

BA 14.9001  
392 888 EN

# **magneta**

## ***Operating Instructions***



***Magnetic-particle clutches***

***Type 14.501 / 14.502***

***Magnetic-particle brakes***

***Type 14.512***

**Please first read these Operating Instructions before taking any action/s.**

**Manufacturer / location:**

magneta GmbH & Co KG  
 Dibbetweg 31  
 D-31855 Aerzen  
 borough: Groß Berkel  
 Tel.: (05154) 95 31 31  
 Fax: (05154) 95 31 41  
 E-Mail: Info@magneta.de  
 Internet: www.magneta.de

The year of manufacture is given on the packaging label

These Operating Instructions apply to the

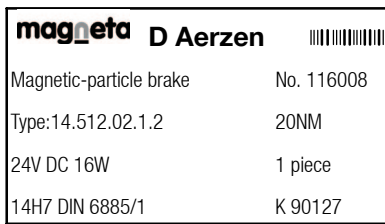
Magnetic-particle clutch Type 14.501

Type 14.502

Magnetic-particle brake Type 14.512

## Nameplate

## Design

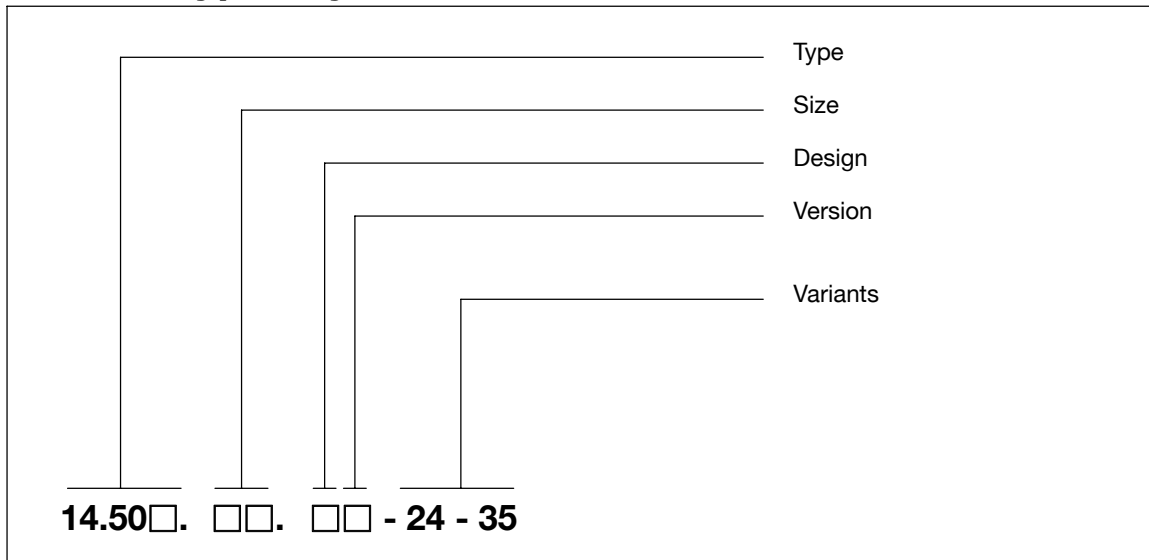
Field	Content	Example
1	Assembly plant Barcode no.	
2	Name Materials number	
3	Type Torque	
4	Power supply voltage Capacity Quantity: pcs.	
5	Bore Date of manufacture	

BA 14.9001

Author: magneta GmbH & Co KG

3th edition: 01/02

## Type key



### Type

- 14.501 Clutch with spade plug connection
- 14.502 Clutch with slip rings
- 14.512 Brake with spade plug connection

### Size

01, 02, 03, 04, 08, 16, 32

### Design

- 1 without heat sink
- 2 with heat sink
- 3 with heat sink and separate fan

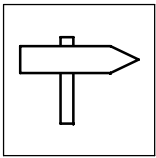
### Version

- 1 with shaft
- 2 with hollow shaft

### Variants

Voltage, bore and/or shaft diameter.

