SIEI-AREG
KFM 05

Integrated performance.

English

**GEFRAN**

⟩ The distributed drive solution

The KFM 05 drive system brings together a motor, frequency inverter and positioning unit within a single device.

Unlike other drive systems where the frequency inverter must be installed separately, the KFM 05 features a frequency inverter that is already integrated into the motor. There is also a built-in sensor for the rotor position. This combination makes the KFM 05 an ideal positioning drive for lower power ranges.

	Model			
Rated speed	KFM 05 / 180	KFM 05 / 310	KFM 05 / 510	KFM 05 / 500 L
1000 min^{-1}	Rated motor torque 1,8 Nm			
1500 min^{-1}		Rated motor torque 2 Nm		
1750 min^{-1}			Rated motor torque 2,8 Nm	
2550 min^{-1}				Rated motor torque 1,9 Nm

⟩ Standard software

The KFM 05 comes with E@syDrives (available on the WINDOWS® interface in German or English) preinstalled, as well as a menu, configuration and download program with a software oscilloscope for optimum settings, drive adaptation and diagnostics.
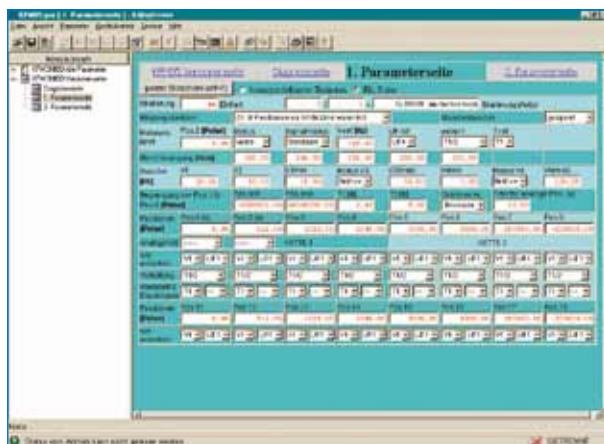
The program is stored in FLASH ROM. This enables standard or user-specific software to be easily loaded or replaced without the need to access to the device itself. Since the basic software (boot sector) remains stored, the user is able to carry out replacements without any problems.

➲ KFM 05 technology

- A variety of fieldbus interfaces are used to implement user-orientated control and positioning options.
- The internal position encoder resolution is 512 pulses per revolution (2048 pulses per revolution is in the pipeline).
- The stiffness of the position loop can be fine tuned to within a few pulses of the internal feedback encoder.
- There are 5 digital control inputs and 3 digital control outputs for hardware control (24 V via an optocoupler, isolated). In addition, 2 analogue inputs are available. A total of 6 LEDs can also be used to display operation and diagnostic status.

➲ Power supply

The KFM 05 only requires a single-phase 230 V AC/50 Hz power supply.

➲ Integrated EMC filters

The KFM 05 is equipped with all the filters required under the EMC Directive as standard.

➲ RS 232

An RS 232 interface for parameter setting and diagnostics is provided as standard.

➲ Fieldbus

A PROFIBUS connection is available as an option: this involves a different component version rather than simply an additional board. This option makes it possible to control all functions via the fieldbus.

➲ Options

A DC/DC transformer is available as an option for providing the fieldbus and electronics with an additional 24 V power supply. This eliminates the need for an internal auxiliary supply.

An integrated holding or emergency stop brake is another option available with the KFM 05 (control via 24 V DC or 230 V AC). Additionally, it is possible to integrate a relay board at a later point in time.

