132		5.5/1.5		833			558								

Table 37 - CRWB 500 - Wheel block with gearbox and motor

DIMENSIONS & DETAILS

3.23. - GEAR BOX & MOTOR DETAILS - Ø112

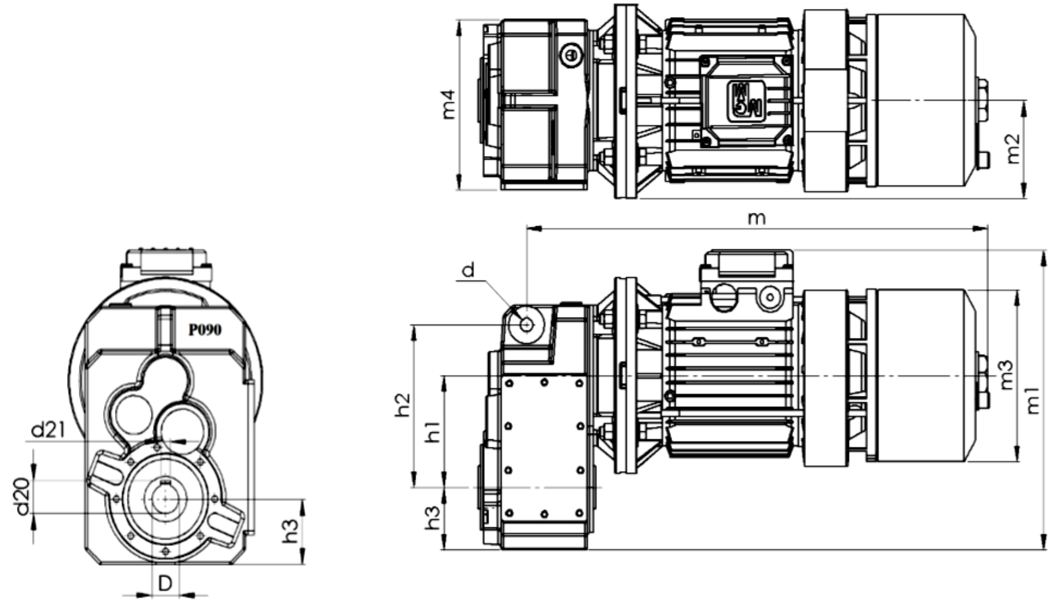


Fig 37 - CRWB 112 - Gearbox and motor details

*All dimensions are in mm

<table>
<tr><th rowspan="2">Wheel block size</th><th rowspan="2">Drive model No.</th><th colspan="3">Motor</th><th colspan="13">Dimensions</th><th rowspan="2">Weight (Kg)</th></tr>
<tr><th>Type</th><th>Power (kw)</th><th>Frame Size</th><th>m</th><th>m1</th><th>m2</th><th>m3</th><th>m4</th><th>D</th><th>d</th><th>d20</th><th>d21</th><th>h1</th><th>h2</th><th>h3</th></tr>
<tr><td rowspan="6">112</td><td>PAG 090 025 000 063</td><td rowspan="3">Single Speed with Inverter</td><td>0.25</td><td>63</td><td>324</td><td>240</td><td>70</td><td>121</td><td rowspan="6">139</td><td rowspan="6">22</td><td rowspan="6">11</td><td rowspan="6">25.3</td><td rowspan="6">8</td><td rowspan="6">91.5</td><td rowspan="6">133</td><td rowspan="6">51</td><td>9.4</td></tr>
<tr><td>PAG 090 037 000 071</td><td>0.37</td><td rowspan="3">71</td><td rowspan="3">352</td><td rowspan="3">248</td><td rowspan="3">80</td><td rowspan="3">136</td><td>11.6</td></tr>
<tr><td>PAG 090 055 000 071</td><td>0.55</td><td>12.6</td></tr>
<tr><td>PAG 090 025 006 071</td><td rowspan="3">Dual Speed with Contactor</td><td>0.25/0.06</td><td>13.1</td></tr>
<tr><td>PAG 090 037 009 080</td><td>0.37/0.09</td><td rowspan="2">80</td><td rowspan="2">389</td><td rowspan="2">256</td><td rowspan="2">100</td><td rowspan="2">153</td><td>16.95</td></tr>
<tr><td>PAG 090 055 012 080</td><td>0.55/0.12</td><td>17.95</td></tr>
</table>

Table 38 - CRWB 112 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø125

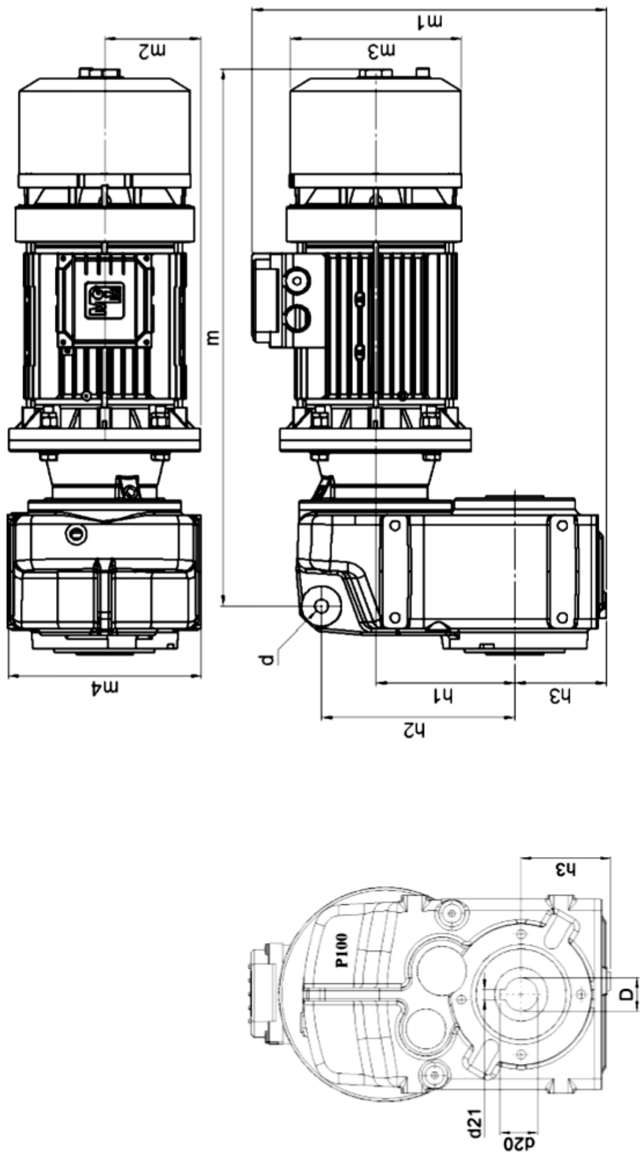


Fig 38 - CRWB 125 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions												Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
125	PAG 100 037 000 071	Single Speed with Inverter	0.37	71	424	278	80	145	148	25	11	28.3	8	102	140	71	17.2
	PAG 100 055 000 071		0.55														18.2
	PAG 100 075 000 080		0.75	80	469	286	100	160									24.6
	PAG 100 037 009 080	Dual Speed with Contactor	0.37/0.09														24.6
	PAG 100 055 012 080		0.55/0.12														25.6
	PAG 100 075 018 090		0.75/0.18	90	501	300	100	180									34.5

Table 39 - CRWB 125 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø160

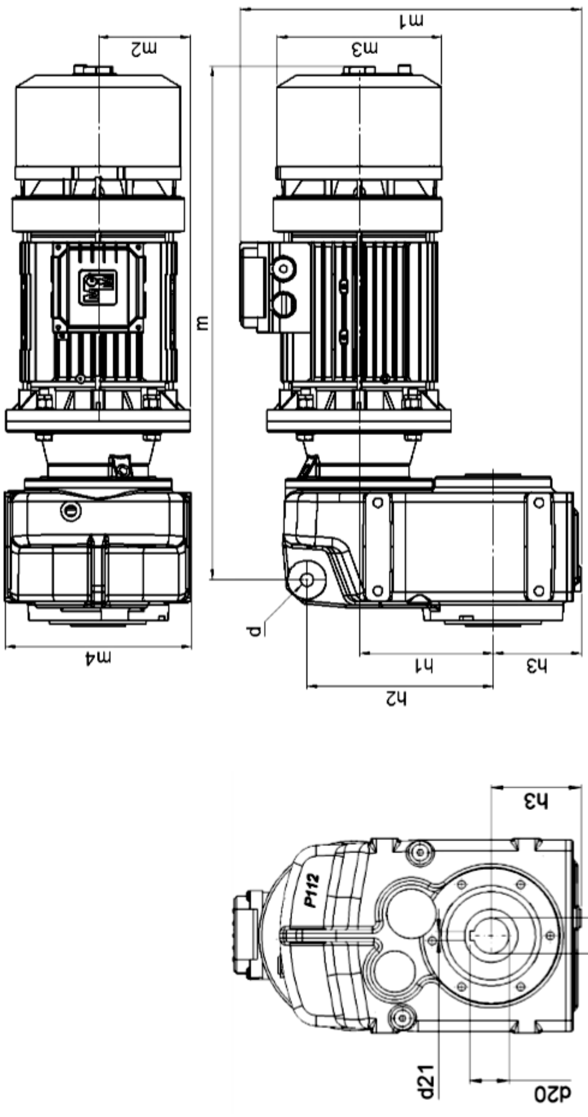


Fig 39 - CRWB 160 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions												Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
160	PAG 112 055 000 071	Single Speed with Inverter	0.55	71	434	295	80	145	165	30	11	33.3	8	116	155	74	20.3
	PAG 112 075 000 080		0.75	80	479	303	100	160									26.6
	PAG 112 110 000 080		1.1														27.6
	PAG 112 037 009 080	Dual Speed with Contactor	0.37/0.09														26.6
	PAG 112 055 012 080		0.55/0.12														27.6
	PAG 112 075 018 090		0.75/0.18	90	511	317	100	180									35.2
	PAG 112 110 025 090		1.1/0.25		535												35.7