Temperature sensor: normally-closed or opened

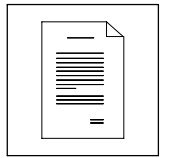


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## Declaration of Conformity / Manufacturer's Certification

## Service addresses



## 1 Preface and general information

### 1.1 How to use these Operating Instructions

- These Operating Instructions are intended to ensure that work on and with magnetic-particle clutches and brakes of the 14.501/502/512 type is performed safely. They contain safety information that must be observed.
- All personnel using and/or working on these clutches and brakes must have these Operating Instructions to hand at all times and must observe the relevant information and notes in them.
- These Operating Instructions must always be maintained in complete and perfectly legible condition.

#### 1.1.1 Terminology used

##### Units

The term "unit" is used in the text that follows to denote magnetic-particle clutches and/or brakes.

### 1.2 Scope of delivery

- Unit
- For clutches:
  - Brushes
  - Brush holders
- Commissioning notes
- Check immediately after receipt of shipment that the scope of delivery tallies with the accompanying paperwork.
- Claim:
  - Visible transport damage immediately of the forwarder
  - Visible deficiencies/incompleteness immediately of the magneta company.

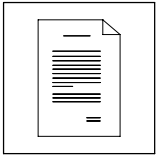
### 1.3 Magnetic-particle clutches and brakes, type 14.501/502/512

#### 1.3.1 Labelling

- magneta- Units are uniquely and unmistakably labelled by the content of their nameplates.
- CE labelling: conforms with EC Guideline " "Low-voltage". No CE labelling is permissible below 75 V DC; from 75 V DC up, such labelling is required and extant.

#### 1.3.2 Application as directed

- Operate the units only under the operating conditions prescribed in these Operating Instructions.



## **Preface and general information**

### **Magnetic-particle clutches and brakes**

- are components
  - intended for installation in/on plant and machinery and
  - for assembly together with other components to a machine;
- are electrical components;
- are not to be operated outside their individual performance/capacity limits;
- fulfil the protective requirements of the EC "Low voltage" Guideline "
- are not machines within the meaning of the EC "Machines" Guideline ";
- are not household equipment but exclusively intended for commercial use as components.

### **Magnetic-particle clutches and brakes**

- comply with the EC Guideline "on "Electromagnetic compatibility", provided they are installed as required by CE-typical drive systems.
- can be used
  - on public and private networks,
  - and in the industrial, commercial and domestic fields.
- The user is responsible for adherence to EC Guidelines where machinery use is concerned.

### **Any other use shall be deemed inappropriate**

## **1.3.3 Legal regulations**

### **Liability**

- The information, data and notes in these Operating Instructions were state-of-the-art at the time of printing. Claims referring to units already supplied cannot be derived from the information, illustrations and descriptions given.
- The process engineering information and circuitry parts given in these Operating Instructions are suggestions whose transferability to particular applications must be checked in every individual case. **magneta** cannot accept any liability whatsoever for the suitability of the procedures and circuitry parts given.
- We cannot accept any liability whatsoever for damage and/or operational malfunctions due to:
  - disregarding these Operating Instructions,
  - unauthorised modification of/to any unit/s,
  - operating faults,
  - inappropriate/improper working on and/or with the unit/s, and/or
  - inappropriate use.

### **Warranty**

- Conditions of warranty: please refer to our General Terms and Conditions of Business for the goods and services supplied by **magneta** GmbH & Co KG.
- Warranty claims must be made of **magneta** immediately the fault/s and/or defect/s concerned is/are detected.
- The warranty is null and void in all cases in which no liability claim/s can be made as well.



## 2 Safety information

### 2.1 Persons responsible for safety

#### Operator

- An operator is any natural or legal person who uses the unit/s or on whose behalf same is/are used.
- The operator or their safety officer must ensure,
  - that all relevant applicable regulations, notes and laws are adhered to,
  - that only qualified personnel work on and/or with the unit/s,
  - that personnel always have these Operating Instructions available to them during all relevant operations, and
  - that unqualified personnel are prohibited from working on/with the unit/s.