➲ Housing

A variety of housings offering different connection configurations can be supplied.
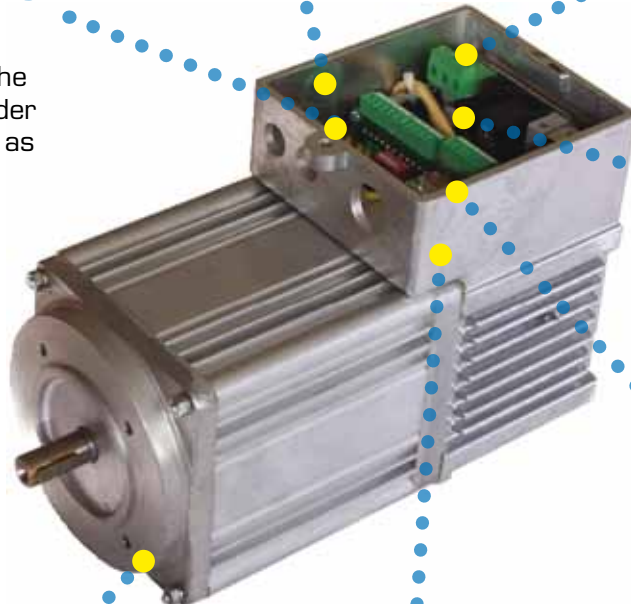
Series KFM 05

⟳ Connections, display elements and operator control elements

The KFM 05 is supplied with either internal terminals or plugs located on the housing.

⟳ Housing designs

The KFM 05 is available in a variety of designs:

- **Standard design**

The standard housing for the KFM 05 has four holes for cable bushes.

- **IP 20 design with cable inlets**

The cable inlets enable quick and easy installation and removal.

- **Plug design**

All connections in this version are provided with plugs to make connecting the KFM 05 both easier and quicker.

- **Design with holding brake**

The holding brake must be requested at the time of ordering, as a longer form of housing is required for its installation. It is not possible to install the holding brake at a later point in time.

- **Class 3 safety function (in the pipeline)**

The KFM 05 is equipped with a safety relay to allow pulse blocking: this guarantees that the "safe stop" function is available.

We are, of course, able to meet specific customer requests – please get in touch with us.

Standard design	IP 20 design with cable inlets
Plug design	Design with fan
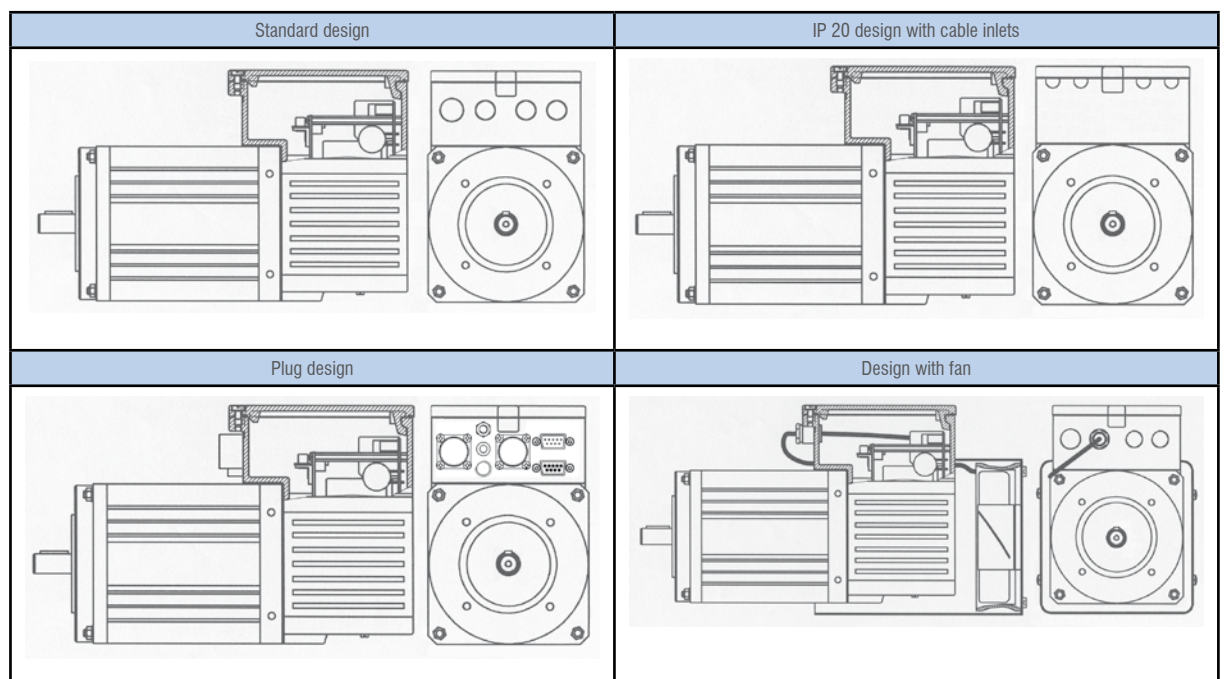
⊃ Typical applications

