DANIELI MORGÅRDSHAMMAR	JOB N° DPC68X01	Doc.: 000-000-375-614 Rev: 00 Page: 1/15
	Customer: BARRAMANSA	

ROLLING MILL CALCULATIONS

FOR SQUARES

Remarks:

- For rolling sequences see drawing 000-000-361-339
- Calculations consider an average temperature of 1100°C at first stand entry

Rev.	Date	Description	Compiled	Checked	Approved
00	30-03-2023	ISSUED	Ciappa M.	Trevisan M.	

DOCUMENT CONTENTS

Remark:

- R-factor = elongation

1 Gear ratios and motors summarizing table

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

STAND NO.	STAND TYPE	GEAR RATIO 1^	GEAR RATIO 2^	MOTOR TYPE	MOTOR POWER (kW)	MOTOR RPM (RPM)
1H	GCC7555	118.730		AC	450	0 /1000 /2000
2V	GCC7555	85.673		AC	450	0 /1000 /2000
3H	GCC7555	118.730		AC	450	0 /1000 /2000
4H/V	GCC6548	74.409		AC	450	0 /1000 /2000
5H	GUC8548	87.594		AC	800	0 /1000 /2000
6H/V	GCC6548	68.825		AC	450	0 /1000 /2000
7H	GUC8548	55.247	73.990	AC	800	0 /1000 /2000
8H/V	GUC8548	43.393	58.768	AC	800	0 /1000 /2000
9H	GUC8548	37.442	49.768	AC	800	0 /1000 /2000
10H/V	GUC8548	27.471	37.083	AC	800	0 /1000 /2000
11H	GCC6548	17.428	26.576	AC	800	0 /1000 /2000
12H/V	GUC8548	13.852	27.600	AC	800	0 /1000 /2000
13H	GUC8548	11.734	22.354	AC	800	0 /1000 /2000
14H/V	GCC6548	9.471	18.603	AC	800	0 /1000 /2000
15H	GUC8548	9.841	19.250	AC	800	0 /1000 /2000

***Subject to the confidentiality clause ***

TERMINATED AT 10:46:28

2 Roll pass design calculations

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 3"
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.56 m/s
AXV : 3272.11 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 118.7 s
INTER BILLET : 15.0 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE	STOCK HEIGHT	STOCK WIDTH	AREA	REDUC TION
	(mm)	(mm)		(mm)	(mm)	(mm²)	(%)
			SQUARE	182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX	149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX	158.00	X 159.39	24563.0	13.8
3H	750.0	11.80	R.BOX	121.80	X 177.92	18738.4	23.7
4V	660.0	15.00	ROUND	136.00	X 136.12	14532.2	22.4
5H	660.0	6.00	DIAMOND	108.10	X 157.44	10185.0	29.9
6V	660.0	6.00	SQUARE	91.1 117.75	X 117.67	8155.8	19.9
7H	660.0	5.00	DIAMOND	93.50	X 123.91	6988.5	14.3
8V	660.0	5.00	SQUARE	77.1 100.05	X 100.05	5856.3	16.2

STAND NO.	SPEED	WORK DIA	ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	R O L L I N G LOAD	R O L L I N G TORQUE	R O L L I N G POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.11	627.8	3.5	118.730	415	1.163	122.2	1728.0	192.53	70	37.7
2V	0.13	613.9	4.1	85.673	355	1.160	136.1	1611.5	183.06	79	49.7
3H	0.17	656.5	5.1	118.730	603	1.311	93.5	2400.2	299.94	160	58.8
4V	0.23	568.2	7.6	74.409	563	1.289	91.8	1786.2	207.23	164	64.8
5H	0.32	601.3	10.2	87.594	894	1.427	58.7	2284.1	245.06	262	36.6
6V	0.40	596.7	12.8	68.825	884	1.249	63.3	1263.2	116.10	156	39.3
7H	0.47	608.6	14.7	55.247	812	1.167	51.4	1069.1	77.70	120	18.4
8V	0.56	606.5	17.6	43.393	764	1.193	53.5	1036.4	76.65	141	23.1

TOTAL ROLLING POWER : 1152 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 3" 3/4
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.50 m/s
AXV : 4589.25 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 84.6 s
INTER BILLET : 49.1 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE	STOCK HEIGHT	STOCK WIDTH	AREA	REDUC TION
	(mm)	(mm)		(mm)	(mm)	(mm²)	(%)
			SQUARE	182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX	149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX	158.00	X 159.39	24563.0	13.8
3H	750.0	11.80	R.BOX	121.80	X 177.92	18738.4	23.7
4V	660.0	15.00	ROUND	136.00	X 136.12	14532.2	22.4
5H	660.0	6.00	DIAMOND	119.20	X 152.50	10937.3	24.7
6V	660.0	6.00	SQUARE 96.4	126.10	X 126.10	9178.5	16.1