#### Qualified personnel

Qualified personnel are persons who - because of their training, experience, familiarisation, instruction and knowledge of relevant Standards and regulations, accident prevention rules and operating conditions- have been authorised by the person/s responsible for plant safety to perform the activities required and are able to recognise and avoid possible risks in so doing. (Definition of qualified personnel per IEC 364)

### 2.2 General safety information

- No claim is made that these safety notes are comprehensive. In the event of queries and/or problems, please refer to the **magneta** company.
- The units are state-of-the-art when supplied and considered fundamentally safe to operate.
- Risks to life and limb, to the units themselves and to other assets of the operator may arise from operating the units if
  - unqualified staff work on/with the units, and/or
  - the units are used improperly.
- The process engineering and circuitry information given in these Operating Instructions constitute suggestions only and their applicability to the particular individual applications must always be checked in each and every case.
- Use of the units must be such that they fulfil their function in fault-free operation if properly installed and used and do not constitute any danger to persons. This also applies to their interaction with the plant as a whole.
- Take additional measures to limit the consequences of malfunction/s possibly giving rise to any risk to persons and/or damage to material/s.
  - Electrical or non-electrical safety equipment (locking devices or mechanical blocks),
  - System-wide measures.
- Only operate the units when they fully comply with all safety requirements.
- Changes and/or modifications during the warranty period result in all warranty claims becoming null and void. This also applies should repairs be made without our knowledge and consent or if any attempt is made to repair a fault autonomously (Chapter 1.3.3 refers).



## Safety information

### 2.3 Layout of safety information

- All safety information in these Operating Instructions is laid out uniformly, as below.



#### Signal word

Note

- The icon labels / the risk type.
- The signal word labels the severity of the risk.
- The note text describes the risk and supplies information on how it may be avoided.

#### Warning of danger to persons

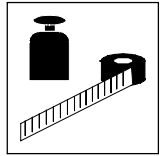
Icons used	Signal words	
 Warning of hazardous electric voltage	<b>Danger!</b>	Warns of <b>impending danger</b> . Consequence if disregarded: death or severe injuries.
	<b>Warning!</b>	Warns of <b>potential very hazardous situations</b> . Consequence if disregarded: death or severe injuries.
 Warning of general danger	<b>Caution!</b>	Warns of <b>potential hazardous situations</b> . Consequence if disregarded: light or minor injuries.

#### Warning of material damage

Icons used	Signal words	
	<b>Stop!</b>	Warns of <b>potential damage to material/s</b> . Consequence if disregarded: damage to the drive system/device and/or its environment.

#### Other notes

Icons used	Signal words	
	<b>Tip!</b>	Denotes a general useful tip. Following it eases use of the control device/drive system.