- Positioning drive for linear axes
- Angle positioning
- Handling machines

- Kneading machines/ dough processing
- Robots
- Packaging machines

- Assembly lines
- Belt drives
- Conveyors
- Special-purpose machine

⊃ Application examples

⊃ KFM 05 with door function

In many cases, electric doors are still operated using electromechanical control systems. These systems present their own particular problems in terms of end position recognition and maintenance intervals.

While the obvious solution would be to convert the types of drives used, there remains, however, the issue of cost. Can this kind of expenditure be justified?

This is where the KFM 05 comes in.

Fast-acting and with a positioning accuracy of ±0.1 mm, it can be purchased at between a half and a third of the price of traditional control systems. An added bonus is that the KFM 05 does not have to be installed in the switching cabinet, making it easy to install.
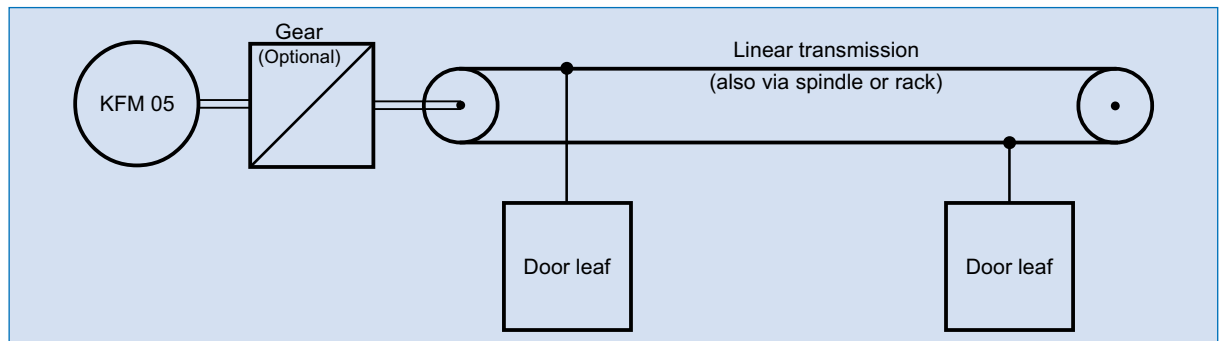
Thanks to the integrated incremental encoder, there is no need for end switches on the doors. Once the mains supply has been switched on, the reference point is sought by means of a blockade, whereby the door travels in either the "OPEN" or "CLOSE" direction with adjustable speeds and torques. Alternatively, a reference sensor can be installed, although this is not absolutely essential.

Solution:

The KFM 05 is designed to deal with typical door applications.

The following safety features are provided as standard:

- Separate "Position reached" outputs for both end positions.
- The initial opening and closing movements can be performed with a reduced torque.
- Opening the enable input and start inputs causes the drive to stop immediately.

Thanks to its IP 54/IP 65 degree of protection, the drive can be installed anywhere.

The drive has proven to be a particularly effective solution in the relentless three-shift system commonly found in the automotive industry.

⊃ KFM 05 as a cycle drive

Remit:

An automatic machine has been built for chamfering motor shafts.

The shafts are resting on a conveyor belt that moves cyclically, allowing each shaft to be machined on both sides by stations 1 and 2.

The same drive is to be used for adjusting the width. For this purpose, a magnet switches the drive to the acme thread spindle, which is used to set the distance between the two belts.