Table 40 - CRWB 160 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø200

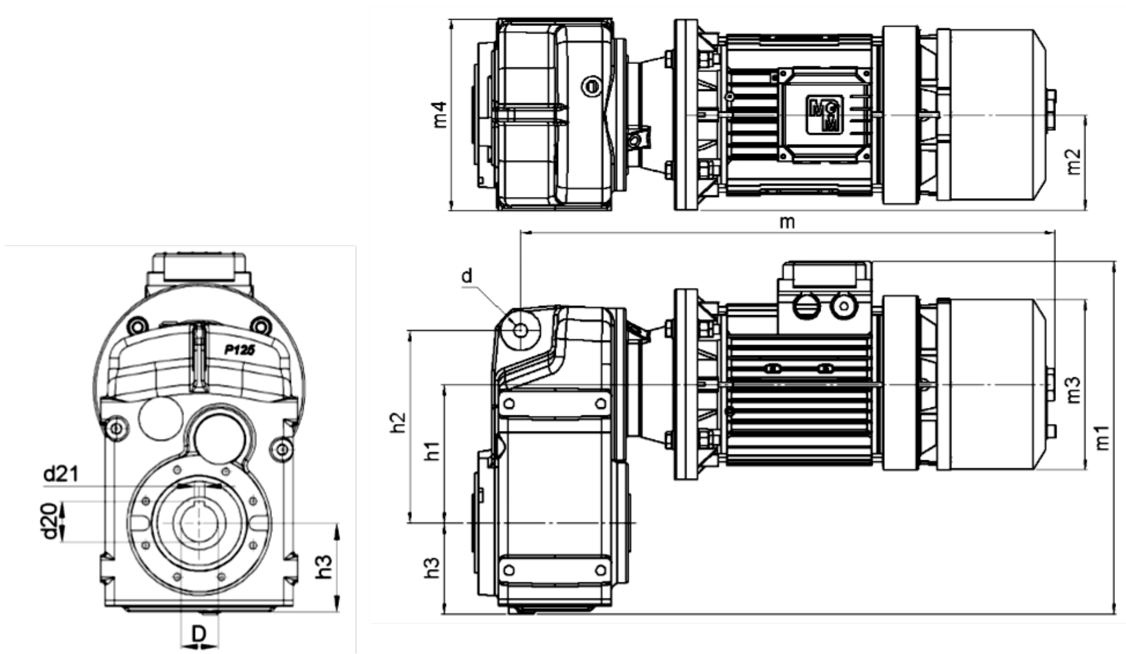


Fig 40 - CRWB 200 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions													Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
200	PAG 125 055 000 071	Single Speed With Inverter	0.55	71	452	324	80	145	186	35	14	38.3	10	128	165	91	24.3
	PAG 125 075 000 080		0.75	80	497	332	100	160									30.6
	PAG 125 110 000 080		1.1														31.6
	PAG 125 150 000 090		1.5	90	529	346		180									36.6
	PAG 125 055 012 080	Dual Speed With Contactor	0.55/0.12	80	497	332		160									29.3
	PAG 125 075 018 090		0.75/0.18	90	529	346		180									39.1
	PAG 125 110 025 090		1.1/0.25		553												39.6
	PAG 125 130 030 090		1.3/0.3														40.6

Table 41 - CRWB 200 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø250

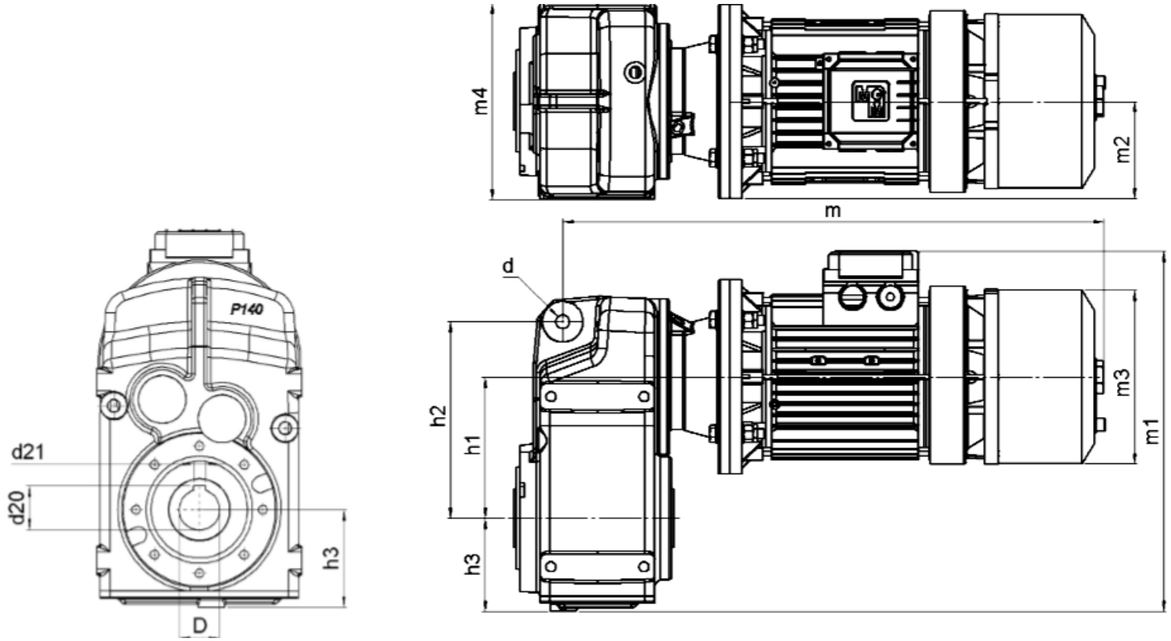


Fig 41 - CRWB 250 - Gearbox and motor detailsr

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions													Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
250	PAG 140 075 000 080	Single Speed With Inverter	0.75	80	503	358	100	160									48.5
	PAG 140 110 000 080		1.1														49.5
	PAG 140 150 000 090		1.5	90	535	372	100	180									54.6
	PAG 140 220 000 090		2.2		579												57.1
	PAG 140 075 018 090	Dual Speed With Contactor	0.75/0.18		525				202	40	14	43.3	12	145	202	100	57.1
	PAG 140 110 025 090		1.1/0.25		549												57.6
	PAG 140 130 030 090		1.3/0.3														58.6
	PAG 140 160 040 100		1.6/0.4	100	600	383	125	196									70.3
	PAG 140 220 050 100		2.2/0.5														74.3

Table 42 - CRWB 250 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø320

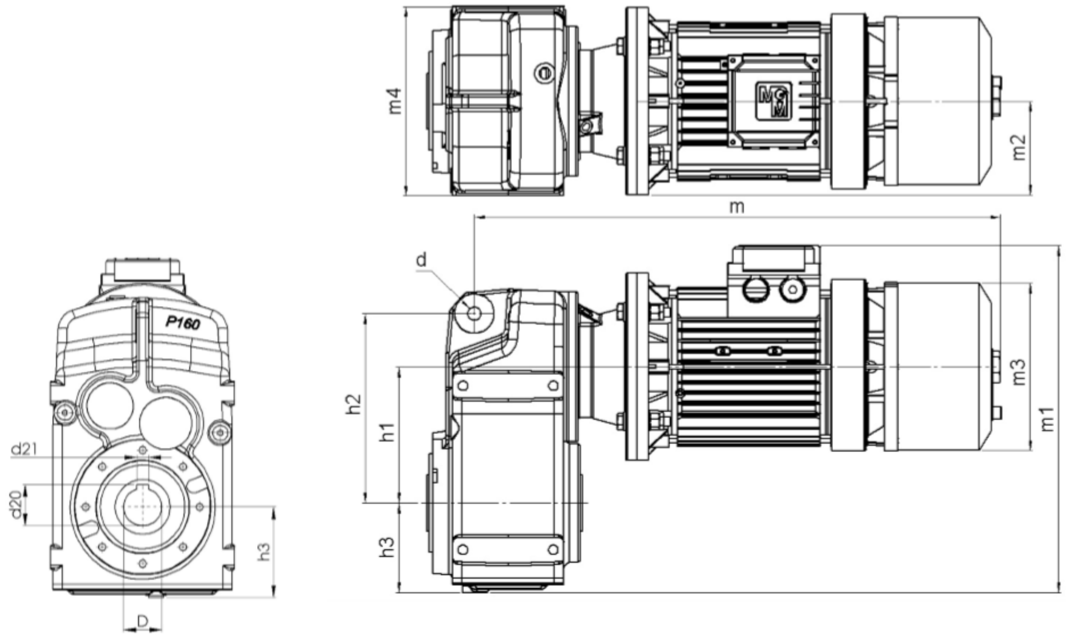


Fig 42 - CRWB 320 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions													Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
320	PAG 160 150 000 090	Single Speed With Inverter	1.5	90	550	403	100	180	218	45	14	48.8	14	166	215	110	60.9
	PAG 160 220 000 090		2.2		575												63.4
	PAG 160 300 000 100		3	100	615	414	125	196									74.4
	PAG 160 110 025 090		1.1/0.25	90	574	403	100	180									64.9
	PAG 160 130 030 090	Dual Speed With Contactor	1.3/0.3														72.9
	PAG 160 160 040 100		1.6/0.4	100	635	414	125	196									76.4
	PAG 160 220 050 100		2.2/0.5														80.4
	PAG 160 300 080 112		3/0.8	112	653	434		218									95

Table 43 - CRWB 320 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø400

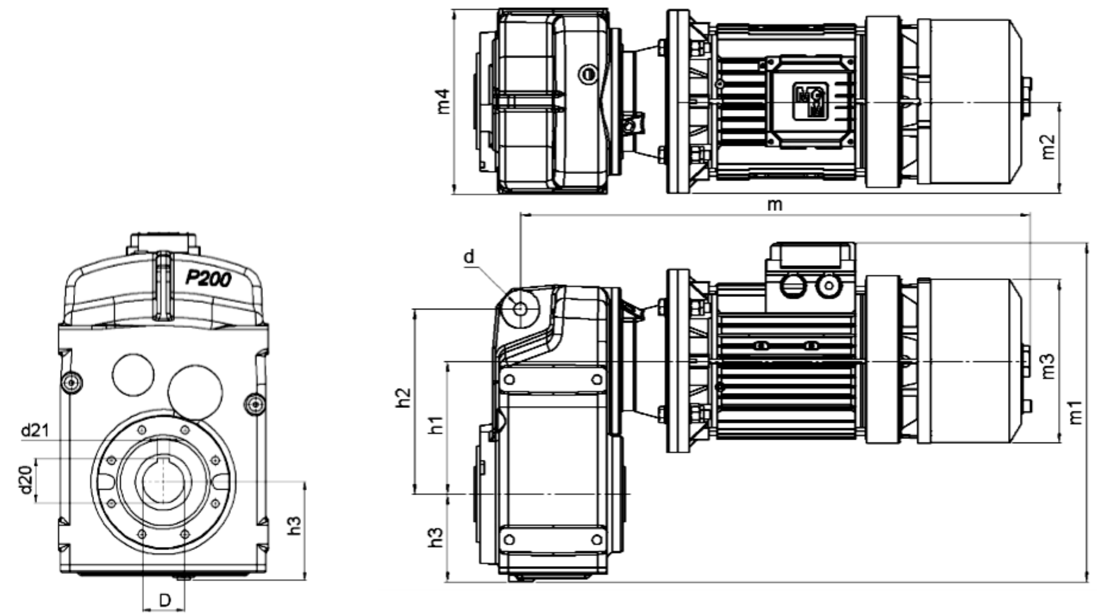


Fig 43 - CRWB 400 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions												Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
400	PAG 200 220 000 090	Single Speed with Inverter	2.2	90	586	461	100	180	280	55	22	59.3	16	202	270	132	96.4
	PAG 200 300 000 100		3	100	647	472	125	196									114.1
	PAG 200 400 000 112		4	112	665	492		218									118.1
	PAG 200 220 050 100	Dual Speed with Contactor	2.2/0.5	100	647	472		196									106.1
	PAG 200 300 080 112		3.0/0.8	112	665	492		218									115.1
	PAG 200 400 110 132		4.0/1.1	132	740	492	150	265									153.1