### 3 Technical Data

#### 3.1 Product description

##### 3.1.1 How they work

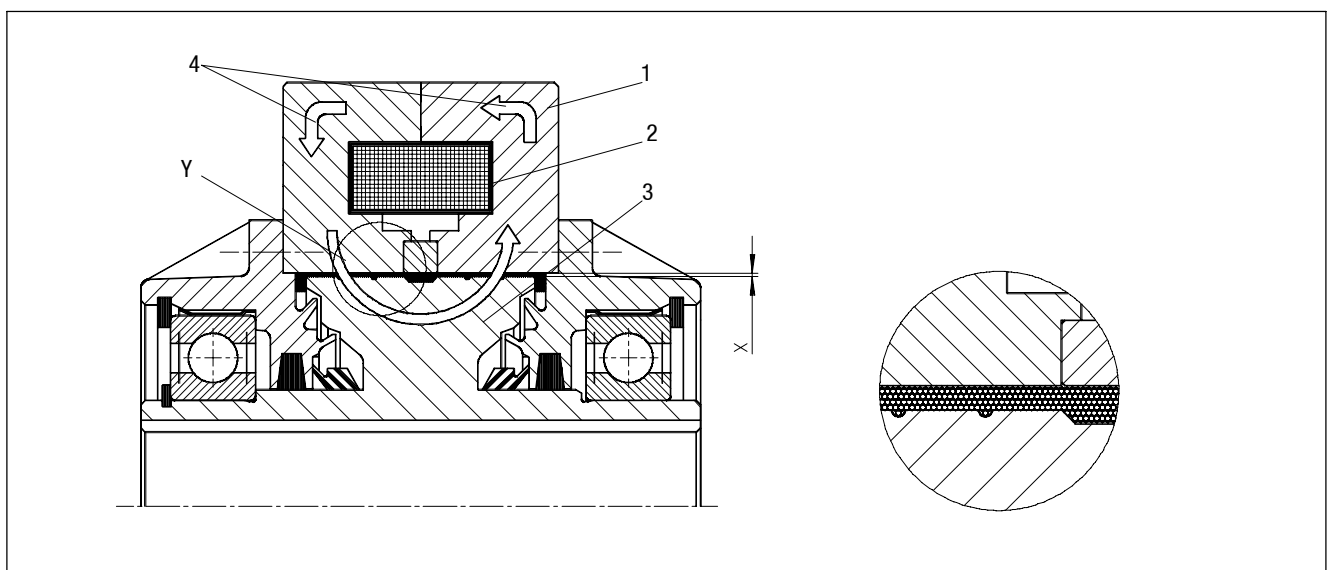


Fig. 1 Magnetic-particle clutch

Fig.1a Detail Y

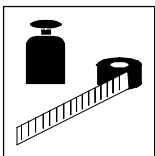
The characteristic feature of magnetic-particle clutches is that the torque can be smoothly and steplessly changed dependant on the excitation current.

The clutch must be energised with DC current to create the torque required. A magnetic field is thus created as shown in Fig. 1. The torque is transmitted via wear-resistant, non-oxidising iron particles in the electromagnetic field in the air gap between the stator and the rotor. These fine-grain iron particles form magnetic chains as shown in Fig. 1a that are dependant on the electromagnetic energy quantity and thus transmit the torque. Energy quantity determines the rigidity of these chains and therefore also the amount of torque transferable.

##### 3.1.2 Design

magneta - Type 14.502 magnetic-particle clutches are so designed that the field current coil is installed in a rotating outer rotor. Slip rings are therefore needed for current supply. Drive is primarily via the outer rotor. Connection with the motivating power is via an adequate number of tapped bore holes in the outer rotor in axial direction. Power output is via the inner rotor, which has a feather keyway on its hollow shaft. Output and input may also be reversed.

Fig. 2 shows force flow.



## Technical Data

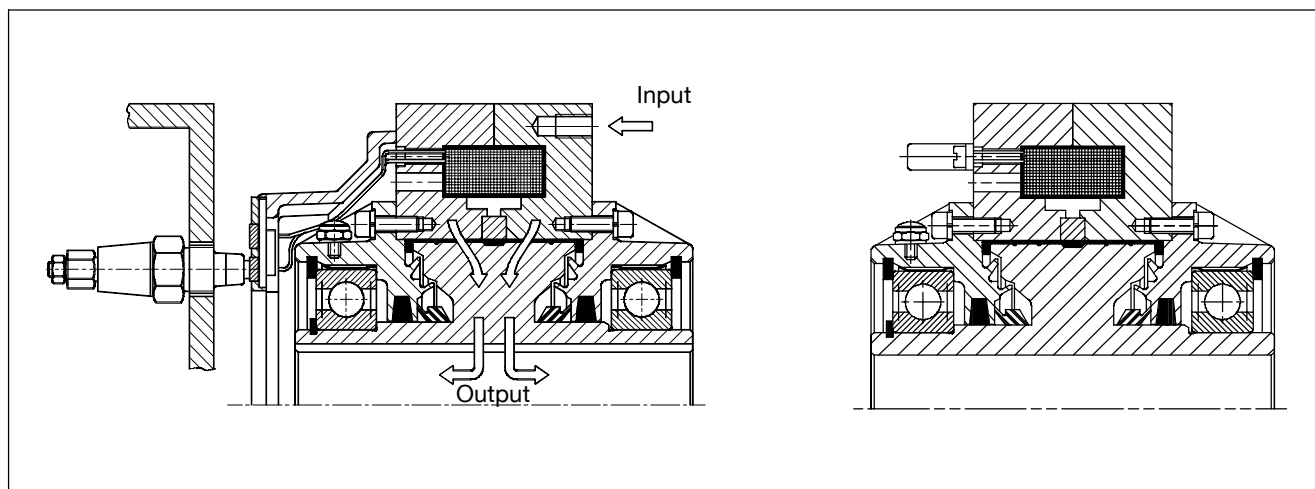


Fig. 2 Magnetic-particle clutch, type 14.502

Fig. 3 Magnetic-particle brake, type 14.512

Magnetic-particle brakes are needed in many specific applications.

