

CROMSTEEL

INDUSTRIES

shafts for
linear motion



CROMSTEEL
INDUSTRIES



Total surface: 100.000 m²

Production area: 35.000 m²

Turnover in 2012: 60.000.000 Euro

Production capacity: 4.000 tons of steel monthly

From the foundation in year 2000 the mission of CROMSTEEL INDUSTRIES has been to produce precision shafts and bars for linear motion and hydraulic systems.

The main goal set by CROMSTEEL INDUSTRIES is to ensure the highest grade of product performance and innovation to meet any customer need and expectation. For us long term success is the interaction of rigorous quality management and a broad range of products made possible by the vertical integration of our manufacturing processes.

These two factors combine into tangible superior value for linear motion and hydraulic system OEMs and distributors.

Our past and future success is built upon two strengths: vision on technology and the core values we live every day (the spirit, the philosophy and the transactional policies).

Customers

We believe that trust, respect, mutual understanding and prompt support to customers are key to long term partnership.

Innovation

Competitive companies have to innovate. CROMSTEEL INDUSTRIES invests resources in research, development and planning, and all this together with a constant effort to anticipate the needs of our customers by striving to improve quality and reduce costs result in delivering outstanding products.

Staff

We believe that every employee should ascent together with the company.

Integrity

The management and the staff of CROMSTEEL INDUSTRIES always act with integrity and they are guided by honesty and ethics in relation with customers. We are strong and honest competitors.

Corporate Social Responsibility

CROMSTEEL INDUSTRIES and its employees are aware of their responsibility towards the community and its well-being, especially in the area of atmosphere conservation. It is our duty to keep the air clean and healthy, since it has a direct and remarkable influence on the life of people.

We invite you to be one of our valuable customers among the others from more than 55 countries we are serving all over the world.

Paolo MENNINI

owner

Precision Shafts

Precision Shafts are induction hardened (from 3 KHz to over 400 KHz) according to the steel quality, shaft diameter and the necessary depth.

The induction hardening process gives a degree of surface hardness which provides good wear resistance.

The soft shaft core ensures a good resilience.

Our **Precision Shafts** are fine ground and super finished.

The experience we got from our production process, but also from our daily contacts with many companies from several production fields enable us to provide technical information and an utmost care in preparing this catalogue.

We trust that this unique catalogue can be useful to the design board and offers a clear indication to the purchase department.

Confidence of our customers in the quality and reliability of our **Precision Shafts** represents for us the award for the attention we pay to the continuous improvements of our production facilities and quality.

Why Precision Shafts

Precision Shafts are mainly used as raceways for ball bushing, track rollers and plain bearings or they find application as conveyors or finishing rollers.

The Precision Shafts application fields are the following:

- Automatic packaging machines
- Wood and aluminium working machines
- Tool machines
- Robots, leisure and fitness equipment
- Protection systems for production machines
- Door opening systems
- Food and pharmaceutical industries
- Printing and serigraphy machines
- Movable furniture parts
- Checking and measuring equipment

Production programme

W series – hardened and ground steel shafts

WZ series - hardened and ground steel shafts in inch

WV series – hardened, hard chrome plated steel shafts

WVZ series - hardened, hard chrome plated steel shafts in inch

WRA series - hardened and ground stainless steel shafts

WRAZ series - hardened and ground stainless steel shafts in inch

WRB series - hardened and ground stainless steel shafts

WRBZ series - hardened and ground stainless steel shafts in inch

WRBV series - hardened and hard chrome plated stainless steel shafts with high corrosion resistance

WH series – hardened and ground hollow shafts

WHZ series - hardened and ground hollow shafts in inch

WHV series – hardened and hard chrome plated hollow shafts

WHVZ series - hardened and hard chrome plated hollow shafts in inch

Precision shafts / Slide shafts including customized machining, templates

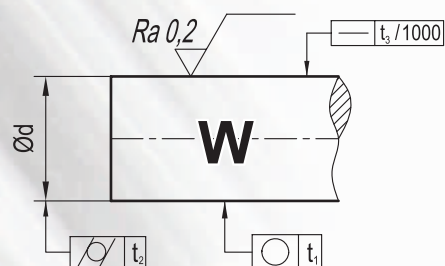
STEEL GRADE CORRESPONDENTS									
EURONORM	DIN	Werkstoff No.	STAS	AFNOR	B.S.	UNI	JIS	GOST	AISI SAE ASTM
EN 10083	17212		880-88		970		G4802	1050-88	J403
	Cf53	1.1213		XC48TS	070M55	C53			1050
C60E	Ck60	1.1223	OLC60	1C60 AF70C55	060A62 60HS; CS	C60 1C60	S58C	60	1060
EN 10088			3583-87					5632	J405
X46Cr13		1.4034	40Cr130	Z44Cr13		X40Cr14		40Ch13	420C
X90CrMoV18		1.4112	90VMoCr180						440B

CHEMICAL COMPOSITION										
% BY WEIGHT (upon indicated standard)										
STEEL GRADE	Standard	C	Si	Mn	P max	S max	Cr	Mo	Ni	V
Cf53	DIN 17212	0.50 - 0.57	0.15 - 0.35	0.40 - 0.70	0.025	0.035	–	–	–	–
C60E	EN 10083	0.57 - 0.65	max 0.4	0.60 - 0.90	0.030	0.035	max 0.40	max 0.1	max 0.4	–
X46Cr13	EN 10088	0.43 - 0.50	max 1.0	max 1.0	0.040	0.015	12.5 - 14.5	–	–	–
X90CrMoV18	EN 10088	0.85 - 0.95	max 1.0	max 1.0	0.040	0.015	17.0 - 19.0	0.9 - 1.3	–	0.07 - 0.12

MECHANICAL PROPERTIES: +N				
MATERIAL		R _{p0.2} (N/mm ²)	R _m (N/mm ²)	A _{min}
Cf53 W-1.1213	d ≤ 16 mm	min 510	740 ÷ 880	12
	16 mm < d ≤ 40 mm	min 430	690 ÷ 830	14
	40 mm < d ≤ 100 mm	min 400	640 ÷ 780	15
C60E W-1.1221	d ≤ 16 mm	min 380	min 710	10
	16 mm < d ≤ 40 mm	min 340	min 670	11
	40 mm < d ≤ 100 mm	min 310	min 650	11

HARDNESS		
STEEL GRADE	Core hardness HB max	Surface hardness HRC
Cf53	229	62 ± 2
C60E	241	62 ± 2
X46Cr13	245	55 ± 3
X90CrMoV18	265	56 ± 3