Table 44 - CRWB 400 - Gearbox and motor details

DIMENSIONS & DETAILS

GEAR BOX & MOTOR DETAILS - Ø500

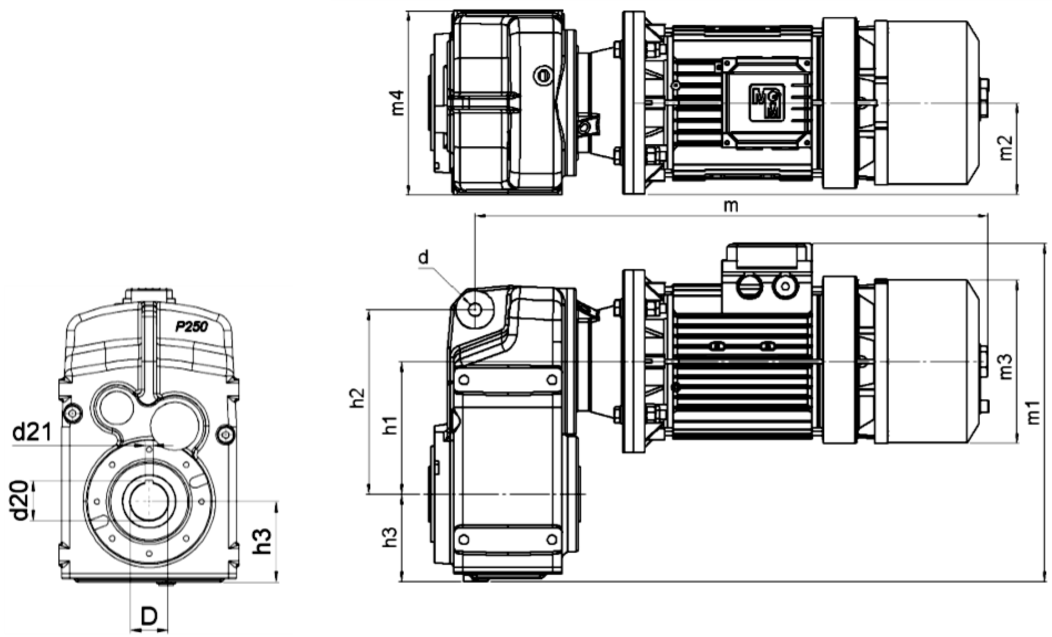


Fig 44 - CRWB 500 - Gearbox and motor details

*All dimensions are in mm

Wheel block size	Drive model No.	Motor			Dimensions													Weight (Kg)
		Type	Power (kw)	Frame Size	m	m1	m2	m3	m4	D	d	d20	d21	h1	h2	h3	
500	PAG 250 300 000 100	Single Speed with Inverter	3	100	674	540	125	196	336	70	22	74.9	20	247	335	155	144
	PAG 250 400 000 112		4	112	692	560	125	218									158
	PAG 250 550 000 132		5.5	132	795	562	150	265									185
	PAG 250 300 080 100	Dual Speed with Contactor	3.0/0.8	112	692	540	125	218									159
	PAG 250 400 110 112		4.0/1.1	132	795	562	150	265									201
	PAG 250 550 150 132		5.5/1.5		833												208

Table 45 - CRWB 500 - Gearbox and motor details

DIMENSIONS & DETAILS

3.24. - CENTRAL DRIVE ARRANGEMENTS

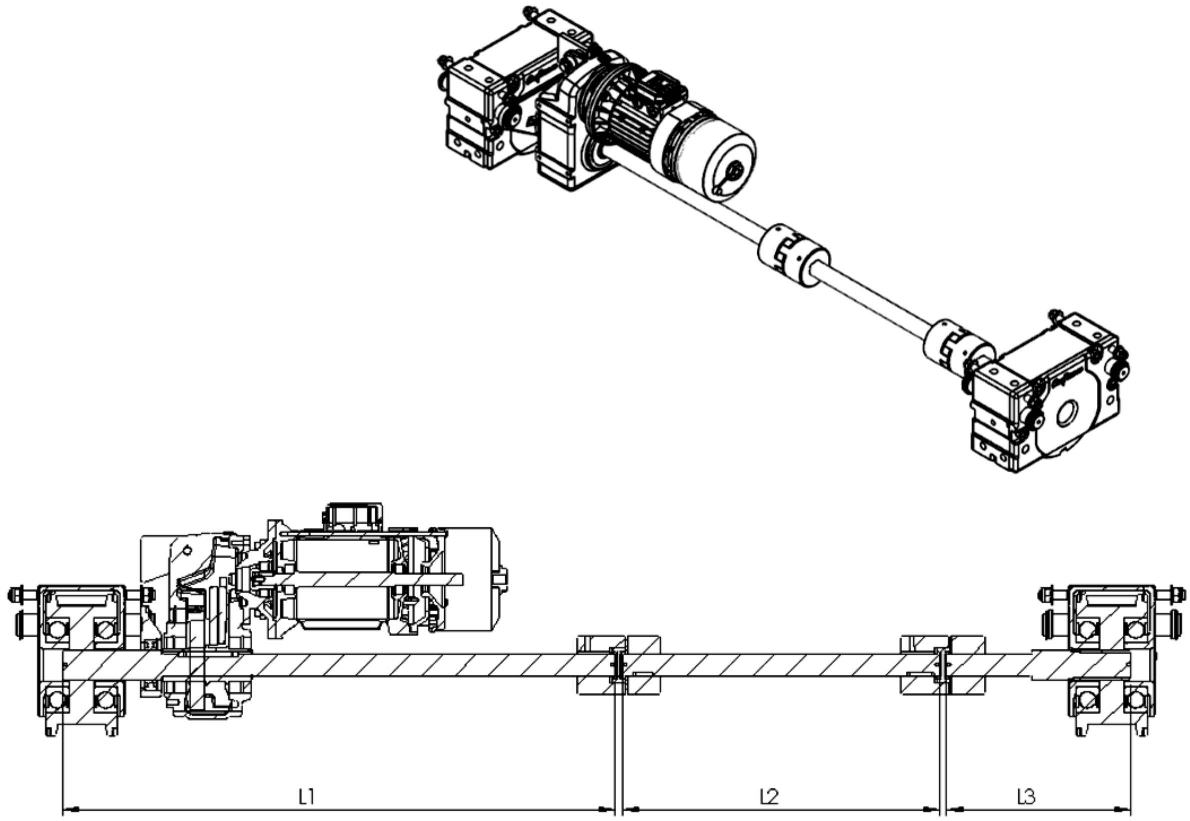


Fig 45 - Central drive arrangements

Wheel block size	Track gauge length														
	1250			1400			1800			2240			2800		
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Ø112	670	385	270	670	535	270	670	935	270	670	1375	270	670	1935	270
Ø125	660	360	250	660	510	250	660	910	250	660	1350	250	660	1910	250
Ø160	750	280	250	750	430	250	750	830	250	750	1270	250	750	1830	250
Ø200	950	0	345	950	235	250	950	635	250	950	1075	250	950	1635	250
Ø250	1080	0	305	1080	0	455	1080	540	305	1080	980	305	1080	1540	305
Ø320	1090	0	325	1090	0	475	1090	540	325	1090	980	325	1090	1540	325
Ø400	1075	0	370	1225	0	370	1225	390	370	1225	830	370	1225	1390	370
Ø500	1020	0	450	1170	0	450	1370	0	650	1370	630	450	1370	1190	450

*All dimensions are in mm

Table 46 - Central drive arrangements

DIMENSIONS & DETAILS

3.25. - GEAR BOX & MOTOR ACCESSORIES DETAILS

Wheel block size	Frame Size	Bolt	Nut & Spring Washer	Quantity	Torque arm mounting Rubber Bush -For pin & end connections
					Dimensions
112	63 & 71	M8 x 35	M8	4	OD - 30 , ID - 10.5,T- 15
	80	M10 x 40	M10	4	
125	71	M8 x 35	M8	4	OD - 30 , ID - 10.5,T- 15
	80 & 90	M10 x 40	M10	4	
160	71	M8 x 40	M8	4	OD - 30,ID - 10.5,T - 15
	80 & 90	M10 x 40	M10	4	
200	71	M8 x 45	M8	4	OD - 40,ID - 12.5,T - 20
	80 & 90	M10 x 45	M10	4	
250	80 & 90	M10 x 50	M10	4	OD - 40,ID - 12.5,T - 20
	100	M12 x 60	M12	4	
320	90	M10 x 60	M10	4	OD - 40,ID - 12.5,T - 20
	100 & 112	M12 x 60	M12	4	
400	90	M10 x 50	M10	4	OD - 60,ID - 21,T-30
	100, 112 & 132	M12 x 60	M12	4	
500	90	M10 x 50	M10	4	OD - 60,ID - 21,T-30
	100, 112 & 132	M12 x 60	M12	4	