STAND NO.	SPEED	WORK DIA	ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	R O L L I N G LOAD	R O L L I N G TORQUE	R O L L I N G POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.16	627.8	4.9	118.730	582	1.163	122.2	1752.1	195.22	100	38.3
2V	0.19	613.9	5.8	85.673	498	1.160	136.1	1594.8	181.17	110	49.2
3H	0.24	656.5	7.1	118.730	846	1.311	93.5	2331.7	291.38	217	57.1
4V	0.32	568.2	10.6	74.409	790	1.289	91.8	1709.3	198.31	220	62.0
5H	0.42	594.3	13.5	87.594	1181	1.329	65.7	1838.3	184.46	260	32.6
6V	0.50	593.2	16.1	68.825	1108	1.192	66.8	1103.5	90.14	152	33.8

TOTAL ROLLING POWER : 1061 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 3" 1/4
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.50 m/s
AXV : 3445.75 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 112.7 s
INTER BILLET : 21.0 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE	STOCK HEIGHT	STOCK WIDTH	AREA	REDUCTION
	(mm)	(mm)		(mm)	(mm)	(mm²)	(%)
			SQUARE	182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX	149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX	158.00	X 159.39	24563.0	13.8
3H	750.0	11.80	R.BOX	121.80	X 177.92	18738.4	23.7
4V	660.0	15.00	ROUND	136.00	X 136.12	14532.2	22.4
5H	660.0	6.00	DIAMOND	119.20	X 152.50	10937.3	24.7
6V	660.0	6.00	SQUARE	96.4 126.10	X 126.15	9179.2	16.1
7H	660.0	5.00	DIAMOND	103.20	X 130.88	8103.6	11.7
8V	660.0	5.00	SQUARE	83.6 109.15	X 109.15	6891.5	15.0

STAND NO.	SPEED	WORK DIA	ROLLING ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	ROLLING LOAD	ROLLING TORQUE	ROLLING POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.12	627.8	3.7	118.730	437	1.163	122.2	1730.5	192.81	74	37.8
2V	0.14	613.9	4.4	85.673	374	1.160	136.1	1607.3	182.58	83	49.6
3H	0.18	656.5	5.3	118.730	635	1.311	93.5	2386.6	298.24	167	58.5
4V	0.24	568.2	8.0	74.409	593	1.289	91.8	1771.7	205.55	172	64.3
5H	0.32	594.3	10.1	87.594	887	1.329	65.7	1923.1	192.96	205	28.8
6V	0.38	593.2	12.1	68.825	832	1.192	66.8	1164.5	95.12	120	32.2
7H	0.43	603.1	13.5	55.247	744	1.133	56.9	990.1	70.39	99	16.7
8V	0.50	601.9	15.9	43.393	688	1.176	58.1	1088.7	79.47	132	24.0

TOTAL ROLLING POWER : 1053 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 4"
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.50 m/s
AXV : 5190.76 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 74.8 s
INTER BILLET : 58.9 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE	STOCK HEIGHT	STOCK WIDTH	AREA	REDUCTION
	(mm)	(mm)		(mm)	(mm)	(mm²)	(%)
			SQUARE	182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX	149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX	158.00	X 159.39	24563.0	13.8
3H	750.0	18.10	R.BOX	128.10	X 174.26	19688.7	19.8
4V	660.0	19.00	ROUND	141.00	X 141.03	15616.2	20.7
5H	660.0	6.00	DIAMOND	126.30	X 155.62	12093.3	22.6
6V	660.0	6.00	SQUARE 102.	132.30	X 132.30	10381.5	14.2

STAND NO.	SPEED	WORK DIA	ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	ROLLING LOAD	ROLLING TORQUE	ROLLING POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.18	627.8	5.5	118.730	658	1.163	122.2	1765.0	196.65	114	38.5
2V	0.21	613.9	6.6	85.673	563	1.160	136.1	1594.5	181.13	125	49.2
3H	0.26	655.1	7.7	118.730	913	1.248	94.9	2056.4	244.44	197	47.9
4V	0.33	568.3	11.2	74.409	831	1.261	91.7	1676.9	188.36	220	58.9
5H	0.43	588.3	13.9	87.594	1221	1.291	71.7	1751.9	172.52	252	31.5
6V	0.50	587.5	16.3	68.825	1119	1.165	72.5	1102.2	87.29	149	33.0

