

Datasheet



Precise power transmission of non-aligned elements



Features at a glance

Flexible shafts type **AF-M** provide an economical and practical solution to transfer the rotary movement between two non-aligned elements.

Excellent compensation of misalignments and damping of vibrations and shocks.

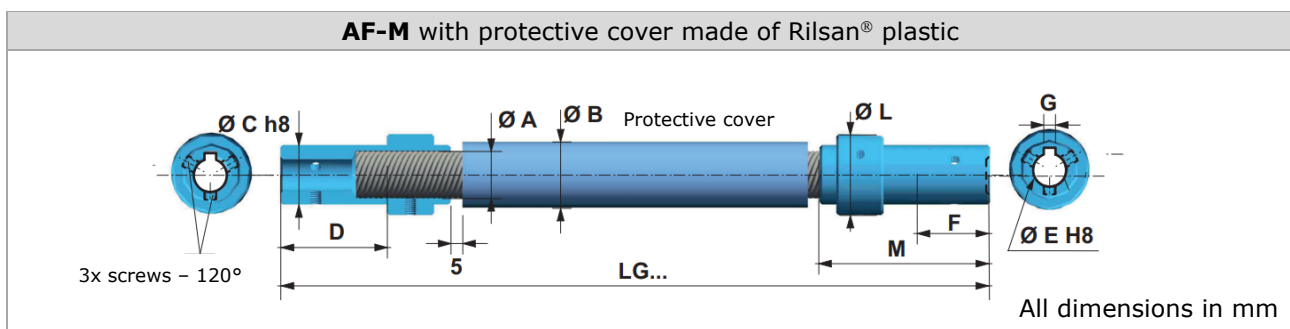
- Universal applicability, high reliability, maintenance-free and easy-of-use.
- Smooth-running and silent operation.
- Suitable for manual and motorised drives.
- Simple and quick installation, without the need for other supports.
- Terminal couplings made of solid stainless steel (AISI 303).
- Protective cover made of Rilsan® plastic for lengths above 400 mm.

The low cost and easy installation allow a variety of applications: packaging machines, machine tools with numerical control, automation technology, robots, lifting adjustments, etc.



Available terminal couplings: **CL** = cylindrical shaft; **CF** = cylindrical hollow shaft; **CM** = cylindrical solid shaft with key; **CMB** = cylindrical solid shaft with two-piece bushings with screws for easy assembly.

Dimensions and efficiency table



Version	Flexible shaft	Protective cover	Terminal	Effective length	Inner coupling	Bore depth	Key
	Ø A	Ø B	Ø C	D	Ø E	F	G
AF6M	6	12	12	30	6	20	-
AF8M	8	14	15	30	8	20	-
AF12M	12	20	17	37	10	26	3
AF15M	15	22	20	37	10	26	3
AF20M	20	35	25	45	14	32	5

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Efficiency table (Continued)

Version	Terminal cover	Terminal	Torsion	Binding radius*	Torque	Weight
	Ø L	M	(°)	mm	Nm	g
AF6M	15	45	80	70	3	800
AF8M	20	45	70	90	4.5	1100
AF12M	26	56	50	160	9	1600
AF15M	28	56	28	300	12	2100
AF20M	34	72	18	400	18.5	3300

The data refer to flexible shafts with a total length of 1000 mm. * Minimal bending radius.
Protective cover made of Rilsan® plastic; recommended against oil, grease, dirt, corrosive agents, etc. for lengths above 400 mm.

Ordering example

Type	AF12M	-	200	-	DX	-	CL-CM	-	RILSAN
<p>AF06M = flexible shaft Ø6 mm AF08M = flexible shaft Ø8 mm AF12M = flexible shaft Ø12 mm AF15M = flexible shaft Ø15 mm AF20M = flexible shaft Ø20 mm</p>									
Total length (mm)	In xxx mm (on request)								
Rotation	<p>DX = for operation in clockwise (right-hand) direction SX = for operation in counter-clockwise (left-hand) direction</p>								
Terminal couplings (indication per shaft end)	<p>CL = cylindrical shaft CF = cylindrical hollow shaft CM = cylindrical solid shaft with key CMB = cylindrical solid shaft with two-piece bushings Q = cylindrical square shaft</p>								
Protective cover	RILSAN = Protective cover made of Rilsan® plastic for lengths above 400 mm.								



Other versions that cannot be generated from the order code are available on request as special versions.