Table 47 - Gearbox and motor accessories details

*All dimensions are in mm

OPTIONS AND ACCESORIES

OPTIONS AND ACCESORIES

4.0. - OPTIONS AND ACCESORIES

4.1. - GEARBOX MOUNTING FLANGE DIMENSIONS

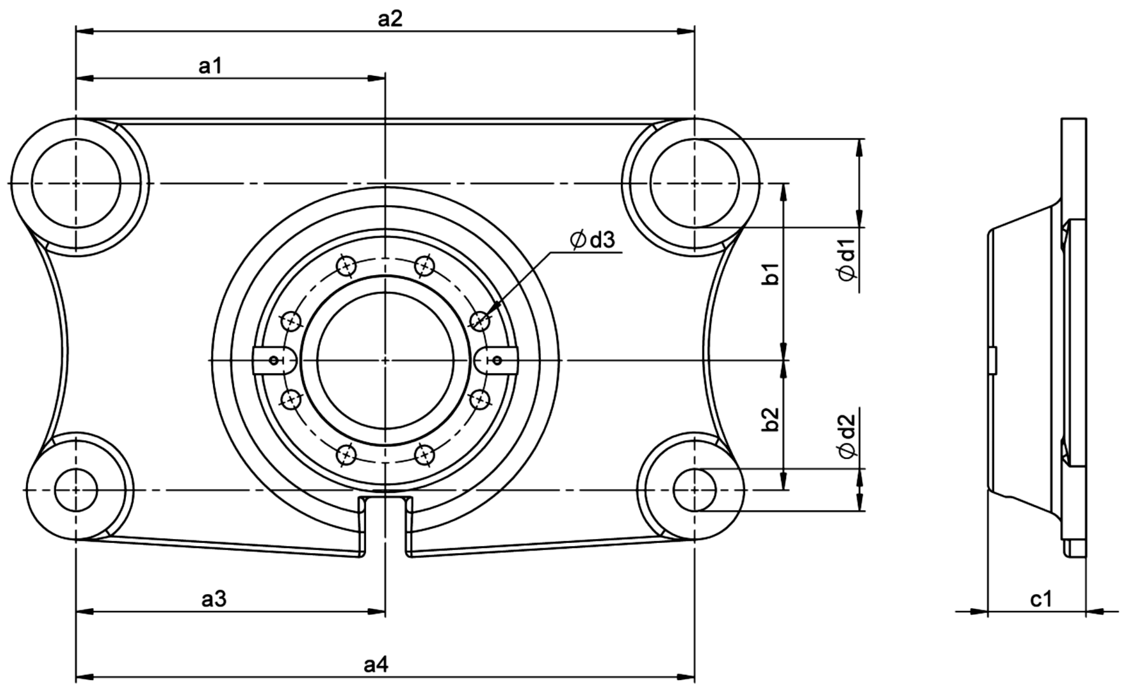


Fig 46 - Gearbox mounting flange

Wheel block size	a1 ±0.02	a2 ±0.02	a3	a4	b1 ±0.02	b2	c1	d1 F8	d2	d3
112	77.5	155	77.5	155	38	20	28	18	11	7
125	90	180	90	180	40.5	20.5	37	21	13	9
160	113	226	113	226	55	25	33	30	17	9
200	137.5	275	137.5	275	75	35	39	35	21	9
250	155.5	311	155.5	311	82	52	61.5	40	25	11
320	192	384	192	384	85	70	60	50	25	11
400	227	454	227	454	130	95	55.5	65	31	14
500	292.5	585	292.5	585	160	110	70	70	31	14

Table 48 - Gearbox mounting flange dimensions

*All dimensions are in mm

OPTIONS AND ACCESORIES

4.2. - WELDING FLANGE DIMENSIONS

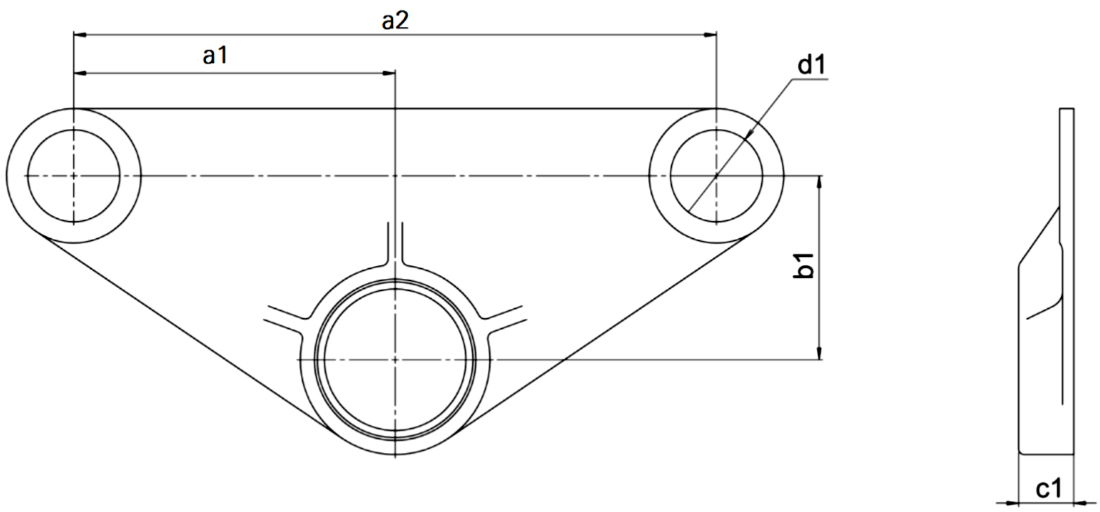


Fig 47 - Welding flange

Wheel block size	a1 ± 0.02	a2 ± 0.02	b1 ± 0.02	c1	d1
112	77.5	155	38	25	18
125	90	180	40.5	24	21
160	113	226	55	29	30
200	137.5	275	75	34	35
250	Not applicable				
320					
400					
500					

Table 49 - Welding flange dimensions

*All dimensions are in mm

OPTIONS AND ACCESORIES

4.3. - TORQUE ARM MOUNTING

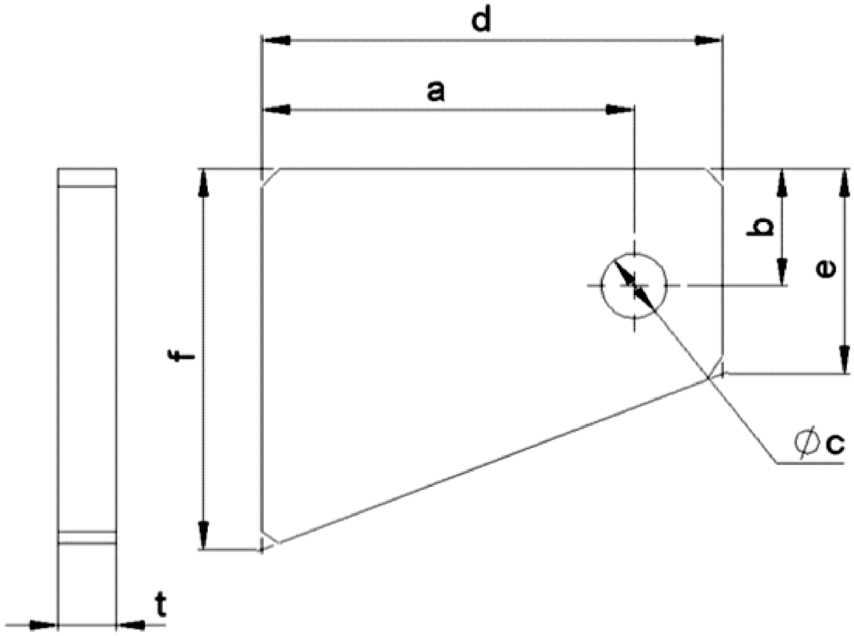


Fig 48 - Torque arm mounting

Torque arm dimensions							
Wheel block size	a	b	c	d	e	f	t
112	70	15	11	82	28	35	10
125	58	20	11	78	37	50	10
160	63	20	11	78	35	65	10
200	76	20	13	95	34.5	60	10
250	86.5	22	14	110	42	60	14
320	65	20	14	90	35	68	16
400	78	33	22	115	58	100	20
500	95	33	22	125	64.5	110	25

Table 50 - Torque arm dimensions

*All dimensions are in mm

OPTIONS AND ACCESORIES

4.4. - BUFFERS

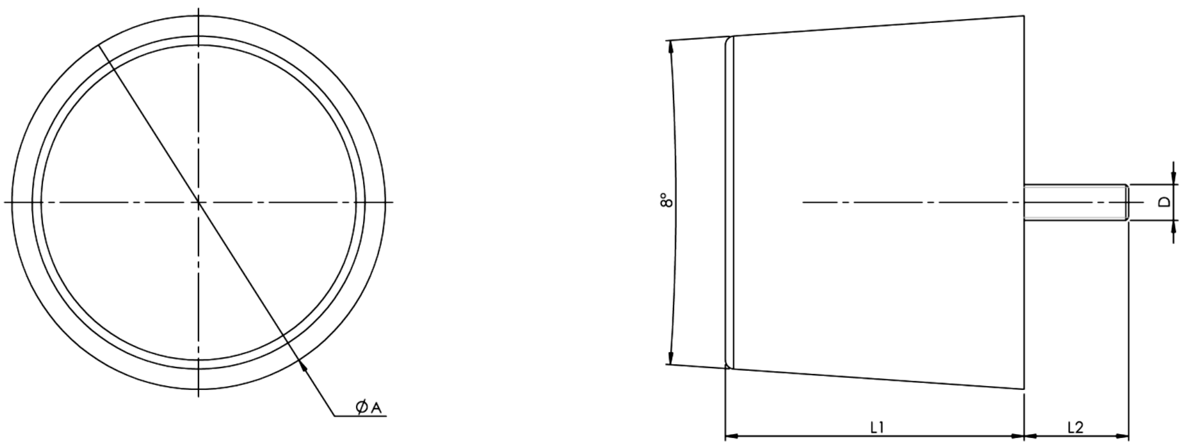


Fig 49 - Buffers

Code	Material	Diameter Ø A	Length L1	Length L2	D	Wheel Block Size
RB60	Rubber	60	60	12	M12	112, 125, 160
RB80		80	70			
RB100		100	85	35	M12	200, 250, 320, 400, 500
RB125		125	105			320, 400, 500
PU80	Polyurethane	80	80	12	M12	112, 125, 160
PU100		100	100	35	M12	200, 250, 320, 400, 500
PU125		125	120			320, 400, 500
PU160		160	160			320, 400 , 500
PU200		200	200			400, 500