STEEL GRADE Cf53



Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth R _h t DIN 6773	Standard tolerance ISO h6	Roundness (circular) t ₁	Parallelism (cylindric) t ₂	Straightness t ₃
mm	kg		mm	mm	µm	µm	µm	mm/m
4	0.10	W 4	4000	0.5 - 0.8	0/-8	4	6	0.16
5	0.16	W 5	4000	0.5 - 0.8	0/-8	4	6	0.16
6	0.23	W 6	6000	0.5 - 0.8	0/-8	4	6	0.16
8	0.40	W 8	6000	0.6 - 0.9	0/-9	4	6	0.16
10	0.62	W 10	6000	0.7 - 1.0	0/-9	4	6	0.12
12	0.89	W 12	6000	0.8 - 1.2	0/-11	5	8	0.12
13	1.04	W 13	6000	0.8 - 1.2	0/-11	5	8	0.12
14	1.21	W 14	6000	0.9 - 1.3	0/-11	5	8	0.12
15	1.39	W 15	6000	1.0 - 1.4	0/-11	5	8	0.12
16	1.58	W 16	6000	1.1 - 1.5	0/-11	5	8	0.1
18	2.00	W 18	6000	1.1 - 1.5	0/-11	5	8	0.1
20	2.47	W 20	6000	1.2 - 1.5	0/-13	6	8	0.1
22	2.98	W 22	6000	1.2 - 1.5	0/-13	6	8	0.1
24	3.55	W 24	6000	1.4 - 1.6	0/-13	6	8	0.1
25	3.85	W 25	6000	1.5 - 1.7	0/-13	6	9	0.1
28	4.83	W 28	6000	1.5 - 1.8	0/-13	6	9	0.1
30	5.55	W 30	6000	1.5 - 1.9	0/-13	6	9	0.1
32	6.31	W 32	6000	1.5 - 1.9	0/-16	7	11	0.1
35	7.55	W 35	6000	1.5 - 1.9	0/-16	7	11	0.1
40	9.87	W 40	6000	1.6 - 2.0	0/-16	7	11	0.1
45	12.50	W 45	6000	1.6 - 2.0	0/-16	7	11	0.1
50	15.40	W 50	6000	2.2 - 2.6	0/-16	7	11	0.1
55	18.64	W 55	6000	2.2 - 2.6	0/-19	8	13	0.1
60	22.20	W 60	7000	2.2 - 2.6	0/-19	8	13	0.1
65	26.03	W 65	7000	2.2 - 2.6	0/-19	8	13	0.1
70	30.20	W 70	7000	2.2 - 2.6	0/-19	8	13	0.1
75	34.70	W 75	7000	2.2 - 2.6	0/-19	8	13	0.1
80	39.50	W 80	7000	2.2 - 2.6	0/-19	8	13	0.1
90	49.92	W 90	7000	2.2 - 3.2	0/-22	8	13	0.2
100	61.62	W 100	7000	2.2 - 3.2	0/-22	8	13	0.2
120	88.73	W 120	7000	2.5 - 4.0	0/-22	10	16	0.2

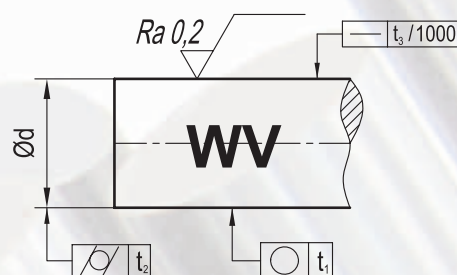
By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Surface hardness: 62±2 HRC

Length tolerance: 0/+200 mm

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE Cf53



Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth Rht DIN 6773	Standard tolerance ISO h7	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	kg		mm	mm	µm	µm	µm	mm/m
4	0.10	WV 4	4000	0.5 - 0.8	0/-12	6	10	0.16
5	0.16	WV 5	4000	0.5 - 0.8	0/-12	6	10	0.16
6	0.23	WV 6	6000	0.5 - 0.8	0/-12	6	10	0.16
8	0.40	WV 8	6000	0.6 - 0.9	0/-15	6	10	0.16
10	0.62	WV 10	6000	0.7 - 1.0	0/-15	6	10	0.12
12	0.89	WV 12	6000	0.8 - 1.2	0/-18	8	12	0.12
14	1.21	WV 14	6000	0.9 - 1.3	0/-18	8	12	0.12
15	1.39	WV 15	6000	1.0 - 1.4	0/-18	8	12	0.12
16	1.58	WV 16	6000	1.1 - 1.5	0/-18	8	12	0.1
18	2.00	WV 18	6000	1.1 - 1.5	0/-18	8	12	0.1
20	2.47	WV 20	6000	1.2 - 1.5	0/-21	9	12	0.1
22	2.98	WV 22	6000	1.2 - 1.5	0/-21	9	12	0.1
24	3.55	WV 24	6000	1.4 - 1.6	0/-21	9	12	0.1
25	3.85	WV 25	6000	1.5 - 1.7	0/-21	9	12	0.1
28	4.83	WV 28	6000	1.5 - 1.8	0/-21	9	12	0.1
30	5.55	WV 30	6000	1.5 - 1.9	0/-21	9	12	0.1
32	6.31	WV 32	6000	1.5 - 1.9	0/-25	11	15	0.1
35	7.55	WV 35	6000	1.5 - 1.9	0/-25	11	15	0.1
40	9.87	WV 40	6000	1.6 - 2.0	0/-25	11	15	0.1
45	12.50	WV 45	6000	1.6 - 2.0	0/-25	11	15	0.1
50	15.40	WV 50	6000	2.2 - 2.6	0/-25	11	15	0.1
55	18.64	WV 55	6000	2.2 - 2.6	0/-30	12	15	0.1
60	22.20	WV 60	7000	2.2 - 2.6	0/-30	12	15	0.1
65	26.03	WV 65	7000	2.2 - 2.6	0/-30	12	15	0.1
70	30.20	WV 70	7000	2.2 - 2.6	0/-30	12	15	0.1
75	34.70	WV 75	7000	2.2 - 2.6	0/-30	12	15	0.1
80	39.50	WV 80	7000	2.2 - 2.6	0/-30	12	15	0.1
90	49.92	WV 90	7000	2.2 - 3.2	0/-35	14	17	0.2
100	61.62	WV 100	7000	2.2 - 3.2	0/-35	14	17	0.2
120	88.73	WV 120	7000	2.5 - 4.0	0/-35	14	17	0.2

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Chrome thickness: 12±5 µm.

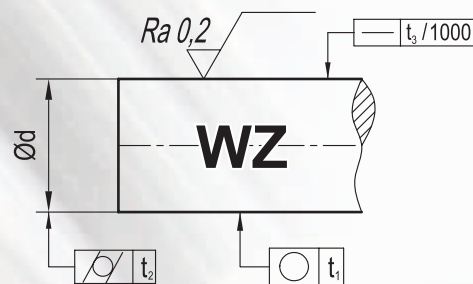
Chrome layer hardness: min 900 HV 0.1

Surface hardness: 62±2 HRC

Length tolerance: 0/+200 mm

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE Cf53



Shaft Diameter d	Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth Rht DIN 6773	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	kg		inch	mm	inch	inch	inch	inch/m
1/4	6.35	0.25	WZ 6	237	0.019 - 0.031	-0.0005/-0.001	0.0002	0.0002	0.008
3/8	9.525	0.56	WZ 9	237	0.027 - 0.039	-0.0005/-0.001	0.0002	0.0002	0.008
1/2	12.7	0.99	WZ 12	237	0.031 - 0.047	-0.0005/-0.001	0.0002	0.0003	0.008
5/8	15.875	1.55	WZ 15	237	0.043 - 0.059	-0.0005/-0.001	0.0002	0.0003	0.008
3/4	19.05	2.24	WZ 19	237	0.047 - 0.059	-0.0005/-0.001	0.0002	0.0004	0.008
1	25.4	3.97	WZ 25	237	0.059 - 0.066	-0.0005/-0.001	0.0002	0.0004	0.008
1¼	31.75	6.22	WZ 31	237	0.059 - 0.074	-0.0005/-0.001	0.0003	0.0004	0.004
1½	38.1	8.95	WZ 38	237	0.062 - 0.078	-0.0006/-0.0011	0.0003	0.0004	0.004
2	50.8	15.91	WZ 50	237	0.086 - 0.102	-0.0006/-0.0013	0.0003	0.0004	0.004
2¼	57.15	20.13	WZ 57	237	0.086 - 0.102	-0.0007/-0.0015	0.0003	0.0005	0.004
2½	63.5	24.85	WZ 63	276	0.086 - 0.102	-0.0007/-0.0015	0.0003	0.0005	0.004
3	76.2	35.78	WZ 76	276	0.086 - 0.102	-0.0008/-0.0017	0.0003	0.0005	0.004

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

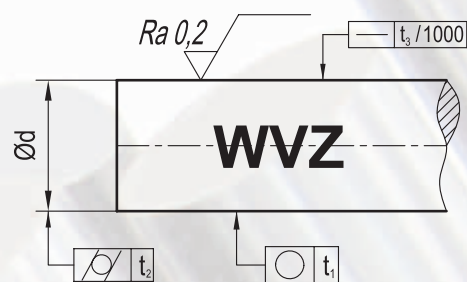
By request we can deliver other Class tolerance (i.e. "S", "ISO h6", etc.)