If the outer rotor is fixed, a clutch becomes a brake. Slip rings for power supply are no longer needed if the outer rotor is so fixed. The power supply is then via spade plugs on the outer rotor. This is the principle on which magneteta magnetic-particle brake design is based (Fig. 3).

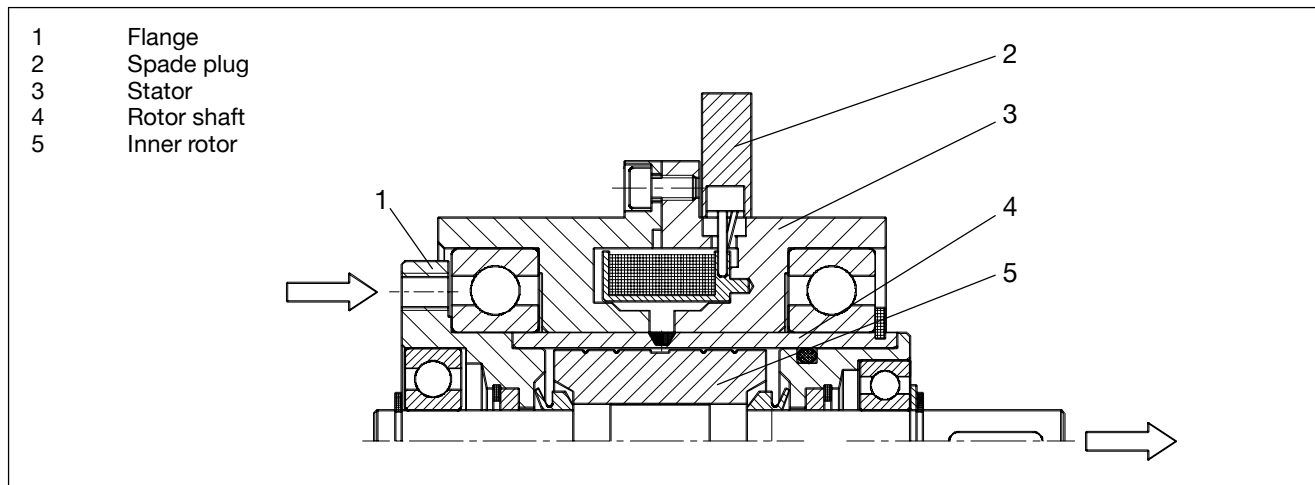
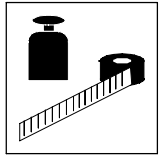


Fig. 4 Magnetic-particle clutch, type 14.501

In applications where power supply via slip rings is not feasible or not permissible, the magneteta type 14.501 magnetic-particle clutch is used. The field coil is installed in the fixed stator as shown in Fig. 4. The power supply is via a spade plug.

Input is primarily via the rotor shaft. This has appropriate tapped bore holes in its flange for connection with drive elements such as chain or belt pulleys. Output is via the inner rotor shaft, which has a feather keyway in it. Here again, input and output can be reversed.