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Terminal couplings for TR, ASR, GR made of solid stainless steel (AISI 303), available versions

Q	CL	CF	CM	CMB	Q = cylindrical square shaft		
Legend							
$\varnothing A$	Diameter of flexible shaft				$\varnothing A$	B	C
$\varnothing B$	Diameter of square shaft				6	5	30
C	Total length				8	6.5	35
D	Available length / bore depth				10	8 - 8.5	40
E	Key				12	10	40
$\varnothing F$	Diameter hollow-/solid shaft				15	12 - 13	45
$\varnothing G$	Outer diameter bushing				20	16.5 - 17.5	45

CL = cylindrical solid shaft					CF = cylindrical hollow shaft					
				<i>* available - nutzbar</i>						
$\varnothing A$	$\varnothing B$	C	D		$\varnothing A$	$\varnothing B$	C	D	E	$\varnothing F$
6	10	28	12		6	10	28	10	-	6
8	12	38	16		8	12	38	15	-	8
10	14	44	20		10	14	44	15	-	8
12	16	48	22		12	16	48	16	3	10
15	20	50	25		15	20	50	16	3	10
20	25	57	30		20	25	57	20	5	14

CM = cylindrical solid shaft with key						CMB = cylindrical solid shaft, two-piece bushings						
$\varnothing A$	$\varnothing B$	C	D	E	$\varnothing F$	$\varnothing A$	$\varnothing B$	C	D	E	$\varnothing F$	$\varnothing G$
6	10	28	10	-	6	6	10	10	39	-	6	14
8	12	38	14	-	8	8	12	12	53	-	8	22
10	14	44	14	-	8	10	14	14	59	-	8	22
12	16	48	15	3	10	12	16	16	64	3	10	24
15	20	50	15	3	10	15	20	20	66	3	10	24
15	20	50	15	5	14*	15	20	20	76	5	14*	32*
20	25	57	20	5	14	20	25	25	78	5	14	32

* optional

All dimensions in mm

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Mechanical characteristics

Flexible shafts are mechanical elements subjected to torque and elastic deformation. When considering a single flexible shaft, the equal and opposite torques acting on both sides cause a relative rotation of the different sections that is proportional to the length.

The relationship between applied torque **T [Nm]** and twist angle of the extremities **φ [°]** is obtained as a function of the following three parameters:

- Torsional rigidity **k [10³Nm / °]**,
- which depends on the section diameter and the construction characteristics
- - length of the shaft **L [mm]**
- - Rotation direction **r**,
- dimensionless parameter characterising the asymmetrical behaviour of the shaft

$$\varphi = \frac{T}{rK} \cdot L$$

$$T = \frac{rk}{L} \cdot \varphi$$

The parameter **r** is equal to **1** when the shaft is loaded according to the winding direction of the spiral. When loaded in the opposite direction, **r < 1**, as indicated in the following table:

Flexible shaft parameters				
∅	k[10 ³ Nm/°]	r	T _{max} [Nm]	Φ [°]*
4	17	0.55	1.1	46.71
5	26	0.55	1.8	69.23
6	38	0.55	3.0	78.95
8	67	0.55	4.5	67.16
10	101	0.55	7.5	74.26
12	180	0.65	9.0	50.00
15	405	0.80	12.5	30.86
20	1050	0.85	18.5	17.62

* The data refer to a length of T_{max} = 1000 mm.



Direction of rotation and winding

Flexible shafts differ both in their construction and in their direction of winding. A left-wound shaft (related to its outermost layer) can transmit a higher torque in clockwise direction than in counter-clockwise direction. A right-wound shaft can transmit a higher torque in counter-clockwise direction than in clockwise direction.

Outermost layer **left-wound**, for **operation in clockwise** (right-hand) **direction**.
Outermost layer **right-wound**, for **operation in counter-clockwise** (left-hand) **direction**.

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Efficiency diagrams and tables



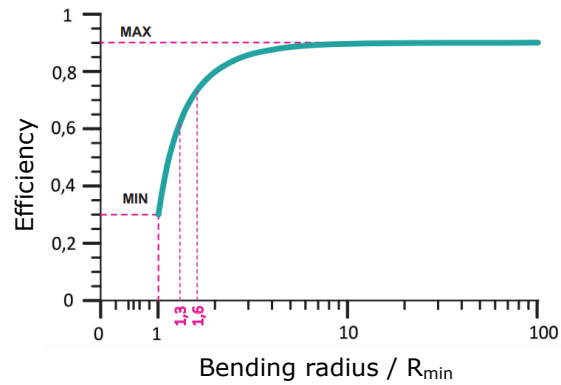
To identify the flexible shaft most suitable for your requirements, refer to the values in the tables.

If the actual loads and efficiency cannot be clearly determined, please contact our technical department.

All tables show linear dimensions in [mm] unless otherwise specified.
All forces, efficiency and loads are given in [N] or [Nm] (10 N = 1 kg or 10 N·m = 1 kg·m) unless otherwise specified.