Surface hardness: 62±2 HRC

Length tolerance: 0/+8 inch (0/+200 mm).

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE Cf53



Shaft Diameter d	Shaft Diameter d	Weigh per metre	Shaft part number	Standard length	Hardening depth Rht DIN 6773	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	kg		inch	inch	inch	inch	inch	inch/m
1/4	6.35	0.25	WVZ 6	237	0.019 - 0.031	-0.0005/-0.001	0.0002	0.0004	0.008
3/8	9.525	0.56	WVZ 9	237	0.027 - 0.039	-0.0005/-0.001	0.0002	0.0004	0.008
½	12.7	0.99	WVZ 12	237	0.031 - 0.047	-0.0005/-0.001	0.0003	0.0005	0.008
5/8	15.875	1.55	WVZ 15	237	0.043 - 0.059	-0.0005/-0.001	0.0004	0.0005	0.008
3/4	19.05	2.24	WVZ 19	237	0.047 - 0.059	-0.0005/-0.001	0.0004	0.0005	0.004
1	25.4	3.97	WVZ 25	237	0.059 - 0.066	-0.0005/-0.001	0.0004	0.0005	0.004
1¼	31.75	6.22	WVZ 31	237	0.059 - 0.074	-0.0005/-0.001	0.0004	0.0006	0.004
1½	38.1	8.95	WVZ 38	237	0.062 - 0.078	-0.0006/-0.0011	0.0004	0.0006	0.004
2	50.8	15.91	WVZ 50	237	0.086 - 0.102	-0.0006/-0.0013	0.0004	0.0006	0.004
2¼	57.15	20.13	WVZ 57	237	0.086 - 0.102	-0.0007/-0.0015	0.0005	0.0006	0.004
2½	63.5	24.85	WVZ 63	276	0.086 - 0.102	-0.0007/-0.0015	0.0005	0.0006	0.004
3	76.2	35.78	WVZ 76	276	0.086 - 0.102	-0.0008/-0.0017	0.0005	0.0006	0.004

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

By request we can deliver other Class tolerance (i.e. "S", "ISO h7", etc.)

Chrome thickness: 12±5 µm.

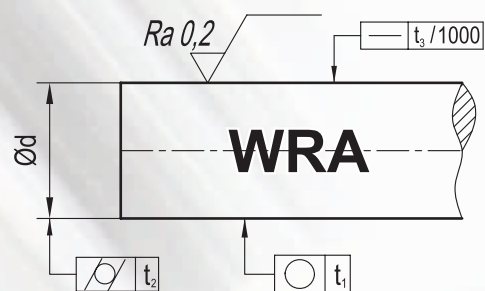
Chrome layer hardness: min 900 HV 0.1

Surface hardness: 62±2 HRC

Length tolerance: 0/+8 inch (0/+200 mm)

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE X90CrMoV18 (W1.4112)

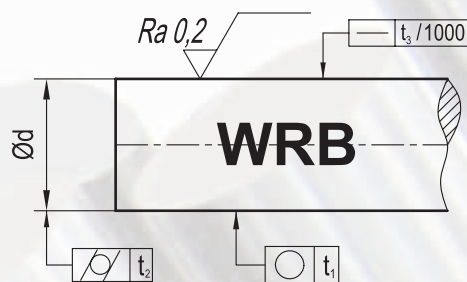


Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth Rht DIN 50190 (max)	Standard tolerance ISO h6	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	kg		mm	mm	µm	µm	µm	mm/m
5	0.16	WRA 5	5000	0.5 - 0.8	0/-8	4	5	0.16
6	0.23	WRA 6	6000	0.5 - 0.8	0/-8	4	6	0.16
8	0.40	WRA 8	6000	0.6 - 0.9	0/-9	4	6	0.16
10	0.62	WRA 10	6000	0.7 - 1.0	0/-9	4	6	0.16
12	0.89	WRA 12	6000	0.8 - 1.2	0/-11	5	8	0.12
14	1.21	WRA 14	6000	0.9 - 1.3	0/-11	5	8	0.12
15	1.39	WRA 15	6000	1.1 - 1.5	0/-11	5	8	0.12
16	1.58	WRA 16	6000	1.1 - 1.5	0/-11	5	8	0.12
20	2.47	WRA 20	6000	1.2 - 1.6	0/-13	6	9	0.1
25	3.85	WRA 25	6000	1.5 - 1.7	0/-13	6	9	0.1
30	5.55	WRA 30	6000	1.5 - 1.9	0/-13	6	9	0.1
40	9.87	WRA 40	6000	2.5 - 3.0	0/-16	7	11	0.1
50	15.40	WRA 50	6000	2.7 - 3.2	0/-16	7	11	0.1
60	22.20	WRA 60	6000	2.9 - 3.3	0/-19	8	13	0.1

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.
Length tolerance: 0/+200 mm
Surface hardness: min. 56±3 HRC

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

**STEEL GRADE
X46Cr13
(W1.4034)**



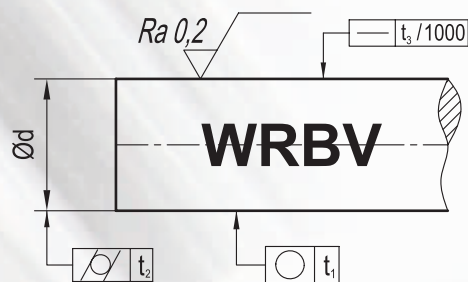
Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth Rht DIN 50190 (max)	Standard tolerance ISO h6	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	kg		mm	mm	µm	µm	µm	mm/m
5	0.16	WRB 5	4000	0.5 - 0.8	0/-8	4	5	0.16
6	0.23	WRB 6	6000	0.5 - 0.8	0/-8	4	6	0.16
8	0.40	WRB 8	6000	0.6 - 0.9	0/-9	4	6	0.16
10	0.62	WRB 10	6000	0.7 - 1.0	0/-9	4	6	0.16
12	0.89	WRB 12	6000	0.8 - 1.2	0/-11	5	8	0.12
14	1.21	WRB 14	6000	0.9 - 1.3	0/-11	5	8	0.12
15	1.39	WRB 15	6000	1.1 - 1.5	0/-11	5	8	0.12
16	1.58	WRB 16	6000	1.1 - 1.5	0/-11	5	8	0.12
20	2.47	WRB 20	6000	1.2 - 1.5	0/-13	6	9	0.1
25	3.85	WRB 25	6000	1.5 - 1.7	0/-13	6	9	0.1
30	5.55	WRB 30	6000	1.5 - 1.9	0/-13	6	9	0.1
40	9.87	WRB 40	6000	2.5 - 3.0	0/-16	7	11	0.1
50	15.40	WRB 50	6000	2.7 - 3.2	0/-16	7	11	0.1
60	22.20	WRB 60	6000	2.9 - 3.3	0/-19	8	13	0.1

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.
Length tolerance: 0/+200 mm
Surface hardness: 55±3 HRC

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

NEW

STEEL GRADE X46Cr13 (W1.4034)



The corrosion resistant steel shafts used in linear motion are commonly known as "stainless" shafts. But due to their metallurgical structure and composition, no induction hardenable steel shaft can achieve a corrosion resistance comparable to that, for example, of "true" stainless steel like AISI 316 and others (which cannot be induction hardened).