Diagram of mechanics

Top view
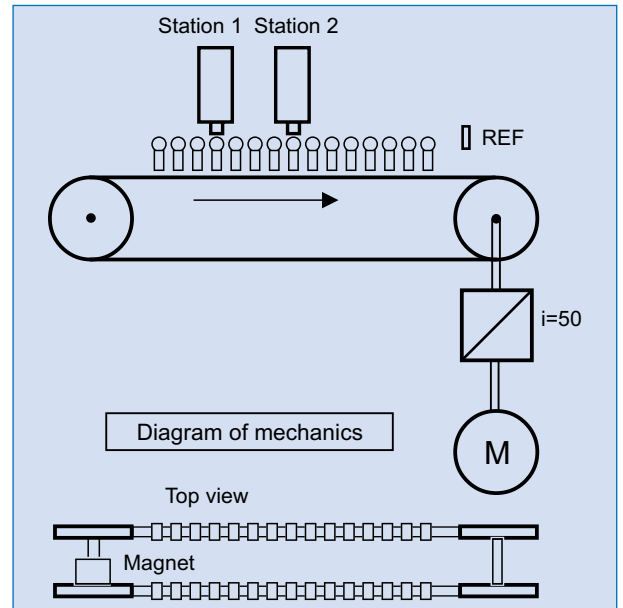
Solution:

A KFM 05 05/180 with an i = 50 gear was used.

The input function is 10, 8 relative distances via I1/2/3 starting via analogue input 1.

First, a reference motion is executed via analogue input 2. The PLC then gives the signal   for the cycle feed of 25 mm (with a distinction drawn between forwards and reverse feed). The feed for a cycle takes approximately 0.4 seconds. For the width adjustment, a multiple of the cycle length is set via inputs I1 to I3 and the PLC activates the magnet. This makes it possible to set the distance between the two conveyor belts to the dimensions of the workpieces within a range from 40 mm to 220 mm. Adopting this approach removes the need for a separate drive.

⊃ KFM 05 as a lift drive

Remit:

An automatic system is to be set up for the purpose of installing the rear section of a car. Two lifts are to be fitted since, for space reasons, installation work is being carried out on two different levels. These lifts have to transport the workpiece carrier, weighing 40 kg, from one level to the other.

Specific feature:

The weights involved vary considerably. A downwards motion with a 40 kg weight may be followed by an upwards motion with no load, or vice versa.

Diagram of mechanics
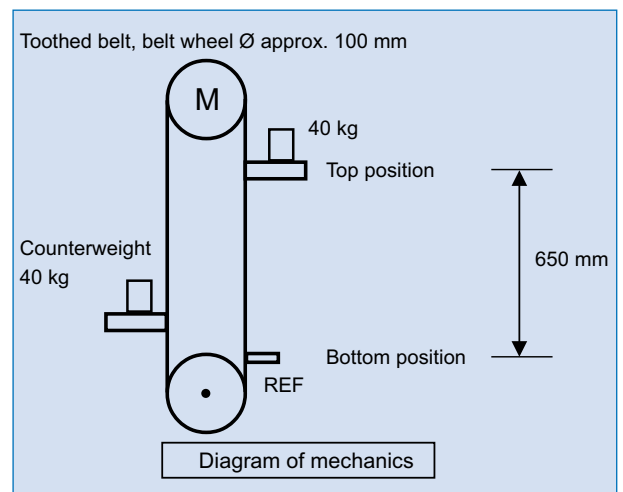
Solution:

A KFM 05 310 was used for both lifts.

The difference in load, depending on whether or not a 40 kg workpiece carrier was being transported, was managed by switching between two V/f characteristics. The characteristic for the reference motion also had to be optimised. Each lift travels a distance of 650 mm in approximately 3.5 seconds. A gear reduction of i = 50 was selected to provide an adequate level of self-locking.

A holding brake was unnecessary, as the KFM 05 keeps the lift in the correct position using only its position control function. Input function 07 was selected (2 positions with safety function).