Table 51 - Buffer dimensions

*All dimensions are in mm

OPTIONS AND ACCESORIES

4.5. - GREASE NIPPLE ARRANGEMENT

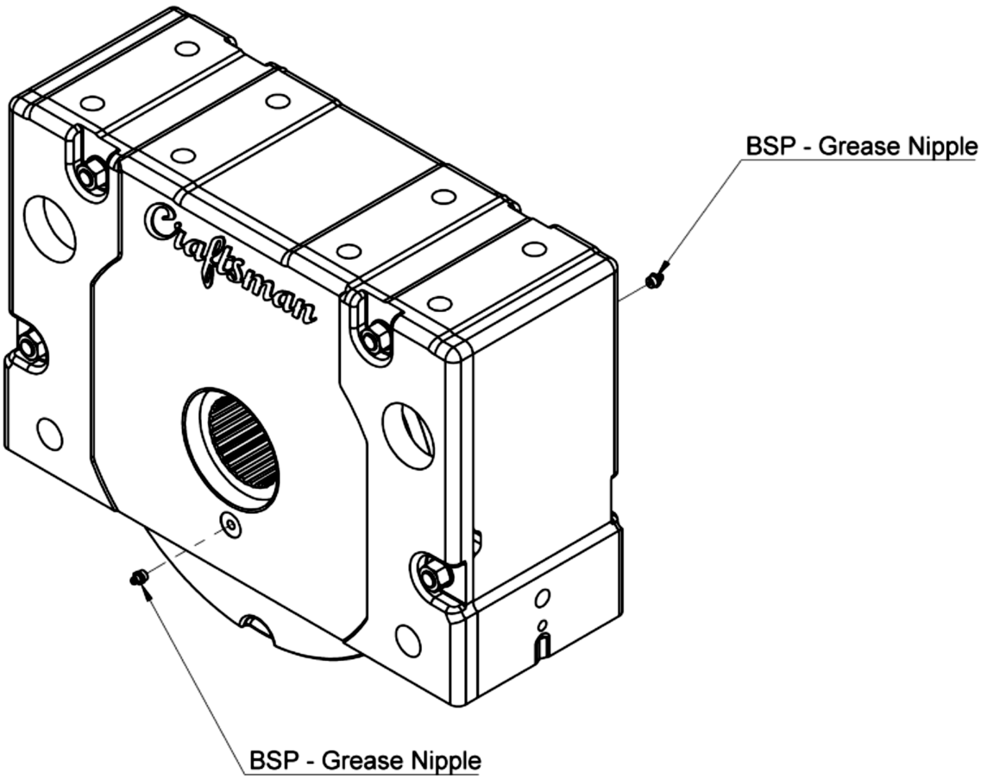


Fig 50 - Grease nipple arrangement in non drive assembly

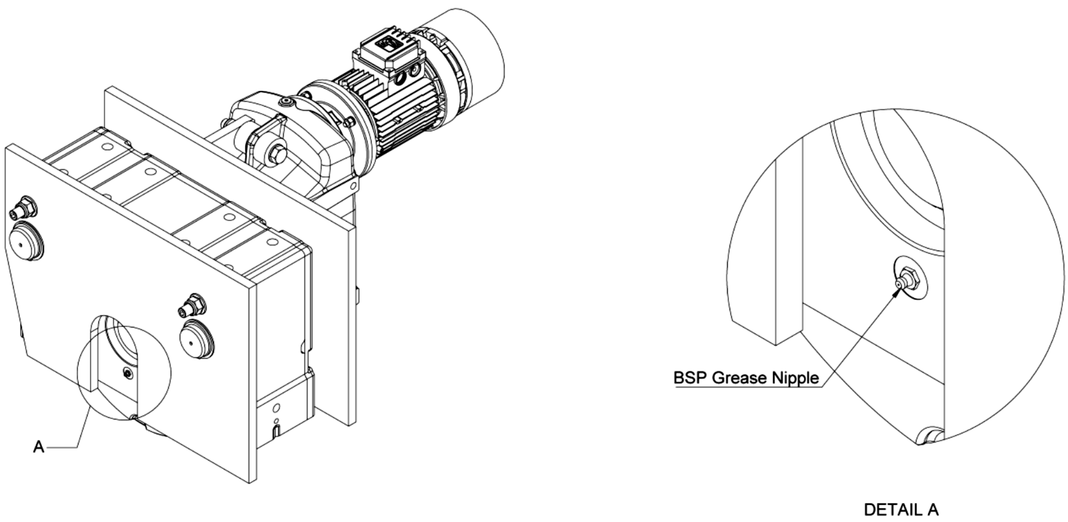
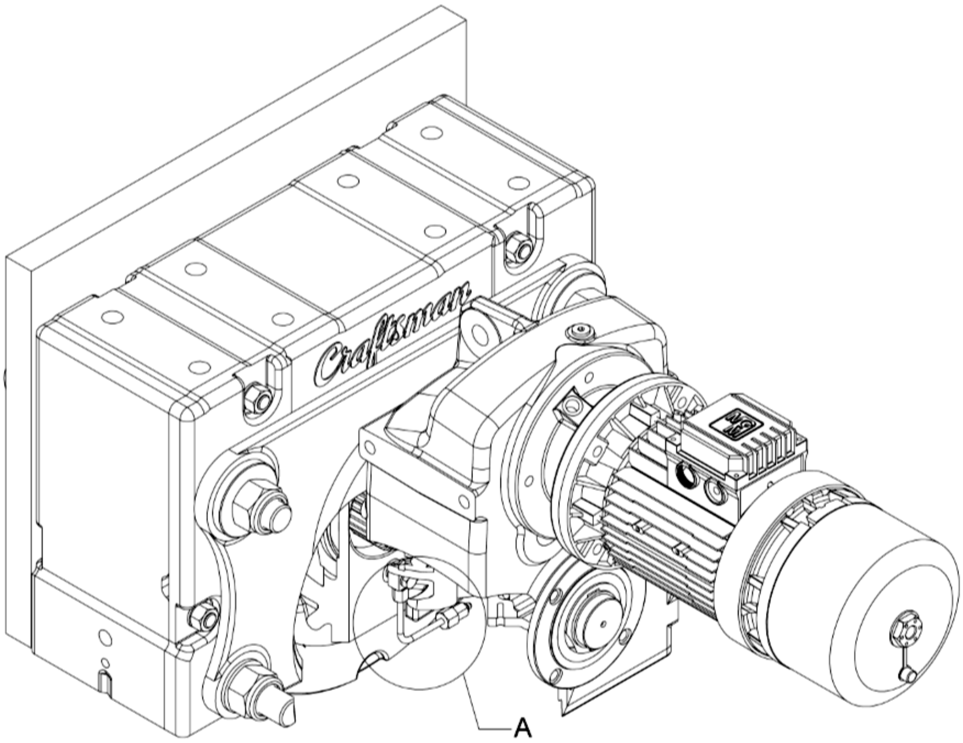


Fig 51 - Grease nipple arrangement in drive assembly

OPTIONS AND ACCESORIES

GREASE NIPPLE ARRANGEMENT



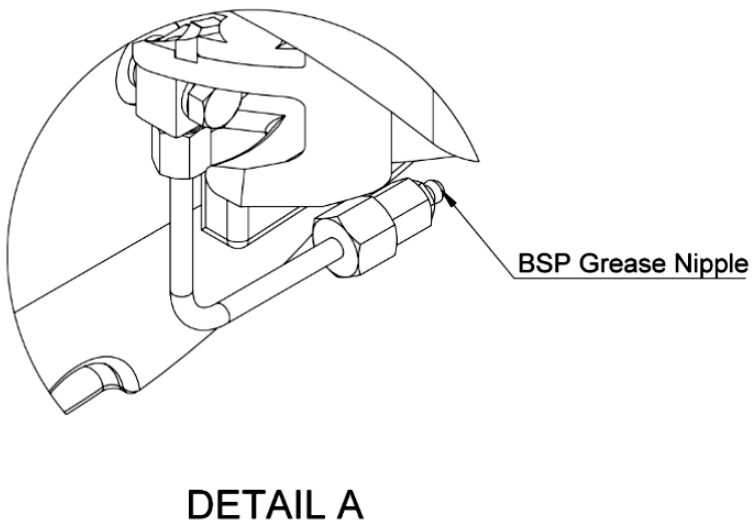


Fig 52 - Grease nipple arrangement in drive assembly

DESIGN DATA

DESIGN DATA

5.0. - DESIGN DATA

5.1 SYMBOLS & UNITS

c1	-	Speed coefficient Values	Values in accordance with table 54 and 57
c2	-	Operating time coefficient Values	in accordance with table 55
D	mm	Travelling wheel diameter	Running surface diameter
n	min^{-1}	Speed of crane wheel	Values acc. to table 57
p	N/mm^2	Pressure	
PL	N/mm^2	Permissible pressure between crane wheel and rail	Values acc. to table 53
b	mm	Rail head width	
r	mm	Radius of curvature of rail head	
b-2r	mm	Ideal effective rail head width	Values for crane rails in accordance with table 56
V	m/min	Speed of crane wheel	
P_{max}	N	Maximum wheel load resulting from load combinations A,B or C	According to ISO 8686-1 to ISO 8686-5
P_{min}	N	Minimum wheel load resulting from load combinations A,B or C	According to ISO 8686-1 to ISO 8686-5
P_{mean}	N	Higher mean load value considering both load combinations A and B	$= P_{min}$ A,B $+2P_{max}$, A,B / 3

Table 52 - Symbols and units

5.1.1 PERMISSIBLE PRESSURE & MATERIAL COEFFICIENTS

Ultimate strength of metal used for rail wheel in N/mm^2	PL in N/mm^2	Minimum ultimate strength for rail in N/mm^2
>500	5,00	350
>600	5,60	350
>700	6,50	510
>800	7,20	510
>900	7,80	600
>1000	8,50	700

Table 53 - Permissible Pressure PL for Wheel material

DESIGN DATA

5.1.2. - SPEED & OPERATING TIME COEFFICIENTS

Wheel size	c1 for v in m/min										
	10	12.5	16	20	25	31.5	40	50	63	80	100
112	1.02	0.99	0.96	0.92	0.89	0.84	0.79	0.75	0.69	-	-
125	1.03	1.00	0.97	0.94	0.91	0.87	0.82	0.77	0.72	0.66	-
160	1.06	1.03	1.00	0.97	0.94	0.91	0.87	0.82	0.77	0.72	0.66
200	1.09	1.06	1.03	1.00	0.97	0.94	0.91	0.87	0.82	0.77	0.72
250	1.11	1.09	1.06	1.03	1.00	0.97	0.94	0.91	0.87	0.82	0.77
320	1.13	1.11	1.09	1.06	1.03	1.00	0.97	0.94	0.91	0.87	0.82
400	1.14	1.13	1.11	1.09	1.06	1.03	1.00	0.97	0.94	0.91	0.87
500	1.15	1.14	1.13	1.11	1.09	1.06	1.03	1.00	0.97	0.94	0.91

Table 54 - Speed coefficient c1

Operating time of traveling gear (referred to 1 hour)	c2
Up to 16%	1.25
Between 16 to 25 %	1.12
Between 25 to 40 %	1.00
Between 40 to 63 %	0.9
Above 63%	0.8

Table 55 - Operating time coefficient c2

Rails as per DIN	Designation New	Designation Previous	r mm	k-2r mm
536-1	A 45	KS 22	4	37
	A 55	KS 32	5	45
	A 65	KS 43	6	53
	A 75	KS 56	8	59
	A 100	KS 75	10	80
	A 120	KS 101	10	100
536-2	F100		10	80
	F120		10	100

Table 56 - Ideal effective rail head width (k-2r)

Wheel speed n from speed coefficient c1	
c1	n=[min-1]
0.66	200
0.72	160
0.77	125
0.79	112
0.82	100
0.84	90
0.87	80
0.89	71
0.91	63
0.92	56
0.94	50
0.96	45
0.97	40
0.99	35.5
1.00	31.5
1.02	28
1.03	25
1.04	22.4
1.06	20
1.07	18
1.09	16
1.10	14
1.11	12.5
1.12	11.2
1.13	10
1.14	8
1.15	6.3
1.16	5.6
1.17	5

Table 57

DESIGN DATA

5.2. - DETERMINING THE WHEEL LOADS

To determine the size of a rail wheel, the following checks shall be made:

a) verify that the wheel is capable of withstanding the maximum load to which it will be subjected;
b) verify that the wheel will allow the appliance to perform its normal duty without abnormal wear.