Linear motion stainless steel shafts are the best compromise between a good surface hardness (lower to that of carbon steel but still enough for linear applications) and a good corrosion resistance.

In case of corrosive environments, e.g. typical of the food processing industry, special solutions should be considered, like our chrome plated stainless steel linear shafts (WRBV) which can also be supplied with an enhanced corrosion protection, thus extending dramatically the product lifespan.

Shaft Diameter d	Weight per metre	Shaft part number	Standard length	Hardening depth Rht DIN 50190 (max)	Standard tolerance ISO h7	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	kg		mm	mm	µm	µm	µm	mm/m
5	0.16	WRBV 5	4000	0.5 - 0.8	0/-12	4	5	0.16
6	0.23	WRBV 6	6000	0.5 - 0.8	0/-12	4	6	0.16
8	0.40	WRBV 8	6000	0.6 - 0.9	0/-15	4	6	0.16
10	0.62	WRBV 10	6000	0.7 - 1.0	0/-15	4	6	0.16
12	0.89	WRBV 12	6000	0.8 - 1.2	0/-18	5	8	0.12
14	1.21	WRBV 14	6000	0.9 - 1.3	0/-18	5	8	0.12
15	1.39	WRBV 15	6000	1.1 - 1.5	0/-18	5	8	0.12
16	1.58	WRBV 16	6000	1.1 - 1.5	0/-18	5	8	0.12
20	2.47	WRBV 20	6000	1.2 - 1.6	0/-21	6	9	0.1
25	3.85	WRBV 25	6000	1.5 - 1.7	0/-21	6	9	0.1
30	5.55	WRBV 30	6000	1.5 - 1.9	0/-21	6	9	0.1
40	9.87	WRBV 40	6000	2.5 - 3.0	0/-25	7	11	0.1
50	15.40	WRBV 50	6000	2.7 - 3.2	0/-25	7	11	0.1
60	22.20	WRBV 60	6000	2.9 - 3.3	0/-30	8	13	0.1

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Chrome thickness: 12±5 µm.

Chrome layer hardness: min 900 HV 0.1

Length tolerance: 0/+200 mm

Surface hardness: 55±3 HRC

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE X90CrMoV18 X46Cr13



X90CrMoV18 – WRAZ

Shaft Diameter d	Shaft Diameter d	Weigh per metre	Shaft part number	Standard length	Hardening depth Rht DIN 50190	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	kg		inch	inch	inch	inch	inch	inch/m
1/4	6.35	0.25	WRAZ 6	237	0.019 - 0.031	-0.0005/-0.001	0.0002	0.0002	0.008
3/8	9.525	0.56	WRAZ 9	237	0.027 - 0.039	-0.0005/-0.001	0.0002	0.0002	0.008
1/2	12.7	0.99	WRAZ 12	237	0.031 - 0.047	-0.0005/-0.001	0.0002	0.0003	0.008
5/8	15.875	1.55	WRAZ 15	237	0.043 - 0.059	-0.0005/-0.001	0.0002	0.0003	0.008
3/4	19.05	2.24	WRAZ 19	237	0.047 - 0.059	-0.0005/-0.001	0.0002	0.0004	0.004
1	25.4	3.97	WRAZ 25	237	0.059 - 0.066	-0.0005/-0.001	0.0002	0.0004	0.004
1¼	31.75	6.22	WRAZ 31	237	0.059 - 0.074	-0.0005/-0.001	0.0002	0.0004	0.004
1½	38.1	8.95	WRAZ 38	237	0.094 - 0.114	-0.0006/-0.0011	0.0003	0.0004	0.004
2	50.8	15.91	WRAZ 50	237	0.106 - 0.125	-0.0006/-0.0013	0.0003	0.0005	0.004
2¼	57.15	20.13	WRAZ 57	237	0.114 - 0.129	-0.0007/-0.0015	0.0003	0.0005	0.004

X46Cr13 – WRBZ

Shaft Diameter d	Shaft Diameter d	Weigh per metre	Shaft part number	Standard length	Hardening depth Rht DIN 50190	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	kg		inch	inch	inch	inch	inch	inch/m
1/4	6.35	0.25	WRBZ 6	237	0.019 - 0.031	-0.0005/-0.001	0.0002	0.0002	0.008
3/8	9.525	0.56	WRBZ 9	237	0.027 - 0.039	-0.0005/-0.001	0.0002	0.0002	0.008
1/2	12.7	0.99	WRBZ 12	237	0.031 - 0.047	-0.0005/-0.001	0.0002	0.0003	0.008
5/8	15.875	1.55	WRBZ 15	237	0.043 - 0.059	-0.0005/-0.001	0.0002	0.0003	0.008
3/4	19.05	2.24	WRBZ 19	237	0.047 - 0.059	-0.0005/-0.001	0.0002	0.0004	0.004
1	25.4	3.97	WRBZ 25	237	0.059 - 0.066	-0.0005/-0.001	0.0002	0.0004	0.004
1¼	31.75	6.22	WRBZ 31	237	0.059 - 0.074	-0.0005/-0.001	0.0002	0.0004	0.004
1½	38.1	8.95	WRBZ 38	237	0.094 - 0.114	-0.0006/-0.0011	0.0003	0.0004	0.004
2	50.8	15.91	WRBZ 50	237	0.106 - 0.125	-0.0006/-0.0013	0.0003	0.0005	0.004
2¼	57.15	20.13	WRBZ 57	237	0.114 - 0.129	-0.0007/-0.0015	0.0003	0.0005	0.004

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

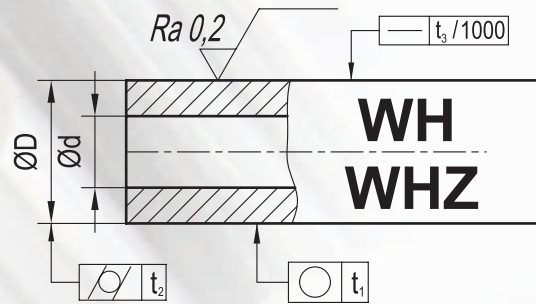
Surface hardness: 56±3 HRC for WRAZ; 55±3 HRC for WRBZ

Length tolerance: 0/+8 inch (0/+200 mm).

By request we can deliver other Class tolerance (i.e. "S", "ISO h6", etc.)

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE C60E



Shaft Diameter Outer D (+/- 10%)	Shaft Diameter Inner d (+/- 10%)	Weight per metre	Shaft part number	Standard length	Hardening depth Rht (max) DIN6773	Standard tolerance ISO h6	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	mm	kg		mm	mm	µm	µm	µm	mm/m
12	4.0	0.79	WH 12	6000	0.6 - 1.3	0/-11	5	8	0.12
14	7.0	0.91	WH 14	6000	0.6 - 1.3	0/-11	5	8	0.12
16	7.0	1.28	WH 16	6000	0.6 - 1.6	0/-11	5	8	0.12
20	14.0	1.25	WH 20	6000	0.9 - 1.6	0/-13	6	9	0.1
25	15.6	2.35	WH 25	6000	0.9 - 1.8	0/-13	6	9	0.1
30	18.3	3.50	WH 30	6000	0.9 - 2.0	0/-13	6	9	0.1
40	28.0	4.99	WH 40	6000	1.5 - 2.5	0/-16	7	11	0.1
50	29.7	9.91	WH 50	6000	1.5 - 3.0	0/-16	7	11	0.1
60	36.0	14.20	WH 60	6000	2.2 - 3.0	0/-19	8	13	0.1