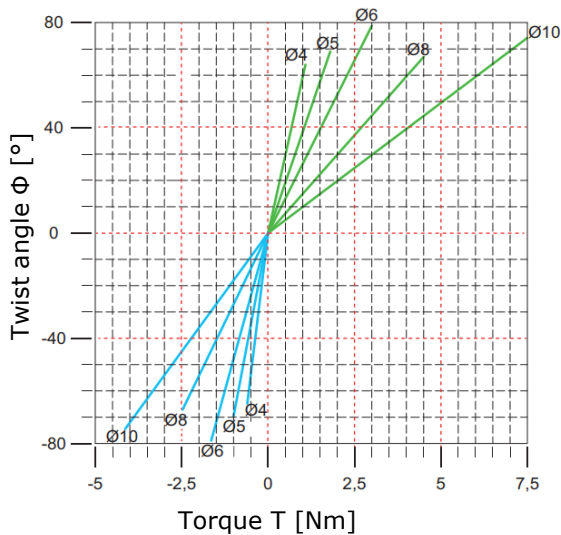
Bending radius

The diagram shows a qualitative-quantitative curve of the efficiency of the flexible shafts as a function of the bending radius. For configurations with a pseudo-straight line, the efficiency is equal to the maximum value of 0.9. The efficiency is nearly constant for high values of the bending radius and decreases rapidly towards the minimum bending radius of 0.2.

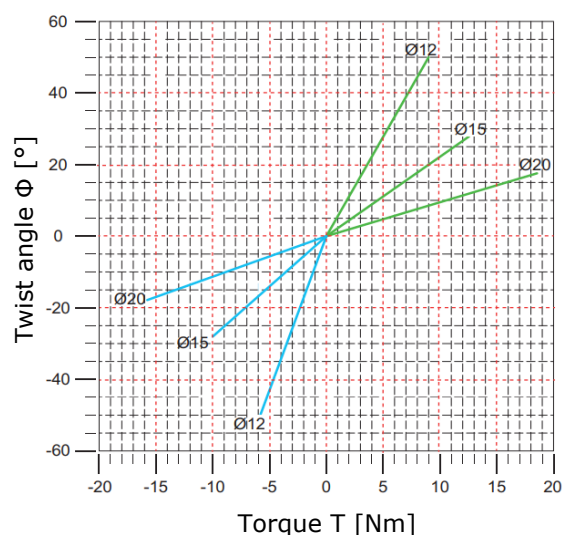


Twist angle / Torque*

For diameters from $\varnothing 4$ to $\varnothing 10$ mm

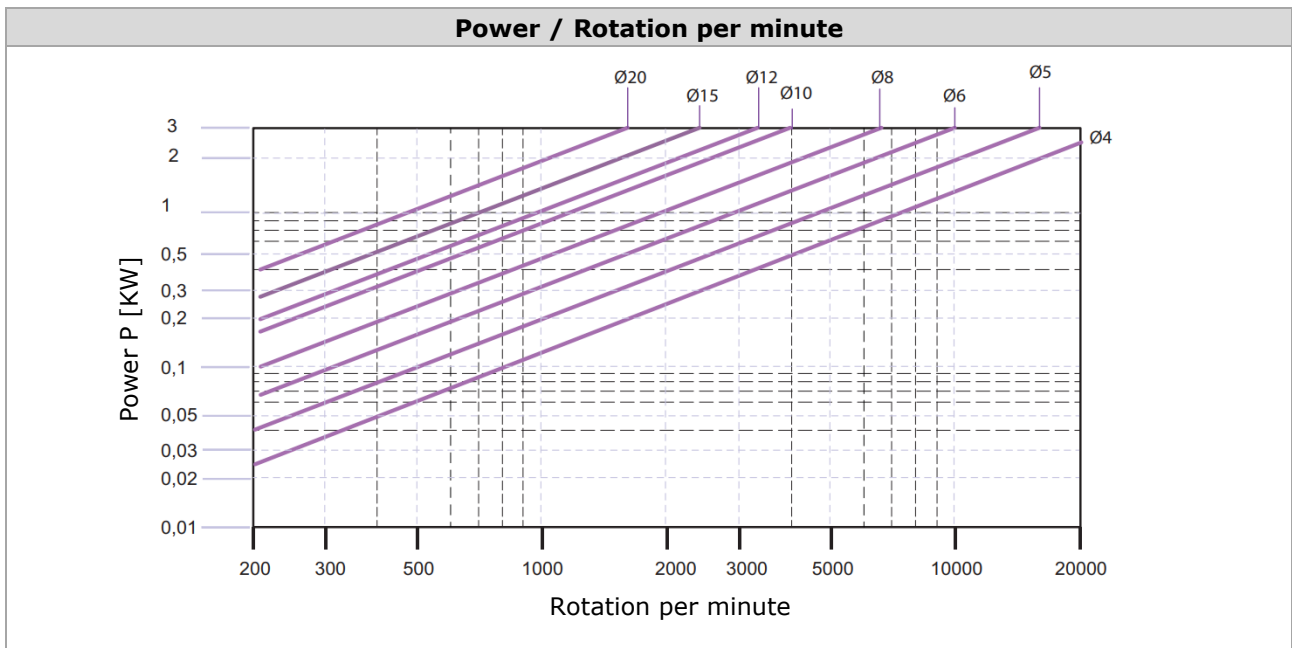


For diameters from $\varnothing 12$ to $\varnothing 20$ mm



* The data refer to flexible shafts with a total length of 1000 mm.

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Manufacturer: **FIAMA**
since 1913

The manufacturer reserves the right to make changes to the products that it deems necessary for their improvement without prior notice.

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