## 3.1.3 Features

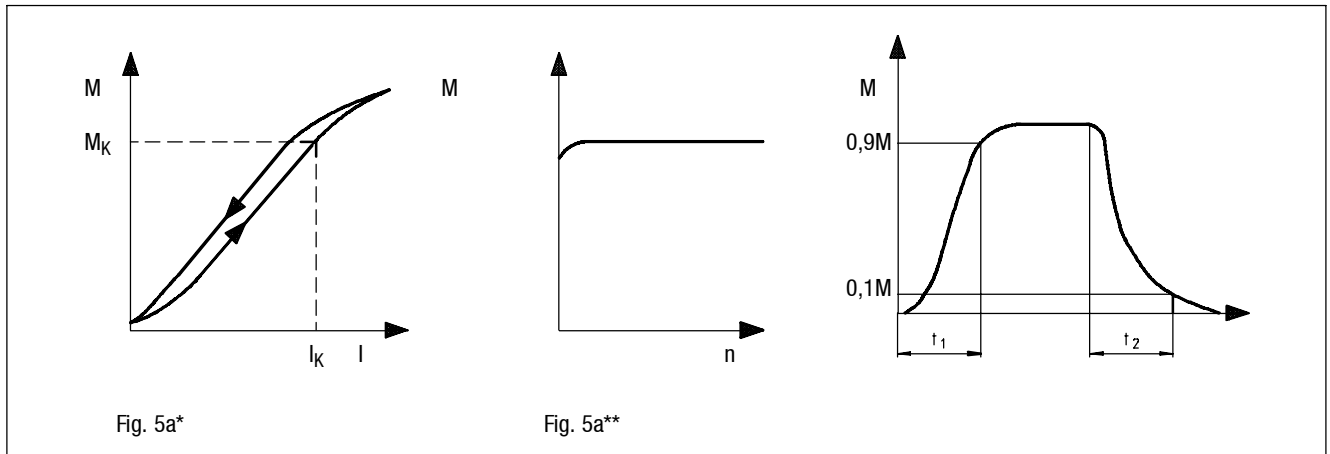


Fig. 5

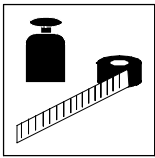
M = Torque	M <sub>K</sub> = Rated torque
I <sub>K</sub> = Rated current	I = Current
n = Speed	t = Time
t <sub>1</sub> = Torque rise time	t <sub>2</sub> = Switch-off time

If the torque set is exceeded, the brake or clutch will slip smoothly.

Magnetic-particle clutches and brakes are designed for constant slip provided the amount of heat that can be dissipated is not exceeded. If so, precise re-calculation will be required.

### Characteristic properties

- Linearly adjustable torque via the excitation current (Fig. 5a\*)
- Torque can be adjusted independently of the speed (Fig. 5a\*\*)
- Torque can be reproduced at brief intervals
- Operation is possible with constant slip
- Torque is generated smoothly
- Low-noise operation



## Technical Data

### 3.2 Rated data

									$n_a$	0 min <sup>-1</sup>	1500 min <sup>-1</sup>	3000 min <sup>-1</sup>			
	Size	$M_K$ Nm	$P_{20}$ W	U V	$I_{20}$ A	R $\Omega$	$t_1/t_2$ ms	$M_R$ Nm		$P_V$ W	$P_V$ W	$P_V$ W	$J_a$ kgm <sup>2</sup>	$J_i$ kgm <sup>2</sup>	m kg
Type 14.502...-1.2 (2.2) clutch	01	10	11	24	0.46	52.4	280/70 =	0.6		20	140	200	$3.6 \cdot 10^{-3}$	$0.18 \cdot 10^{-3}$	2.7
							280/210 ~		●	65	380	700	$7.2 \cdot 10^{-3}$		3.6
	02	20	16	24	0.67	36.0	540/170 =	1.0		30	200	310	$8.1 \cdot 10^{-3}$	$0.52 \cdot 10^{-3}$	4.4
							540/500 ~		●	90	580	920	$17.5 \cdot 10^{-3}$		5.9
	04	40	19	24	0.77	31.1	840/270 =	2.0		45	280 <sup>1)</sup>	*	$23 \cdot 10^{-3}$	$1.7 \cdot 10^{-3}$	8.4
							840/780 ~		●	170	840	1400	$51 \cdot 10^{-3}$		11.1
	08	80	16	24	0.67	36.0	1600/500 =	3.0		75	450 <sup>2)</sup>		$76 \cdot 10^{-3}$	$5.3 \cdot 10^{-3}$	16.0
							1600/1400 ~		●	220	1300		0.15		20.8
	16	160	26	24	1.08	22.2	1800/570 =	4.5		100	680 <sup>3)</sup>		0.19	$17 \cdot 10^{-3}$	25.8
							1800/1700 ~		●	320	1800		0.39		34.4
	32	320	28	24	1.17	20.6	3000/930 =	7.5		160	1000 <sup>4)</sup>		0.59	$68 \cdot 10^{-3}$	40.0
							3000/2700 ~		●	500	3000		1.07		62.6
Type 14.512...-1.2 (2.2) brake	01	10	11	24	0.46	52.4	280/70 =	0.6		25				$0.18 \cdot 10^{-3}$	2.4
							280/210 ~		●	85					
	02	20	16	24	0.67	36.0	540/170 =	1.0		40				$0.52 \cdot 10^{-3}$	4.0
							540/500 ~		●	120					
	04	40	19	24	0.77	31.1	840/270 =	2.0		60				$1.7 \cdot 10^{-3}$	7.8
							840/780 ~		●	220					
	08	80	16	24	0.67	36.0	1600/500 =	3.0		100				$5.3 \cdot 10^{-3}$	15.2
							1600/1400 ~		●	280					
	16	160	26	24	1.08	22.2	1800/570 =	4.5		130				$17 \cdot 10^{-3}$	24.8
							1800/1700 ~		●	400					
	32	320	28	24	1.17	20.6	3000/930 =	7.5		210				$68 \cdot 10^{-3}$	47.0
							3000/2700 ~		●	630					
Type 14.501.03.1.1	2.5	6	24	0.25	94.3	300/90 =	0.10		28			$0.13 \cdot 10^{-3}$	$0.02 \cdot 10^{-3}$	1.95	
						300/260 ~									