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Surface hardness: 62±2 HRC

Lengths tolerances: 0/+200 mm

Shaft Diameter Outer D		Shaft Diameter Inner d (+/- 10%)		Weigh per metre	Shaft part number	Standard length	Hardening depth Rht DIN6773	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	inch	mm	kg		inch	inch	inch	inch	inch	inch/m
1/2	12.7	0.16	4.064	0.90	WHZ 12	237	0.023 - 0.051	-0.0005/-0.001	0.0002	0.0003	0.008
5/8	15.875	0.25	6.35	1.30	WHZ 15	237	0.023 - 0.051	-0.0005/-0.001	0.0002	0.0003	0.008
3/4	19.05	0.438	11.125	1.48	WHZ 19	237	0.035 - 0.062	-0.0005/-0.001	0.0002	0.0004	0.004
1	25.4	0.61	15.494	2.50	WHZ 25	237	0.035 - 0.070	-0.0005/-0.001	0.0002	0.0004	0.004
1¼	31.75	0.72	18.288	4.15	WHZ 31	237	0.059 - 0.078	-0.0005/-0.001	0.0002	0.0004	0.004
1½	38.1	0.89	22.606	5.80	WHZ 38	237	0.059 - 0.098	-0.0006/-0.0011	0.0003	0.0004	0.004
2	50.8	1.25	31.75	9.69	WHZ 50	237	0.086 - 0.118	-0.0006/-0.0013	0.0003	0.0005	0.004

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

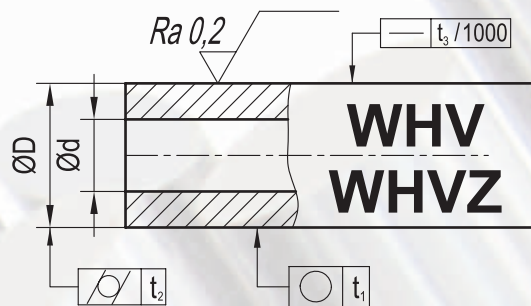
Surface hardness: 62±2 HRC

Length tolerance: 0/+8 inch (0/+200 mm).

By request we can deliver other Class tolerance (i.e. "S", "ISO h6", etc.)

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

STEEL GRADE C60E



Shaft Diameter Outer D (+/- 10%)	Shaft Diameter Inner d (+/- 10%)	Weight per metre	Shaft part number	Standard length	Hardening depth Rht (max) DIN6773	Standard tolerance ISO h7	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
mm	mm	kg		mm	mm	µm	µm	µm	mm/m
12	4.0	0.79	WHV 12	6000	0.6 - 1.3	0/-18	8	12	0.12
14	7.0	0.91	WHV 14	6000	0.6 - 1.3	0/-18	8	12	0.12
16	7.0	1.28	WHV 16	6000	0.6 - 1.6	0/-18	8	12	0.12
20	14.0	1.25	WHV 20	6000	0.9 - 1.6	0/-21	9	12	0.1
25	15.6	2.35	WHV 25	6000	0.9 - 1.8	0/-21	9	12	0.1
30	18.3	3.50	WHV 30	6000	0.9 - 2.0	0/-21	9	12	0.1
40	28.0	4.99	WHV 40	6000	1.5 - 2.5	0/-25	11	15	0.1
50	29.7	9.91	WHV 50	6000	1.5 - 3.0	0/-25	11	15	0.1
60	36.0	14.20	WHV 60	6000	2.2 - 3.0	0/-30	12	15	0.1

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Chrome thickness: 12±5 µm.

Chrome layer hardness: min 900 HV 0.1

Surface hardness: 62±2 HRC

Length tolerance: 0/+200 mm

Shaft Diameter Outer D		Shaft Diameter Inner d (+/- 10%)		Weigh per metre	Shaft part number	Standard length	Hardening depth Rht DIN6773	Standard tolerance Class "L"	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
inch	mm	inch	mm	kg		inch	inch	inch	inch	inch	inch/m
1/2	12.7	0.16	4.064	0.90	WHVZ 12	237	0.023 - 0.051	-0.0005/-0.001	0.0003	0.0005	0.008
5/8	15.875	0.25	6.35	1.30	WHVZ 15	237	0.027 - 0.062	-0.0005/-0.001	0.0003	0.0005	0.008
3/4	19.05	0.438	11.125	1.48	WHVZ 19	237	0.043 - 0.062	-0.0005/-0.001	0.0004	0.0005	0.008
1	25.4	0.61	15.494	2.50	WHVZ 25	237	0.047 - 0.070	-0.0005/-0.001	0.0004	0.0005	0.004
1¼	31.75	0.72	18.288	4.15	WHVZ 31	237	0.062 - 0.078	-0.0005/-0.001	0.0004	0.0005	0.004
1½	38.1	0.89	22.606	5.80	WHVZ 38	237	0.078 - 0.098	-0.0006/-0.0011	0.0004	0.0006	0.004
2	50.8	1.25	31.75	9.69	WHVZ 50	237	0.094 - 0.118	-0.0007/-0.0015	0.0004	0.0006	0.004

By request we can supply shaft diameters in no listed dimensions with special lengths and tolerances.

Chrome thickness: 12±5 µm.

Chrome layer hardness: min 900 HV 0.1

Surface hardness: 62±2 HRC

Length tolerance: 0/+8 inch (0/+200 mm).

By request we can deliver other Class tolerance (i.e. "S", "ISO h7", etc.)

NB: because of the centerless grinding process used for random length shafts, the outmost 100mm of both shaft ends are not guaranteed to be either in diameter tolerance or induction hardened to the standard hardness values

MACHINED SHAFTS

precision machining

custom machining

templates

Precision Shafts may be worked in standard mill lengths or according to Customer's requirements.

For this purpose our workshop has been equipped and it's able to supply **Precision Shafts** according to customer drawings, in a short time.

In the next pages you will find out some examples of the most common mechanical workings given by our specialized workshop.



MACHINING SERVICES: EXAMPLES

Some of the more common machining services provided

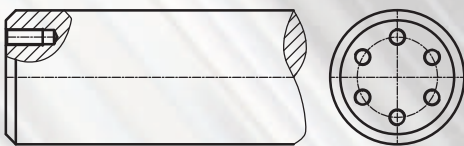
CUTTING AND DEBURRING



RADIAL DRILLING AND TAPPING



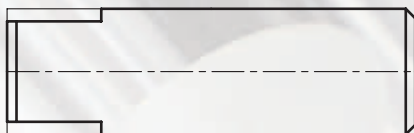
PITCH CIRCLE DRILLING AND TAPPING



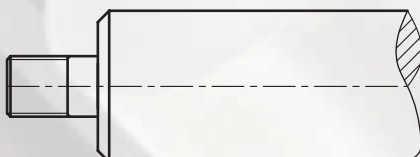
CIRCUMFERENCE GROOVE



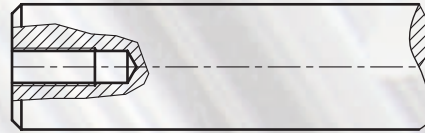
MILLED PLANES (FOR KEY)



