

# ASSAB 705M

## M-STEELS... A new concept in machinery steels

ASSAB M-steels are machinery steels with unique machinability. They are made by a special melting technique which makes it possible to increase the cutting speed by up to 30% or extend the tool life up to four times.

### NEAREST STANDARDS

AISI/SAE	DIN	W.nr.	BS	AFNOR	JIS	SS
4340	34CrNiMo6	1.6582	817M40 (EN 24)	35NCD6	SNCM8	2541

### CHEMICAL COMPOSITION

C %	Si %	Mn %	Cr %	Ni %	Mo %
0.36	0.25	0.70	1.40	1.40	0.20

### PROPERTIES AND APPLICATIONS

ASSAB 705M is an alloyed machinery steel with good hardenability also in heavier sizes. It combines high strength with best toughness. As standard ASSAB 705M is supplied tough hardened with no further heat treatment required. It can be oil hardened to higher mechanical properties if required.

ASSAB 705M is suitable for induction hardening and can also be nitrided or tuffrided to a surface hardness of 600—650 Vickers.

ASSAB 705M is not suitable for welding but can with certain precautions be repair welded.

### SIZE RANGE

ASSAB 705M is available in standard sizes:

10—210 mm diameter, unmachined

25—204 mm diameter, pre-machined

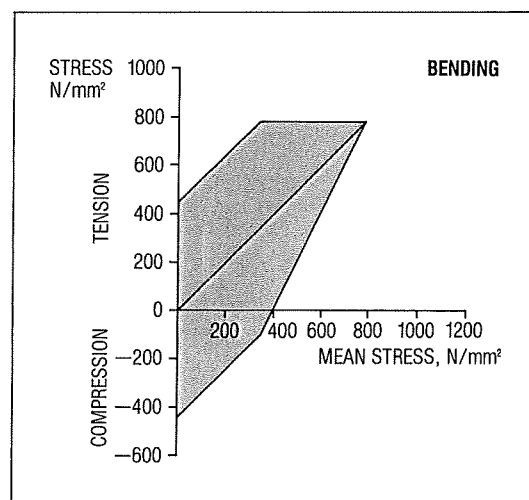
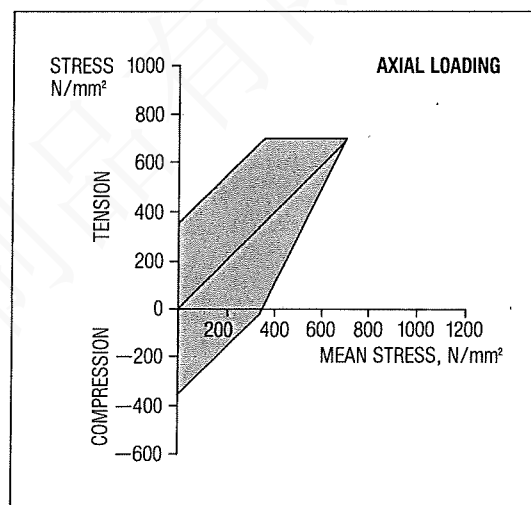
In non M-execution ASSAB 705 is available in standard sizes 210 mm to 450 mm diameter.

### MECHANICAL PROPERTIES AS SUPPLIED

Yield strength, Re	min. 700 N/mm <sup>2</sup>
Tensile strength, Rm	900—1100 N/mm <sup>2</sup>
Elongation, A5	min. 12%
Reduction of area, Z	min. 45%
Impact strength, KU	min. 20 J
Hardness	275—335 Brinell

The mechanical properties are guaranteed for sizes up to and including 250 mm diameter.

### Fatigue strength diagram according to Goodman (Smith)



# CUTTING DATA

## Turning with coated carbide tools P15

### ROUGH TURNING

Tool life T = 15 min

Feed s mm/r	Cutting depth a, mm			Power requirement per cutting depth, kW/mm
	<2	2—5	>5	
Cutting speed v, m/min				
0.25	290	260	230	3.7
0.32	250	230	205	4.0
0.40	220	205	185	4.2
0.50	200	185	170	4.4
0.65	175	160	140	4.8
0.80	150	140	120	5.2

### FINE TURNING

The feed is determined on the basis of reference radius (nose radius) and desired surface finish

Tool life T = 30 min

Surface roughness R <sub>a</sub> μm	Reference radius r, mm			
	0.4	0.8	1.2	1.6
Feed s, mm/r				
0.8	0.08	0.10	0.12	0.16
1.6	0.12	0.16	0.20	0.25
3.2	0.16	0.20	0.25	0.32
6.3	0.25	0.32	0.40	0.50