These verifications are made by means of the following two equations:

$$\frac{P_{max}}{b \times D} \leq 1.9P_L \qquad P_{mean} = \frac{P_{min, A, B} + 2P_{max, A, B}}{3}$$

$$\frac{P_{mean}}{b \times D} \leq P_L \times C_1 \times C_2 \qquad b = l - 2r$$

The mean wheel load takes into account variations of the wheel loading, including, where applicable, positional changes of the handled load in relation to the supporting wheels during a working cycle. Refer P_{mean}, gives an approximate value of the resultant cubic mean loading. When the work process is well known, the cubic mean load can be calculated more accurately using the wheel loads resulting from the actual positions of the handled load. In this calculation, the maximum lifted load shall be used, coefficient c2 taking into account the variation of the load.

In order to determine the mean loads, the procedure is to consider the maximum and minimum loads withstood by the wheel in the loading cases considered, i.e. with the appliance in normal duty but omitting the dynamic coefficients when determining P_{mean}. The values of P_{mean} are determined by the formula shown above in the load combinations A and B.

For rails having a flat or slightly convex bearing surface, of total width, l, with rounded corners of radius, r, at each side, the useful width, b, shall be calculated using Equation b = l – 2r.

For detailed calculations, Please refer ISO 16881-1 and for load combinations please refer ISO8686-1 to 5.

5.2.1. - FULL LOAD HOURS BASED ON THE GROUP OF MECHANISMS

Group of mechanisms	PL in N/mm^2	Calculated total running time (in 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

Table 58 - Full load hours based on mechanisms

DESIGN DATA

5.3. - DETERMINING THE GROUP OF MECHANISMS

The group of mechanisms is determined by the following factors

- Operating time class
- Load cycle range
- Load spectrum

5.3.1. - DETERMINING THE MECHANISMS ACCORDING TO DUTY

OPERATING TIME CLASS

Below table refers to based on the average daily operating hours, operating time class can be defined.

Operating time class	Average daily operating time in hours
T 0	≤ 0.12
T 1	≤ 0.25
T 2	≤ 0.5
T 3	≤ 1
T 4	≤ 2
T 5	≤ 4
T 6	≤ 8
T 7	≤ 16
T 8	> 16

Table 59 - Operating time class

DESIGN DATA

LOAD SPECTRUM

The applicable load spectrum of a travel mechanisms is defined by the ratio of each partial load to the maximum load.

For the classification into groups the cubic mean value k_{F1} referred to the total weight of the storage and retrieval machine is required.

$$k = \sqrt[3]{(\beta_1 + \gamma)^3 x t_1 + (\beta_2 + \gamma)^3 x t_2 + \cdots + \gamma^3 t_\Delta}$$

$$\beta_{i=1,2,..n} = \frac{\text{Effect of pay or partial load}}{\text{Effect of permissible load}}$$

$$\gamma = \frac{\text{Effect of dead load}}{\text{Effect of permissible load}}$$

$$t_{i=1,2,..n} = \frac{\text{Operating time under pay load or partial load}}{\text{Total operating time}}$$

$$t_\Delta = \frac{\text{Operating time under deadload only}}{\text{Total operating time}}$$

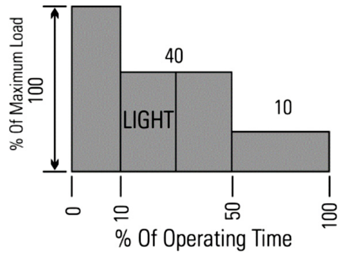
k = Average cubic value

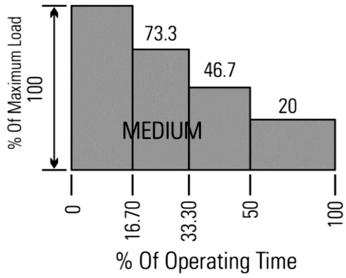
DESIGN DATA

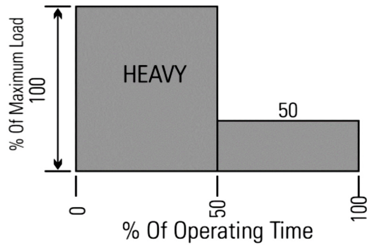
LOAD SPECTRUM

The load spectrum categories into four group with respect to cubic average value, shown below.

Load spectrum		Definitions
L1	Light<0.50	Mechanisms or part of thereof, usually subject to very small loads and in exceptional cases only to maximum loads.
L2	Medium 0.50<k<0.63	Mechanisms or part of thereof, usually subject to small loads but rather often to maximum loads.
L3	Heavy 0.63<k<0.80	Mechanisms or part of thereof, usually subject to medium loads but frequently to maximum loads.
L4	Very Heavy 0.80<k ≤1.00	Mechanisms or part of thereof, usually subject to maximum load most maximum loads.







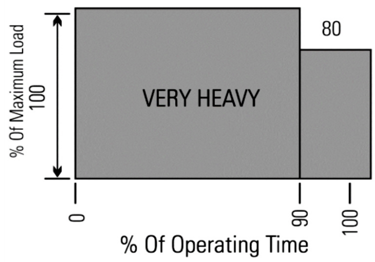


Table 60 - Load spectrum with chart

DESIGN DATA

5.3.2. - DETERMINING BASED ON THE GROUP OF MECHANISMS

The load spectrum categories into four group with respect to cubic average value, shown below.

Operating time class								
T0	T1	T2	T3	T4	T5	T6	T7	T8
V 0.06	V 0.12	V 0.25	V 0.5	V 1	V 2	V 3	V 4	V 5

Classification								
ISO	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8
FEM	1 DM	1 CM	1 BM	1 AM	2 M	3 M	4 M	5 M

Load spectrum	Average cubic value	Operating time class								
		T0	T1	T2	T3	T4	T5	T6	T7	T8
		Average operating period per day in hours								
		<=0.12	<=0.25	<=0.5	<=1	<=2	<=4	<=8	<=16	>16
L1	Light<0.50	-	-	M 1	M 2	M 3	M 4	M 5	M 6	M 7
L2	Medium 0.50<k<0.63	-	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8
L3	Heavy 0.63<k<0.80	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	-
L4	Very Heavy 0.80<k ≤1.00	M 2	M 3	M 4	M 5	M 6	M 7	M 8	-	-

Table 61 - Determining group of mechanisms

5.3.3. - MAXIMUM WHEEL LOADS

Wheel block size	Maximum load in kg
112	3500
125	5000
160	7000
200	10000
250	16000
320	21000
400	30000
500	40000

Table 62 - Maximum wheel loads

DESIGN DATA

5.4. - MOTOR POWER SELECTION

In order to select travel motors correctly, all the necessary torque (or power) values must be considered, taking into account the staring time, the number of starting cycles per hour and the cyclic duration factor. The maximum transmissible torque of the travel motors is limited by the adhesion of the driven travel wheels on their tracks.

DETERMINING THE NECESSARY TORQUE

Speed maintaining torque

To determine the torque necessary for maintaining the speed, account has to be taken of the sum of forces (w) resisting to travel resulting from the dead-weight, the load and operating conditions such as:

- deformation of the running surface,
- friction of the wheels on straight sections and in curves,
- wind force,
- gradients in the track,
- necessary traction of power supply cable.

Accelerating torque (running up to speed)

The acceleration torque shall take into account the sum of acceleration forces of the mass of lifted load and of the other masses put into the motion. The recommended acceleration values are given in table below.

Speed to be reached m/s	(a) Low and moderate speed with long travel		(b) moderate and high speed (normal applications)		(c) high speed with high accelerations	
	Acceleration time s	Acceleration m/s^2	Acceleration time s	Acceleration m/s^2	Acceleration time s	Acceleration m/s^2
4			8	0.5	6	0.67
3.15			7.1	0.44	5.4	0.58
2.5			6.3	0.39	4.8	0.52
2	9.1	0.22	5.6	0.35	4.2	0.47
1.6	8.3	0.19	5	0.32	3.7	0.43
1	6.6	0.15	4	0.25	3	0.33
0.63	5.2	0.12	3.2	0.19		
0.4	4.1	0.098	2.5	0.16		
0.25	3.2	0.078				
0.16	2.5	0.064				

Table 63 - Acceleration time and acceleration value

DESIGN DATA

MOTOR POWER SELECTION CALCULATION

$$\text{Power} = \frac{M \times V \times S \times Cdf}{6117 \times T} \times \left(F + \frac{1100 \times a}{981 \times N}\right) \text{ kw}$$

where:

M Mass of maximum rated Load in Tons

V Specified free running Speed M/Min.

N Mechanical Efficiency of gearing.
For Spur Gear and Helical Gears, Efficiency to be taken as 0.95 per reduction.
For hardened and ground gears Efficiency to be taken as 0.985 per reduction

T Factor introduced by the permissible motor torque during acceleration exceeding the motor-rated torque. As a general Guidance Value of T may be taken as 1.7 for Motors having pull out torque of 275 percent full load torque, Lower values of T should be taken for corresponding pull out Torque.
= 1.3 for dc motors pullout torque x 100
= 1.6 for ac motors 160 x full load torque

F Overall Friction Factor (kgf)
= 8 kgf per tonne for Wheel on anti-friction Bearing
= 13 kgf per tonne for Wheel on Plain Bearing

Cdf Duty Factor as Defined in 7.4.3 (According to Table-2 Pg.No.7 - IS 3177)

a Average linear acceleration of the Crane of the Trolley in cm/s^2 Till the Mechanisms reaches 90 percent of free running speed. For the value of average linear Acceleration refer as Give Table 21A (Pg. No. 54 - IS 3177)

S Service factor aimed at providing adequate motor heat dissipation capacity as given in Table 21B (Pg. No. 54 - IS 3177)

The largest of the values from the results of the following formula shall be taken into account.
Calculations taken from IS:3177.