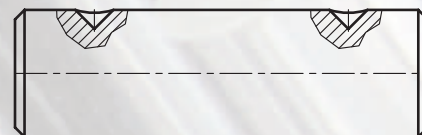
THREADED REDUCED DIAMETERS



AXIAL DRILLING AND TAPPING



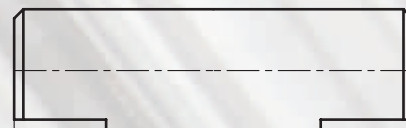
SCREW SEATS



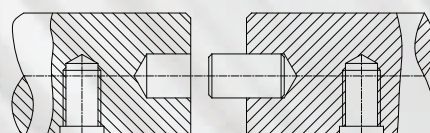
SNAP RING GROOVES



MILLED PLANES

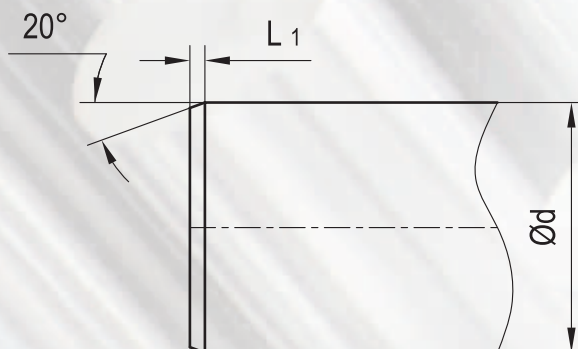


SHAFT COUPLING



MACHINING STANDARDIZATION OVERVIEW

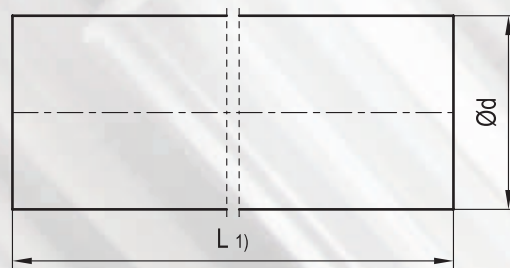
CHAMFERING



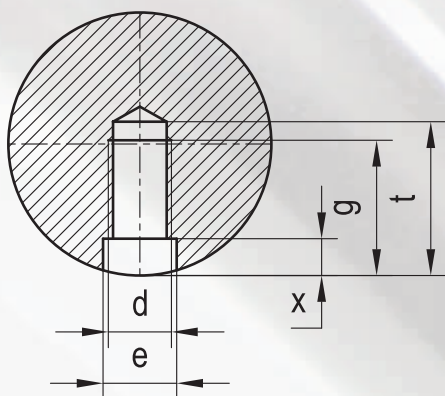
Shaft Diameter	Chamfer Width
d (mm)	L (mm)
5	1.5
8	1.5
10	1.5
12	2.0
16	2.0
20	2.0
25	2.0
30	2.0
40	3.0
50	3.0
60	3.0
80	3.0

CUT LENGTH TOLERANCE

Length	Tolerance
L_1 (mm)	(mm)
<400	± 0.5
400 - 1000	± 0.8
1000 - 2000	± 1.2
2000 - 4000	± 2.0
4000 - 6000	± 3.0



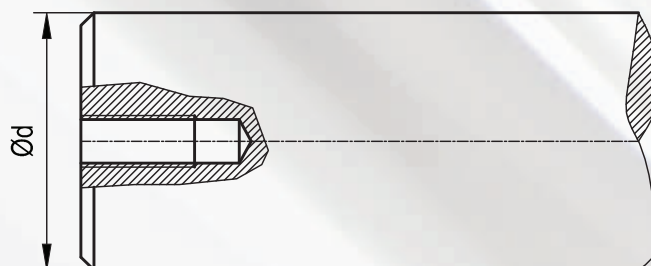
RADIAL DRILLING AND TAPPING



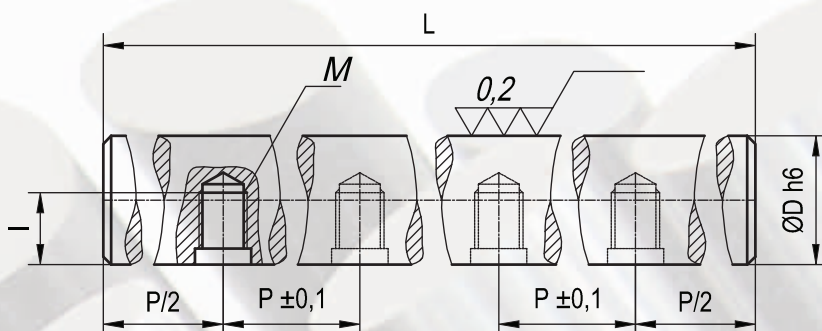
Shaft Diameter	Thread Bore	d		t	g	x	e
d (mm)		min (mm)	max (mm)	(mm)	(mm)	(mm)	(mm)
12	M4	4	4	9	8	2.5	$d+1$
16	M5	5	5	11	9.5	2.5	$d+1$
20	M6	5	6	15	13	3.0	$d+1$
25	M8	5	8	15	14	3.0	$d+1$
30	M10	6	10	22	18	4.0	$d+1$
40	M10	6	12	22	20	4.0	$d+1$
50	M12	6	12	26	23	4.0	$d+1$
60	M14	8	14	35	28	4.5	$d+1$
80	M16	10	16	45	33	5.5	$d+1$
100	M16	12	20	55	40	6.5	$d+1$

AXIAL DRILLING AND TAPPING

Shaft Diameter	Thread Bore
d (mm)	
8-15	M4-M5
16-22	M5-M8
25-32	M10-M12
35-45	M10-M16
46-60	M16-M20
61-80	M16-M24
81-110	M20-M30



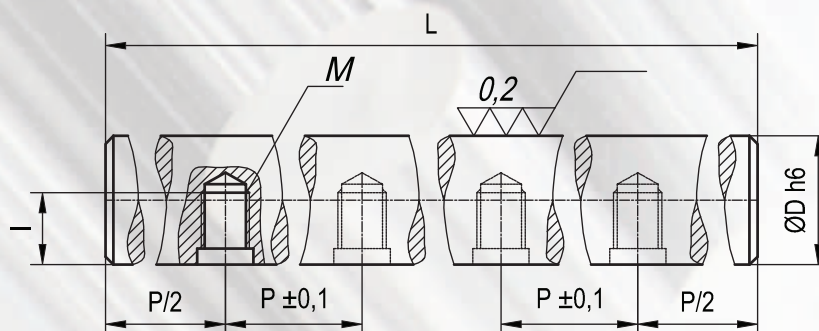
PRE-DRILLED SHAFTS



Shaft diameter D	Shaft part number	Pitch P	P/2	Nominal screw size	Thread Depth l	Standard length L	No. of bores
mm		mm	mm		mm	mm	
10	WB10B	75	37,5	M4	6	6000	80
10	WB10B	120	60	M4	6	6000	50
10	WB10C	150	75	M4	6	6000	40
12	WB12A	75	37,5	M4	8	6000	80
12	WB12B	120	60	M4	8	6000	50
12	WB12C	150	75	M4	8	6000	40
14	WB14A	75	37,5	M4	8	6000	80
14	WB14B	120	60	M4	8	6000	50
14	WB14C	150	75	M4	8	6000	40
16	WB16A	75	37,5	M5	9	6000	80
16	WB16B	100	50	M5	9	6000	60
16	WB16C	150	75	M5	9	6000	40
16	WB16D	150	75	M4	9	6000	40
20	WB20A	50	25	M6	11	6000	120
20	WB20B	75	37,5	M6	11	6000	80
20	WB20C	100	50	M6	11	6000	60
20	WB20D	150	75	M6	11	6000	40
20	WB20E	150	75	M 6	11	6000	40
25	WB25A	60	30	M8	15	6000	100
25	WB25B	75	37,5	M8	15	6000	80
25	WB25C	120	60	M6	15	6000	50
25	WB25D	120	60	M8	15	6000	50
25	WB25E	150	75	M6	15	6000	40
25	WB25F	200	100	M6	15	6000	30
30	WB30A	60	30	M10	17	6000	100
30	WB30B	75	37,5	M10	17	6000	80
30	WB30C	100	50	M10	17	6000	60
30	WB30D	150	75	M6	15	6000	40
30	WB30E	150	75	M8	15	6000	40
30	WB30F	150	75	M10	15	6000	40
30	WB30G	200	100	M8	15	6000	30

* By request we can offer you these items in the induction hardened and hard chrome plated variant; the shaft part number becomes WBV