Tab. 1 \* not applicable  
● Version with heat sink

#### If the speed is exceeded

- 1) 1240 min<sup>-1</sup>
- 2) 1370 min<sup>-1</sup>
- 3) 1410 min<sup>-1</sup>
- 4) 1140 min<sup>-1</sup>

then the power loss given is achieved by the magnetic-particle unit's residual torque.

$P_{20}$  = Coil performance at 20°

U = Coil power

$I_{20}$  = Current at 20°

R = Resistance

$t_1/t_2$  = Operating time

$M_K$  = Rated torque

$M_R$  = Residual torque

$P_V$  = Heat dissipation

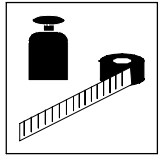
m = Weight

$n_a$  = Primary particle speed

$J_a$  = Primary particle inertia torque

$J_i$  = Secondary particle inertia torque

**About 2.5 times the heat can be dissipated in magnetic-particle brakes using a separate fan.**



## 3.3 Dimensions

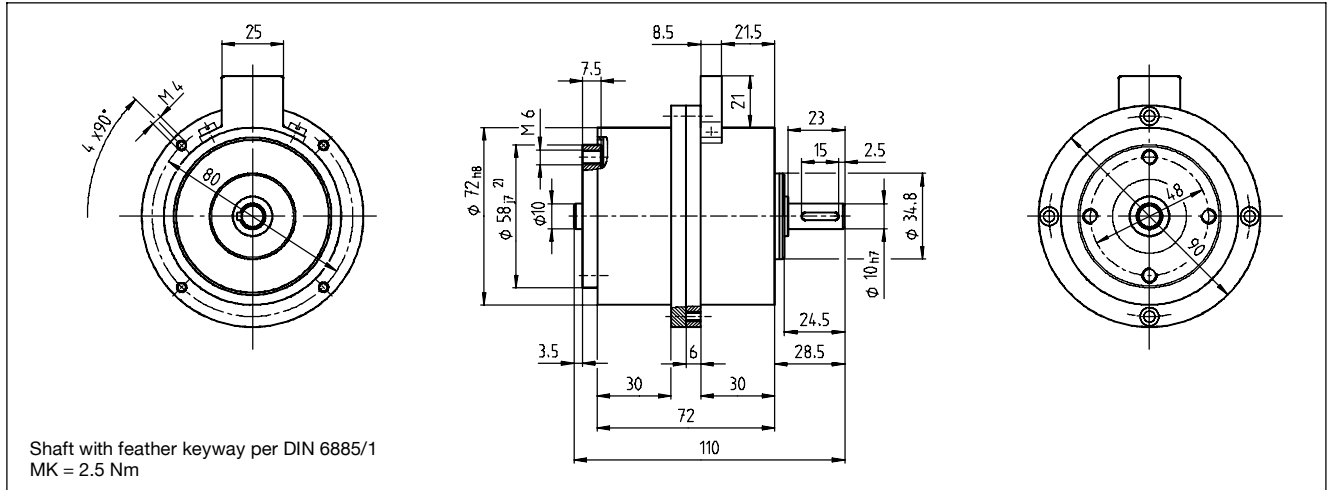


Fig. 6 Type 14.501.03.1.1 clutch

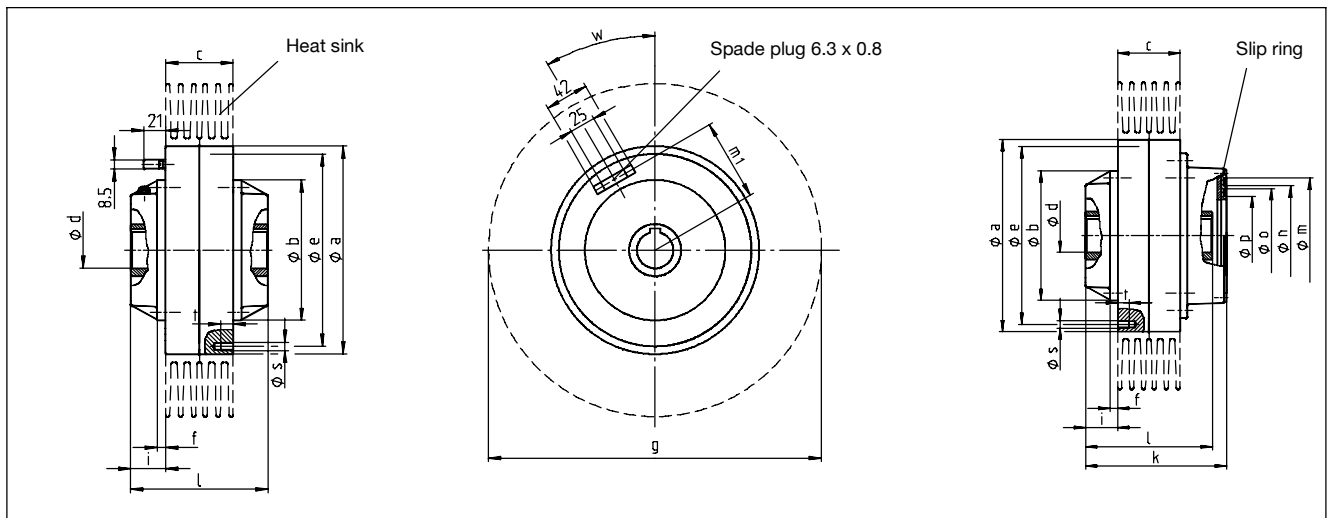


Fig. 7 Type 14.512.□□.1.2 (2.2) brake