CYCLIC DURATION FACTOR AND NUMBER OF CYCLES PER HOUR

In the case where no precise indications are given, the values mentioned in below table can be chosen.

ROTATION

The calculation is carried out in an analogous fashion to determining the necessary torque, angular speeds being substituted for the linear speeds.

DESIGN DATA

Type of appliance		Particulars concerning nature of use (1)	Number of cy cles per hour	Type of mechanisms ED%		
Reference	Designation			Rotation	Crab	Travel
1	Hand-operated appliances					
2	Erection cranes		2-25	25	25-40	25-40
3	Erection and dismantling cranes for power stations, machine shops,etc		2-15		25	25
4	Stocking and reclaiming trans-porters	Hook duty	25 - 60	15 - 40	40 - 60	25 - 40
5	Stocking and reclaiming trans-porters	Grab or magnet	25 - 60	40	60	15 - 40
6	Workshop cranes		10-50		25-40	25 - 40
7	Overhead travelling cranes, pig breaking cranes, scrapyard cranes	Grab or magnet	40 - 120		40 - 60	60 - 100
8	Ladle cranes		3 - 10		40 - 60	40 - 60
9	Soaking - pit cranes		30 - 60	40	40 - 60	40 - 60
10	Stripper cranes, open - hearth furnace - charging cranes		30 10		40 40	60 40
11	Forge cranes		6	100	25	25
12 - a 12 - b	Bridge cranes for unloading, bridge cranes for containers Other bridge cranes (with crab and/or slewing jib crane)	a - Hook or spreader duty b - Hook duty	20 - 60 20 - 60	15 - 40 25 - 40	40 - 60 40 - 60	15 - 40 25 - 40
13	Bridge cranes for unloading, bridge cranes (with crab and/or slewing jib crane)	Grab or magnet	20 - 80	40	40 - 100	15 - 60
14	Dry dock cranes, shipyard jib cranes, jib cranes for dismantling	Hook duty	20 - 50	25	40	25 - 40
15	Dockside cranes (Slewing, on gantry , etc.), floating cranes and pontoon derricks	Hook duty	40 20	25 - 40	40	15 - 25
16	Dockside cranes (Slewing, on gantry , etc.), floating cranes and pontoon derricks	Grab or magnet	25 - 60	40 - 60		25 - 40
17	Floating cranes and pontoon derricks for very heavy loads (usually greater than 100 t)		2 - 10	15 - 40		
18	Deck cranes	Hook duty	30 - 60	40		
19	Deck cranes	Grab or magnet	30 - 80	60		
20	Tower cranes		20	40 - 60	25	15 – 40
21	Derricks		10	25		
22	Railway cranes allowed to run in train		10	25		

(1) This column comprises only some indicatory typical cases of utilisation

Table 64 - Indications for the number of cycles per hour and the cyclic duration factor for the horizontal motion

DESIGN DATA

5.5. - MOTOR POWER SELECTION FOR OTHER APPLICATIONS

Resistance to motion (F)	=	$w \times g \times \left(\frac{2}{D} \times (\mu \times \frac{d}{2} + f) + e\right)$ in N
Total mass to be moved	=	w in Kg
Acceleration due to gravity	=	g = 9.81m/s^2
Diameter of wheel	=	D in mm
Factors of Bearing Friction	=	μ
Diameter of drive shaft	=	d in mm
Lever Arm of Rolling Friction	=	f
say steel on steel	=	f = 0.5 mm
Friction factor like wheel flange friction etc	=	c
Output power (P)	=	$\frac{m \times a \times v}{\eta} + \frac{F \times v}{\eta}$ in W
Total mass	=	m in kg
Acceleration	=	a in m/s^2
Velocity	=	v in m/s
Resistance to motion	=	F in N
Efficiency	=	η

DESIGN DATA

5.6. - BUFFER SELECTION

The case must be considered when the impact due to collision with buffers is applied to the structure, and the case when it is applied to the suspended load. The buffer should be selected to absorb the kinetic energy of the appliance at a fraction of rated speed Vt fixed at 0.7 Vt.

A reduction factor of 0.85 should be considered when the crane is operating without limit switches and 0.7 when operating with limit switches. And the cut off reduction factor will be at least 0.4.

DETERMINATION OF CRANE BUFFER

Actual mass of Impact :

$$M_{imp} = \frac{M_{crn}}{2} + M_{tr} \times \frac{L_{cs} - L_{ha}}{L_{cs}} \text{ kg}$$

Permissible mass of Impact :

$$M_{perm} = \frac{2 \times E_{perm}}{V_{imp}2} \text{ kg}$$

Impact Speed :

$$V_{imp} = \frac{V1 \times K}{60} \text{ m/s}$$

Where:

Actual mass of Impact in Kg	=	M imp
Permissible mass of Impact in Kg	=	M perm
Weight of crane in kg	=	M crn
Weight of trolley / Crab in kg	=	M tr
Weight of Working Loadin kg	=	M wll
Permissible buffer Energy in Nm	=	E perm
Reduction Factor	=	K
Crane Span in m	=	L cs
Hook approach of Trolley in m	=	L ha
Travel Speed in m/min	=	V1
Impact Speed in m/s	=	V imp

DESIGN DATA

BUFFER SELECTION TABLE

						Max travel Speed V1 in m/min									
Without Limit Switches				K = 0.85		10	12.5	16	20	25	32	40	50	63	80
With Limit Switches				K = 0.7		12.5	16	20	25	32	40	50	63	80	100
With final cut off				K = 0.4		20	25	32	40	50	63	80	100	125	160
Code	Material	ØA	Length L1	E perm		Permissible mass of impact M perm in [kg] for max. impact speed V imp in [m/s]									
		mm	mm	Nm	V imp m/s	0.15	0.19	0.23	0.29	0.37	0.47	0.58	0.74	0.93	1.17
RB 60	Rubber	60	60	250	M imp	23510	14340	9180	5870	3580	2290	1460	910	570	360
RB 80		80	70	400		37600	22950	14690	9400	5730	3670	2350	1470	910	580
RB 100		100	85	1000		94030	57390	36730	23500	14340	9180	5870	3700	2290	1460
RB 125		125	105	1600		150450	91820	58760	37610	22950	14680	9390	5910	3660	2340
PU 80	Poly-urethane	80	80	400		37600	22950	14690	9400	5730	3670	2350	1470	910	580
PU 100		100	100	800		75220	45910	29380	18800	11470	7330	4690	2950	1830	1170
PU 125		125	120	1500		141050	86080	55100	35250	21510	13760	8800	5540	3430	2200
PU 160		160	160	3300		310320	189400	121210	77570	47340	30300	19380	12200	7570	4830
PU 200		200	200	6400		601850	367330	235100	150450	91820	58760	37600	23680	14680	9390

Table 65 - Buffer selection Table

After calculating the Actual mass of Impact in Kg, we need to select the buffer from the above Table considering reduction factor and speed. For example if the speed is 20 m / min and Actual mass of Impact M imp is 15000 kg, then from table with Limit switches the buffer

RB 100 or PU 100 can be selected .

DESIGN DATA

5.7. - WHEEL BLOCK SELECTION - SAMPLE CALCULATION

Inputs for design			
1	Payload capacity of hoist - (SWL) in (Kg)	M_{wll}	10000
2	Weight of hoist and trolley in (Kg)	M_{tr}	950
3	Weight of crane girder in (Kg)	M_{crn}	4000
4	Span of crane in (m)	L_{cs}	15
5	Minimum hook approach from CG of trolley to centre of End Carriage in (m)	L_{ha}	0.7
6	Number of LT wheels	N	4
7	Speed of travel in (m / min)	V_s	20
8	Rail material	R_m	St 60-2/E 335
9	Effective Rail Width in mm	R_{eff}	50
10	Operating temperature		-20 °C up to +50°C
Calculation of classification of mechanisms for travelling			
11	Operation Cycle time in s (Includes time to load, travel, unload and return of hoist carriage)	T_{cy}	120 sec
12	Average travel path / cycle in (m)	AT_p	10
13	Daily working hr/day in (Hrs)	D_w	12
14	Average travel speed (m/min)	AT_s	20
15	No. cycles / hr in Nos	C_n	23

i. Average daily operating time (t) hr/day = $\frac{2 \times AT_p \times C_n \times D_w}{AT_s \times 60}$ = 4.6 hr/day

ii. Load spectrum

$$k = \sqrt[3]{(\beta_1 + \gamma)^3 x t_1 + (\beta_2 + \gamma)^3 x t_2 + \cdots + \gamma^3 t_\Delta}$$

Load spectrum can be selected using above formula or by Load spectrum chart from page 94.

DESIGN DATA

WHEEL BLOCK SELECTION - SAMPLE CALCULATION

$$\beta_{i=1,2,..n} = \frac{\text{Effect of pay or partial load}}{\text{Effect of permissible load}}$$

$$\gamma = \frac{\text{Effect of dead load}}{\text{Effect of permissible load}}$$

$$t_{i=1,2,..n} = \frac{\text{Operating time under pay load or partial load}}{\text{Total operating time}}$$

$$t_{\Delta} = \frac{\text{Operating time under deadload only}}{\text{Total operating time}}$$

k = Average cubic value

For example if we take k = 0.44

Classification of Mechanisms :

Average operating time (hr/ day)	Total Duration of Use (hr)	Class of operating time	Class of Load Spectrum			
			L_1 (Light)	L_2 (Medium)	L_3 (Heavy)	L_4 (Very Heavy)
			$K \leq 0.5$	$0.5<K \leq 0.63$	$0.63<K \leq 0.8$	$0.8<K \leq 1$
under 0:15	400 hr	V 0.12	-	M1	M2	M3
from 0:15 to 0:30	800 hr	V 0.25	M1	M2	M3	M4
from 0:30 to 1:00	1 600 hr	V 0.50	M2	M3	M4	M5
from 1:00 to 2:00	3 200 hr	V 1	M3	M4	M5	M6
from 2:00 to 4:00	6 300 hr	V 2	M4	M5	M6	M7
from 4:00 to 8:00	12 500 hr	V 3	M5	M6	M7	M8
from 8:00 to 16:00	25 000 hr	V 4	M6	M7	M8	-
above 16:00	50 000 hr	V 5	M7	M8	-	-

DESIGN DATA

Result :

Hence, by applying the Classes of operating time and load spectrum, the classification of mechanisms.