PRE-DRILLED SHAFTS



Shaft diameter D	Shaft part number	Pitch P	P/2	Nominal screw size	Thread Depth l	Standard length L	No. of bores
mm		mm	mm		mm	mm	

40	WB40A	75	37,5	M12	21	6000	80
40	WB40B	100	50	M12	21	6000	60
40	WB40C	150	75	M10	19	6000	40
40	WB40D	150	75	M8	21	6000	40
40	WB40E	200	100	M10	19	6000	30
40	WB40F	200	100	M8	17	6000	30
40	WB40G	300	150	M8	17	6000	20

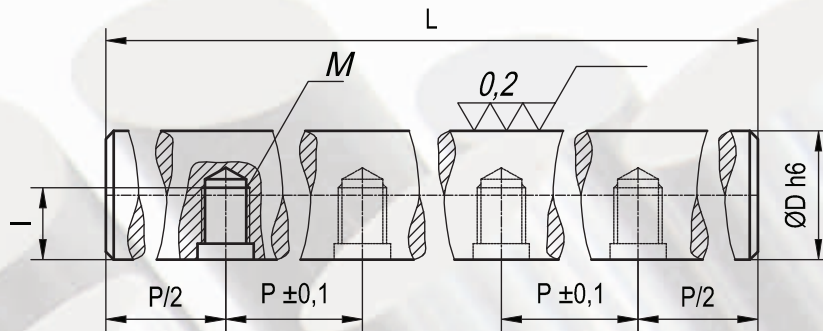
50	WB50A	100	50	M16	27	6000	60
50	WB50B	100	50	M14	25	6000	60
50	WB50C	150	75	M10	22	6000	40
50	WB50D	150	75	M10	21	6000	40
50	WB50E	200	100	M10	21	6000	30
50	WB50F	200	100	M12	21	6000	30
50	WB50G	300	150	M12	21	6000	20
50	WB50H	300	150	M10	21	6000	20

60	WB60A	100	50	M16	27	6000	60
60	WB60B	100	50	M14	25	6000	60
60	WB60C	150	75	M10	22	6000	40
60	WB60D	150	75	M10	21	6000	40
60	WB60E	200	100	M10	21	6000	30
60	WB60F	200	100	M12	21	6000	30
60	WB60G	300	150	M12	21	6000	20
60	WB60H	300	150	M10	21	6000	20
60	WB60I	300	150	M20	21	6000	20

80	WB80A	100	50	M16	27	6000	60
80	WB80B	100	50	M14	25	6000	60
80	WB80F	200	100	M12	21	6000	30
80	WB80G	300	150	M12	21	6000	20
80	WB80I	300	150	M20	21	6000	20
80	WB80J	300	150	M22	21	6000	20

* By request we can offer you these items in the induction hardened and hard chrome plated variant; the shaft part number becomes WBV

PRE-DRILLED SHAFTS



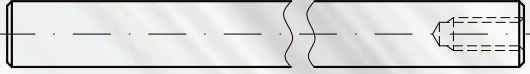
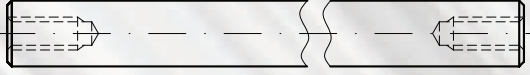
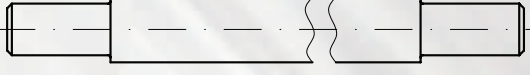
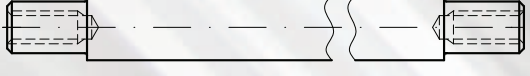
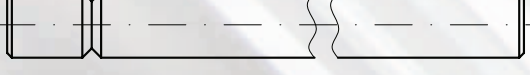
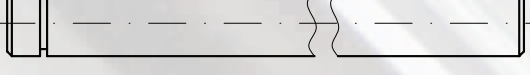
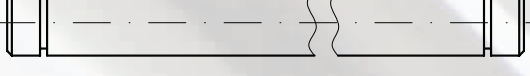
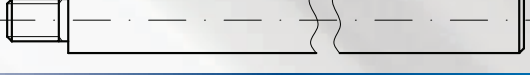
Major diameter D		Part No.	Diameter Tolerance Class "L"	Hole spacing	Standard Thread M(Size)	Dp (Depth)	Maximum Length L
<i>Inch</i>	<i>mm</i>	<i>inch</i>		<i>inch</i>	<i>inch</i>		<i>inch</i>
3/8	9.525	WBZ9xL - PD	-0.0005/-0.001	4	6-32	0.196	236
1/2	12.700	WBZ12xL - PD	-0.0005/-0.001	4	6-32	0.280	236
5/8	15.875	WBZ15xL - PD	-0.0005/-0.001	4	8-32	0.350	236
3/4	19.050	WBZ19xL - PD	-0.0005/-0.001	6	10-32	0.400	236
1	25.400	WBZ25xL - PD	-0.0005/-0.001	6	1/4-20	0.500	236
1 ¼	31.750	WBZ31xL - PD	-0.0005/-0.001	6	5/16-18	0.650	236
1 ½	38.100	WBZ38xL - PD	-0.0006/-0.0011	8	3/8-16	0.700	236
2	50.800	WBZ50xL - PD	-0.0006/-0.0013	8	1/2-13	0.850	236
2 ½	63.500	WBZ63xL - PD	-0.0007/-0.0015	8	1/2-13	1000	236
3	76.200	WBZ76xL - PD	-0.0008/-0.0017	10	1/2-13	1200	236

* By request we can offer you these items in the induction hardened and hard chrome plated variant; the shaft part number becomes WBVZ

CUSTOMIZED MACHINING

TEMPLATES (available in www.cromsteel.ro)

CODE no.

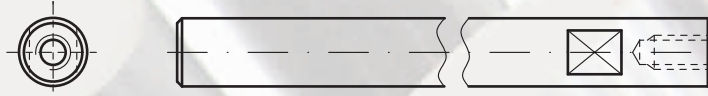
1		CR0001
2		CR0002
3		CR0003
4		CR0004
5		CR0005
6		CR0006
7		CR0007
8		CR0008
9		CR0009
10		CR0010
11		CR0011
12		CR0012
13		CR0013
14		 CR0014
15		 CR0015

CUSTOMIZED MACHINING

TEMPLATES (available in www.cromsteel.ro)

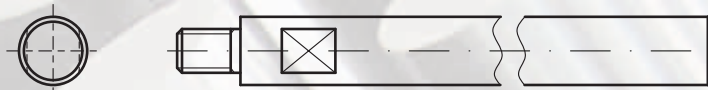
CODE no.

16



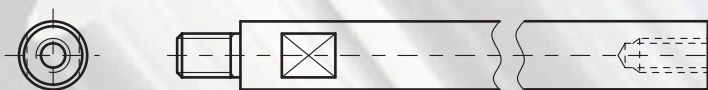
CR0016

17



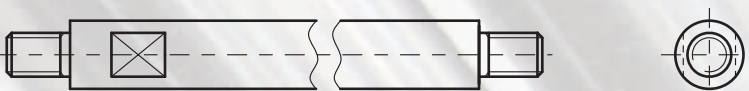
CR0017

18



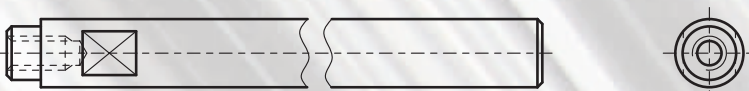
CR0018

19



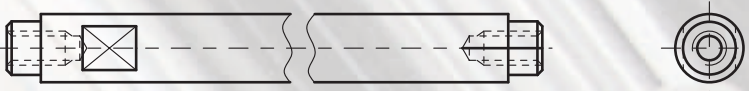
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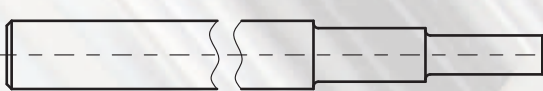
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21