Type 14.502.□□.1.2 (2.2) clutch

Size	M <sub>K</sub> Nm	a <sub>s7</sub>	b <sub>j7</sub> 2)	c	d <sup>H7</sup>				e	f	g	i	k	l	m <sub>1</sub>	m	n	o	p	q	s	s <sub>1</sub>	t	w
					Standard	max.																		
01	10	100	70	45	10	12	-	14 <sup>1)</sup>	90	5	160	20	97	85	39	76	62	58	44	12	M5	4.2	10	44°
02	20	120	80	50	14	16	19	20	110	4	200	24	108	98	47	76	62	58	44	10	M6	5	10	30°
04	40	150	96	60	19	22	-	24	135	5	250	24	119	108	58	76	62	58	44	11	M6	5	10	30°
08	80	200	135	65	28	32	-	35	185	8	320	33.5	147	132	82.5	120	104	98	82	15	M8	6.8	12	30°
16	160	250	180	70	35	38	-	42	235	8	400	28	140.5	126	106	120	104	98	82	14.5	M10	8.5	14	30°
32	320	320	235	80	48	55	-	60	300	10	480	35	165	150	137	142	126	120	104	15	M10	8.5	16	30°

Tab. 2 Bores with keyway per DIN 6885/1

1) Bores with keyway per DIN 6885/3

2) Centring and lateral run out of the mounting surface per DIN 42955-R

