### Recommended cutting speed

Feed s, mm/r	Cutting speed v, m/min
0.12	290
0.16	265
0.20	240
0.25	215
0.32	200
0.40	180

### CORRECTION COEFFICIENTS

		Coefficient for cutting speed
Tool (coated)	P15	1.00
	P25	0.95
	P35	0.85
Cutting conditions	Forged or rolled surface	0.7—0.9
	Non-continuous machining or large variations in cutting depth	0.8—0.9
	Internal turning	0.8
	Work piece difficult to machine or poor condition of the machine	0.7—0.9

## Drilling with high speed steel drills

### Cutting lubrication, emulsion

Cutting speed v = 20 m/min

Diam. of drill	Feed	Revolu- tions	Feeding speed	Power con- sump- tion	Drilling depth to 1st chip removal	Drilling depth to next chip removal
d mm	s mm/r	n r/min	n × s mm/min	P kW	mm	mm
3	0.06	1805	108	0.2	12	6
4	0.08	1355	108	0.2	15	8
5	0.09	1080	97	0.3	20	8
6	0.11	900	99	0.4	25	10
8	0.14	675	95	0.6	30	12
10	0.17	540	92	0.8	35	14
12	0.19	450	86	1.0	40	16
16	0.23	340	78	1.4	50	20
18	0.25	300	75	1.6	50	20
20	0.27	270	73	1.9	55	22
25	0.28	215	61	2.3	65	24
30	0.29	180	52	2.7	70	26
40	0.31	135	42	3.5	90	26
50	0.34	110	37	4.3	110	26

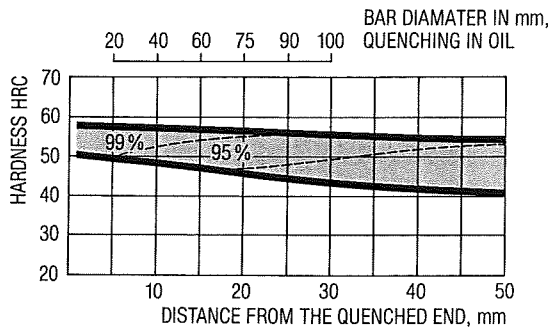
### CORRECTION COEFFICIENTS

		Coefficient for cutting speed	Coefficient for feed
Drilling depth l	l ≤ 4 × d	1.00	1.00
	l = 4 × d — 8 × d	0.80	0.80
Machining condition	Through hole	0.85	
	Poor condition or lack of stability of the machine	0.80	0.80
	Especially favour- able machining conditions	1.20	

*The values in the above tables are applicable for ASSAB 705M, tough hardened to 275—335 HB as supplied.*

# HEAT TREATMENT

## Hardenability diagram



## Soft annealing at 650—700°C

Soak at temperature for 2 hours. Cool with furnace at a maximum rate of 15°C per hour down to 600°C, and then freely in air.

## Stress relieving at 450—650°C

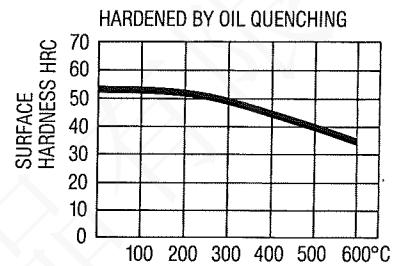
Tough hardened steel should be heated to approximately 50°C below the temperature at which tempering was carried out (as standard ASSAB 705M is supplied tempered at 600°C and should, then, be stress relieved at 550°C). Soak for 1/2—2 hours after the material has reached full temperature. Cool with furnace down to 450°C, and then freely in air.

**Hardening at 830—850°C** with quenching in oil. Soaking time in minutes when the surface has attained full temperature, is 0.7 × thickness in mm. Interrupt the quenching at 125°C and temper immediately afterwards.

## Tempering at 500—700°C

Soaking time should be 1—2 hours after the workpiece has attained full temperature throughout.

## Tempering diagram



## Effect of tempering temperature on the mechanical properties

$R_e$  YIELD STRENGTH OR 0.2% PROOF STRESS, N/mm<sup>2</sup>

$A_5$  ELONGATION AFTER FRACTURE, MEASURING LENGTH 5XD, %

$R_m$  TENSILE STRENGTH, N/mm<sup>2</sup>

Z REDUCTION OF AREA, %

HB BRINELL HARDNESS

TESTPIECE HARDENED BY OIL QUENCHING FROM 850°C.