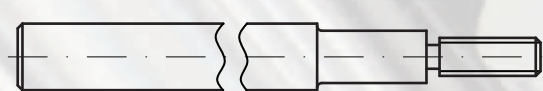
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22



CR0022

23



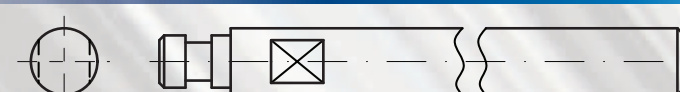
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24



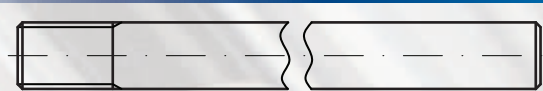
CR0024

25



CR0025

26



CR0026

27



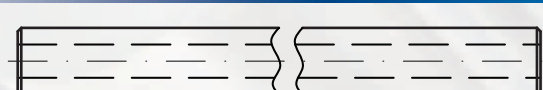
CR0027

28



CR0028

29



CR0029

30



CR0030

CUSTOMIZED MACHINING

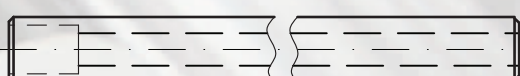
TEMPLATES (available in www.cromsteel.ro)

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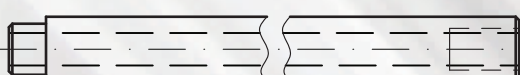
31  CR0031

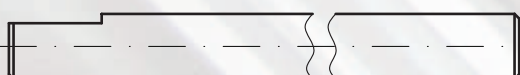
32  CR0032

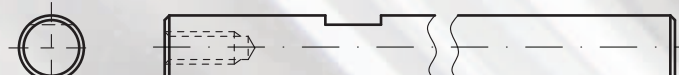
33  CR0033

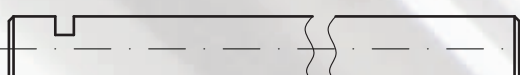
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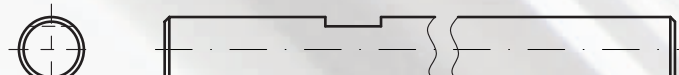
35  CR0035

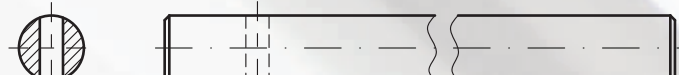
36  CR0036

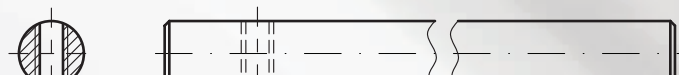
37  CR0037

38  CR0038

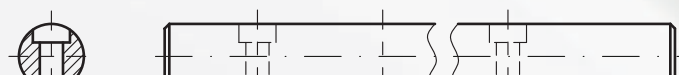
39  CR0039

40  CR0040

41  CR0041

42  CR0042

43  CR0043

44  CR0044

QUALITY control

Chemical composition: spectrometers

Metallographical structure: microscope

Cracks, hidden defects, antimixture: Dr. Foerster instruments

Tolerances: laser and digital micrometers, passmeters

Surface hardness: HRC durometer

Micro-hardness: HV durometer

Hardening depth

Surface roughness Ra, Rt, Rmax: surface finish tester

Roundness, parallelism, chrome layer thickness: specialized gauges



PACKING

Our products packaging
is recyclable

Unpacking our products
is very easy

Packing options:

- strong oiled
- plastic sleeve extrusion
- cardboard tubes
- plastic rings
- aluminium vacuum bags
- wooden cases
- wooden pallets or special pallets

Some cautions related to storage and handling:



- ▶ keep stored in a dry place
- ▶ do not expose the shafts to sunlight
- ▶ direct contact with the floor has to be avoided; it's preferable to use supports rubber or wood lined supports
- ▶ whenever possible, use the bridge crane to load or unload the bars; when you use fork lift be sure that this one is lined with wood, plastic or rubber
- ▶ during handling, always lift the bundles by using canvas or plastic belts
- ▶ always move linear shafts by lifting them from two points: lifting linear shafts from only one point (e.g. in the middle of their length) may badly affect straightness.
- ▶ be aware of the risk of corrosion; salty or polluted atmosphere are corrosive

SR OHSAS 18001:2008 / BS OHSAS 18001:2007
for the System of Health and Work Security

SR EN ISO 14001:2005, EN ISO 14001:2004
for the System of Medium Management

SR EN ISO 9001:2008, EN ISO 9001:2008
for Quality Management Systems

CERTIFICATE

no.: 277 S

This is to certify the Occupational Health and Safety Management Systems of

CROMSTEEL INDUSTRIES S.A.
Romania, Targoviste, no. 16, Laminorului Street, Dambovitza County

Complies with:
SR OHSAS 18001:2008 / BS OHSAS 18001:2007

Domain:
- Steel bars manufacturing by mechanical working, precision shafts and arbors (chrome plated and/or induction case-hardened); hard chromium plating and grinding.
- Steel tubes manufacturing by mechanical working for hydraulic applications.

References: RENAR Accreditation Certificate no. S
Audit Report no. 1335/05.14.2012

Recertification Date: 05.24.2012
Expire Date: 05.23.2015

Certificate Validity is conditioned by the annual surveillance
recertification with its complete renewal
This certificate may be suspended or withdrawn
if it found the conditions required for

Director
Constantin AVRAM

F-1008-07 / Ed. 2 AEROQ S.A.

CERTIFICATE

no.: 495 M

This is to certify the: Environmental Management System of

CROMSTEEL INDUSTRIES S.A.
Romania, Targoviste, no. 16, Laminorului Street, Dambovitza County

Complies with:
SR EN ISO 14001:2005, EN ISO 14001:2004

Domain:
- Steel bars manufacturing by mechanical working, precision shafts and arbors (chrome plated and/or induction case-hardened); hard chromium plating and grinding.
- Steel tubes manufacturing by mechanical working for hydraulic applications.

References: RENAR Accreditation Certificate no. S
Audit Report no. 1335/05.14.2012

Recertification Date: 05.24.2012
Expire Date: 05.23.2015

Certificate Validity is conditioned by the annual surveillance
recertification with its complete renewal
This certificate may be suspended or withdrawn
if it found the conditions required for

Director
Constantin AVRAM

F-1008-000/Ed. 3 AEROQ S.A. - 14 B, F

CERTIFICATE

no.: 598

This is to certify the Quality Management System of

CROMSTEEL INDUSTRIES S.A.
Romania, Targoviste, no. 16, Laminorului Street, Dambovitza County

Complies with:
SR EN ISO 9001:2008, EN ISO 9001:2008

Domain:
- Steel bars manufacturing by mechanical working, precision shafts and arbors (chrome plated and/or induction case-hardened); hard chromium plating and grinding.
- Steel tubes manufacturing by mechanical working for hydraulic applications.

References: RENAR Accreditation Certificate no. SM 003/09.20.2009
Audit Report no. 1335/05.14.2012

Recertification Date: 05.24.2012
Expire Date: 05.23.2015
Initial Certification Date: 06.27.2003

Certificate Validity is conditioned by the annual surveillance audits, confirmed by audit reports and by the
recertification with its complete renewal before the expiry of validity period (1 year)
This certificate may be suspended or withdrawn, if during the surveillance audits
it is found the conditions required for its approval are not achieved in

Director
Constantin AVRAM

F-1008-46 / Ed. 9 AEROQ S.A. - 14 B, Fecucii Street, Sector 1, Bucharest, Romania