Average operating time (t) = 4.6 (hr/day)

Class of operating time : V2

Average cubic value (k) = 0.44

Class of Load Spectrum = L1 (Light)

Classification of mechanisms : M5

Kindly note in the below example, factors of dynamic effects are not considered. But during actual calculation it must be accounted and load cases should be according to ISO 8686-1 to 5.

Check for wheel load :

$$P_{max} = \frac{M_{crn}}{4} + \frac{(M_{wll} + M_{tr})}{2} \times \frac{(L_{cs} - L_{ha})}{L_{cs}} \text{ kg} = 6219.5 \text{ Kg}$$

Max. vertical load on each wheel P max = 6219.5 Kg

$$P_{min} = \frac{M_{crn}}{4} + \frac{(M_{wll} + M_{tr})}{2} \times \frac{L_{ha}}{L_{cs}} \text{ kg} = 1255.5 \text{ Kg}$$

Min. vertical load on each wheel P_{min} = 1255.5 Kg

Average vertical load on each wheel (P_{mean}) = ((2 x P_{max}) + P_{min})/3 = 4564.8 Kg

Average vertical load on each wheel P_{mean} = 4564.8 Kg

Initially for sizing of wheel block diameter, use the below table. Consider the maximum wheel load which is 6219.5kg and from table, suitable wheel block will be Ø160. Kindly note the maximum load carrying capacity of wheel should be always greater than the maximum load on wheel.

Guide Line for Wheel selection								
Wheel block size in mm	112	125	160	200	250	320	400	500
Max wheel load in Kg	3500	5000	7000	10000	16000	21000	30000	40000

Note : P_{mean} is the Average wheel load used to choose the right wheel from the Wheel Load Chart of each wheels. The wheels must be care fully selected, considering the FEM duty of the crane, Permissible load carrying capacity of wheel, speed of travel, rail size and rail material.

DESIGN DATA

Wheel load charts are added in page no : 35 - 42

Fem duty cycle of hoist fem : M5

Travel speed of the crane Vs : 20 m/min

Effective rail width : 50 mm

Refer Page no. 32 for Wheel and Rail width Selection.

It will clearly explain possible different Rail sizes for the selected wheel block. Also the effective Rail width should be calculated and taken to wheel block selection. Other important factor are operating temperature and Rail material reduction factor.

After selection of load carrying capacity, we need to reduce the capacity by carefully considering the operating temperature and rail material.

Selected Wheel Size : 160 mm

Permissible Load carrying capacity of the wheel (from Page No. 37) : 5044 Kg

Temperature Co-efficient : 1

Raw material Co-efficient : 1

Maximum average wheel load is : 4564.8 < 5044kg

Hence, Wheel block is adequately dimensioned and selected.

DESIGN DATA

5.8. - MOTOR POWER SELECTION FOR CRANE APPLICATIONS - SAMPLE CALCULATION

$$\text{Power} = \frac{M \times V \times S \times C_{df}}{6117 \times T} \times \left(F + \frac{1100 \times a}{981 \times N}\right) \text{ kw}$$

Where :			
Mass of maximum rated Load	M	15	Ton
Specified free running Speed	V	20	m/min
Mechanical Efficiency of gearing.	N	0.95	
Factor introduced by the permissible motor torque during acceleration	T	1.7	
Overall Friction Factor	F	8	kgf
Duty Factor	C_{df}	1.25	
Average linear acceleration of the Crane of the Trolley	a	16	cm/S^2
Service factor aimed at providing adequate motor	S	1	

$$\text{Power} = \frac{15 \times 20 \times 1 \times 1.25}{6117 \times 1.7} \times \left(8 + \frac{1100 \times 16}{981 \times 0.95}\right) \text{ kw}$$

Power = 0.97 kw (at 20 m/min) Total Power

If Speed changed to 5m/min then

$$\text{Power} = \frac{15 \times 5 \times 1 \times 1.25}{6117 \times 1.7} \times \left(8 + \frac{1100 \times 16}{981 \times 0.95}\right) \text{ kw}$$

Power = 0.24 kw (at 5 m/min) Total Power

Hence, Drive & gearbox can be selected from the section 3.15 to 3.22 (Pg. No. 60 to 67) based on the calculated power and wheel diameter respectively. If two drive motors are used, the power can be halved.

DESIGN DATA

5.9. - BUFFER SELECTION — SAMPLE CALCULATION

Actual mass of Impact :

$$M_{imp} = \frac{M_{crn}}{2} + M_{tr} \times \frac{L_{cs} - L_{ha}}{L_{cs}} \text{ kg}$$

Permissible mass of Impact :

$$M_{perm} = \frac{2 \times E_{perm}}{V_{imp2}} \text{ kg}$$

Impact Speed :

$$V_{imp} = \frac{V1 \times K}{60} \text{ m/s}$$

Where :			
Weight of crane	M_{crn}	5000	kg
Weight of trolley / Crab	M_{tr}	500	kg
Weight of Working Load	M_{wll}	3000	kg
Permissible buffer Energy	E_{perm}	400	Nm
Reduction Factor (with Limit Switches)	K	0.70	
Crane Span	L_{CS}	12	m
Hook approach of Trolley	L_{ha}	1.2	m
Travel Speed	V_1	40	m/min

$$V_{imp} = \frac{40 \times 0.70}{60} \text{ m/s}$$

V_{imp} = 0.466 m/s ~ 0.47 m/s

Reduction Factor (k) is taken from Table 65 (Pg. No 101) - without limit switches k=0.85, with limit switches k=0.7and with pre and final cut off k=0.4.

DESIGN DATA

$$M_{perm} = \frac{2 \times 400}{0.47^{2}} \text{ kg}$$

$$M_{perm} = 3621.5 \text{ kg} \sim 3600 \text{ kg}$$

$$M_{imp} = \frac{5000}{2} + 500 \times \frac{12 - 1.2}{12} \text{ kg}$$

$$M_{imp} = 2700 \text{ kg}$$

After calculating Actual mass of Impact we need to select Buffer from Table : 65 (Pg. No 101) by comparing the Mimp. For Example the Travel Speed V1 = 40 m/min and Reduction Factor K = 0.70 (with Limit Switches) Mimp is checked with the table RB 80 or PU 80 can be used.

Sample:

						Max travel Speed V1 in m/min									
Without Limit Switches				K = 0.85		10	12.5	16	20	25	32	40	50	63	80
With Limit Switches				K = 0.7		12.5	16	20	25	32	40	50	63	80	100
With final cut off				K = 0.4		20	25	32	40	50	63	80	100	125	160
Code	Material	ØA	Length L1	E perm		Permissible mass of impact M perm in [kg] for max. impact speed V imp in [m/s]									
		mm	mm	Nm	V imp m/s	0.15	0.19	0.23	0.29	0.37	0.47	0.58	0.74	0.93	1.17
RB 60	Rubber	60	60	250	M imp	23510	14340	9180	5870	3580	2290	1460	910	570	360
RB 80		80	70	400		37600	22950	14690	9400	5730	3670	2350	1470	910	580
RB 100		100	85	1000		94030	57390	36730	23500	14340	9180	5870	3700	2290	1460
RB 125		125	105	1600		150450	91820	58760	37610	22950	14680	9390	5910	3660	2340
PU 80	Poly-urethane	80	80	400		37600	22950	14690	9400	5730	3670	2350	1470	910	580
PU 100		100	100	800		75220	45910	29380	18800	11470	7330	4690	2950	1830	1170
PU 125		125	120	1500		141050	86080	55100	35250	21510	13760	8800	5540	3430	2200
PU 160		160	160	3300		310320	189400	121210	77570	47340	30300	19380	12200	7570	4830
PU 200		200	200	6400		601850	367330	235100	150450	91820	58760	37600	23680	14680	9390

6.0 APPENDIX

6.1 ENQUIRY SHEET FOR WHEEL BLOCK

Company : ____ Enquiry No : ___________________
Address : ____ Department : ___________________
Phone : ____ Person-in-charge: ___________________
E-Mail : ____ Designation : ___________________

WHEEL BLOCK APPLICATION DETAILS

Max. Wheel Load (including imp factor) : _______ kg (App.) Min. Wheel Load (including imp factor) : _______kg (App.)
Safe Working Load : ____________kg No of Cycles/Hour : ________ (1 Forward & 1 Backward = 1 Cycle)
Max. Travel speed : ____________m/min Creep Travel speed : ____________m/min
Avg. Travel Speed : ____________m/min Bay Length : ____________m
Avg. Travel path/Cycle : ____________m Travel rail type : Flat rail / Crane Rail
No of Working Hours/Day: ____________ hrs Rail width : _____________
Operating Temperature : ____________°C Rail Material : _____________

Deadweight of Structure : ____________kg Weight of Trolley : _____________kg
Operation : Indoor / Outdoor Wind force : _____________N/m^2 (If outdoor)

TYPE OF APPLICATION

☐ Crane ☐ Crab Hoist ☐ Other Use

USAGE APPLICATION

☐ Normal ☐ Foundry ☐ Hot metal Handling

WHEEL BLOCK CONNECTION TYPE

☐ Top connection ☐ Side connection ☐ Pin connection ☐ End connection (CRWB 112 - 250)

TYPE OF WHEEL BLOCK

☐ Wheel block with Drive ☐ Wheel block with Non Drive ☐ Wheel block only ☐ Wheel block with central drive
(for Central drive Contact Technical Team)

NUMBER OF WHEEL BLOCKS

Wheel block with Drive : __________ Wheel block with Non Drive : __________ Wheel block only : ___________
Drive only : __________ Wheel block with central drive : __________ Drive power : _________kw

ACCESSORIES:

☐ Buffer : Rubber / Poly-Urethane

DETAILS

Wheel material : Cast iron Wheel type : Flange on both sides
Gear Box Type : Parallel shaft with Helical Gear Motor Type : 2 pole with single speed/ 2/8 pole with dual speed

PAINTING

☐ Standard - RAL 3020 (Traffic Red) ☐ Special Paint Finish (color code required) : ______________

6.2 NOTES

Craftsman Automation Limited
123/4, Sangothipalayam Road,
Arasur Post, Coimbatore - 641 407
Tamilnadu, India
Ph : +91-422-3051 000
Fax : +91-422-2361 258
www.craftsmanautomation.com

REV : 1.1 SEPTMEBER 2018