TOTAL ROLLING POWER : 1056 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 3" 1/2
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.50 m/s
AXV : 3990.29 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 97.3 s
INTER BILLET : 36.4 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE		STOCK HEIGHT	STOCK WIDTH	AREA	REDUCTION
	(mm)	(mm)		(mm)	(mm)	(mm)	(mm²)	(%)
			SQUARE		182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX		149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX		158.00	X 159.39	24563.0	13.8
3H	750.0	18.10	R.BOX		128.10	X 174.26	19688.7	19.8
4V	660.0	19.00	ROUND		141.00	X 141.03	15616.2	20.7
5H	660.0	6.00	DIAMOND		126.30	X 155.62	12093.3	22.6
6V	660.0	6.00	SQUARE	102.	132.30	X 132.27	10381.0	14.2
7H	660.0	6.00	DIAMOND		111.46	X 136.40	9280.1	10.6
8V	660.0	6.00	SQUARE	90.0	117.01	X 117.01	7980.6	14.0

STAND NO.	SPEED	WORK DIA	ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	ROLLING LOAD	ROLLING TORQUE	ROLLING POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.14	627.8	4.3	118.730	506	1.163	122.2	1740.0	193.87	86	38.0
2V	0.16	613.9	5.1	85.673	433	1.160	136.1	1598.7	181.61	96	49.3
3H	0.20	655.1	5.9	118.730	702	1.248	94.9	2089.3	248.35	154	48.7
4V	0.26	568.3	8.6	74.409	639	1.261	91.7	1722.4	193.47	174	60.5
5H	0.33	588.3	10.7	87.594	938	1.291	71.7	1814.4	178.68	200	26.7
6V	0.38	587.5	12.5	68.825	860	1.165	72.5	1150.3	91.10	119	30.8
7H	0.43	598.0	13.7	55.247	759	1.119	62.0	960.4	66.94	96	15.9
8V	0.50	597.8	16.0	43.393	693	1.163	62.2	1120.7	81.95	137	24.7

TOTAL ROLLING POWER : 1063 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

DANIELI-MORGARDSHAMMAR PASS DESIGN DEPT.
SPEED CALCULATION FOR HOT ROLLING MILL 30/03/23

JOB NO. : DPC68X01 LAYOUT NO. : 000-000-361-339

SECTION ROLLED : Square 4" 1/4
Hot rolling
MATERIAL : High carbon
ROLLING SPEED : 0.50 m/s
AXV : 5884.27 mm²m/s
BILLET SIZE : 182.3 mm SQUARE
BILLET WEIGHT : 2970.0 kg
MAX HEATING CAPABILITY : 80.0 t/h
ROLLING TIME : 66.0 s
INTER BILLET : 67.7 s
PRODUCTION : 80.0 t/h

STAND NO.	ROLL DIA	GAP	GROOVE TYPE	STOCK HEIGHT	STOCK WIDTH	AREA	REDUCTION
	(mm)	(mm)		(mm)	(mm)	(mm²)	(%)
			SQUARE	182.30	X 182.30	33147.4	
1H	750.0	25.00	BOX	149.00	X 193.64	28502.0	14.0
2V	750.0	18.00	BOX	158.00	X 159.39	24563.0	13.8
3H	750.0	15.00	BOX	125.00	X 170.04	20949.1	14.7
4V	660.0	18.00	BOX	138.00	X 134.10	18079.3	13.7
5H	660.0	25.00	BOX	109.80	X 146.30	15788.3	12.7
6V	660.0	20.00	BOX	120.00	X 117.74	13886.5	12.0
7H	660.0	31.50	BOX	105.50	X 123.78	12781.2	8.0
8V	660.0	9.95	BOX	109.35	X 109.35	11768.5	7.9

STAND NO.	SPEED	WORK DIA	ROLL RPM	GEAR RATIO	MOTOR RPM	R FACTOR	GROOVE FACTOR	ROLLING LOAD	ROLLING TORQUE	ROLLING POWER	UTIL
	(m/s)	(mm)	(RPM)		(RPM)		(mm)	(kN)	(kNm)	(kW)	(%)
	1.20										
1H	0.21	627.8	6.3	118.730	746	1.163	122.2	1780.1	198.34	130	38.9
2V	0.24	613.9	7.5	85.673	638	1.160	136.1	1596.8	181.39	142	49.3
3H	0.28	641.8	8.4	118.730	992	1.173	108.2	1744.2	188.95	165	37.0
4V	0.33	543.2	11.4	74.409	852	1.159	116.8	1378.9	138.56	166	43.3
5H	0.37	577.1	12.3	87.594	1080	1.145	82.9	1370.5	120.24	155	19.4
6V	0.42	562.1	14.4	68.825	991	1.137	97.9	1214.5	112.00	169	37.9
7H	0.46	588.2	14.9	55.247	826	1.086	71.8	956.4	64.10	100	15.2
8V	0.50	562.3	17.0	43.393	737	1.086	97.7	914.3	63.35	113	19.1

TOTAL ROLLING POWER : 1141 kW

*** Subject to the confidentiality clause *** M

TERMINATED AT 10:46:28

3 Motor utilization diagrams