⊃ KFM 05 as an oscillation feed

Remit:

The table motion for a plane grinding machine is to take the form of an oscillation feed.

As the machine itself is relatively simple, there is no PLC involved. With this in mind, the entire intelligence (including teach-in) must be contained within the drive itself.

It should be as easy as possible for the operator to determine the "left position" and "right position. The drive should then traverse between these two positions at a freely adjustable speed.

REF   Left position   Right position

KFM 05   i=2   Spindle with 5 mm/revolution
Max. path 300 mm
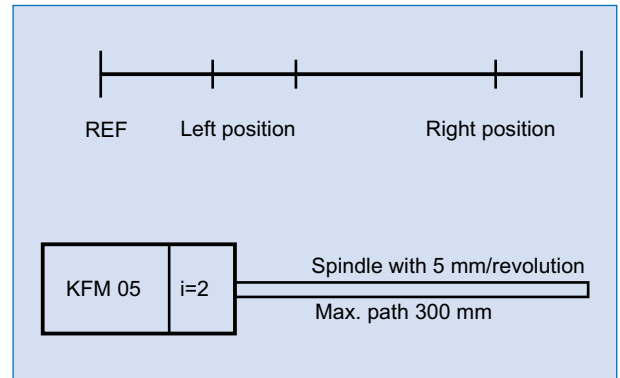
Solution:

A special type of software solution, based on the standard software, had to be developed for this task.

Sequence:

After switching on the mains supply, a reference motion is made to the blockade. This is followed by approaching the left position via I1 and I2 (teach-in function). The current position is accepted via I3.

Using I1 and I2 once again, the right position is then approached, with I3 used to save this.

After the start signal at O2 has been activated, the motor oscillates continuously between the left and right positions. The speed is set at O1, where +5 V is the maximum value set on the screen (e.g. 50 Hz).

A loss of the start signal stops the motor.

⊃ KFM 05 for transport

Large drying machines are used to produce semiconductors and CDs.

A conveyor transports the products through the drying tunnel: given that such tunnels may be as long as 30 m, these often have a somewhat meandering shape.

With earlier systems, the only real issue concerned how long objects spent in the drying zone. By contrast, newer systems require a precise fetching position to be maintained, enabling robots to pick up parts safely and move them on to the next machine.

Fetching position

Drying zone

i=30

KFM 05

Gear reduction presented a problem. Adding faults became apparent after a few clock feeds.

Two self-compensating feed lengths were set to avoid this situation. Following a set pattern, the PLC selects both clock feeds to ensure the positioning fault is always less than 0.2 mm.
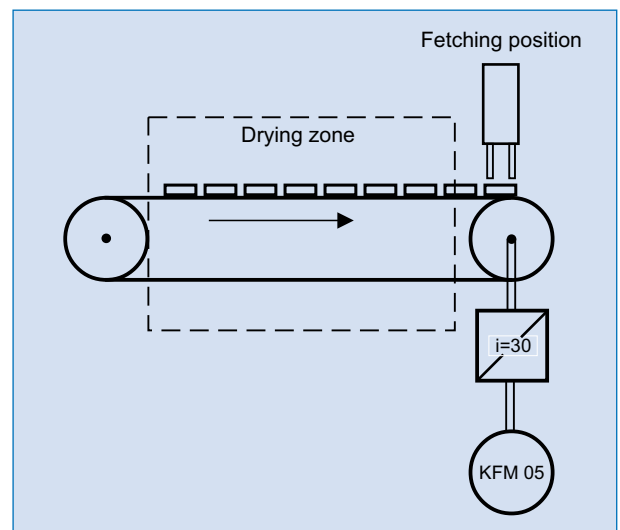
KFM 05 for paletting

A working station is to be equipped with a pallet transport system for unworked and finished parts. Each drive moves the pallets in directions X and Y. The repeating accuracy required is ±0.2 mm and the speeds are relatively low, since the working time and time within which the pallets can be moved is a matter of minutes. The KFM 05 is ideally suited to such circumstances. Using dynamic servo drives would be excessive and too costly.
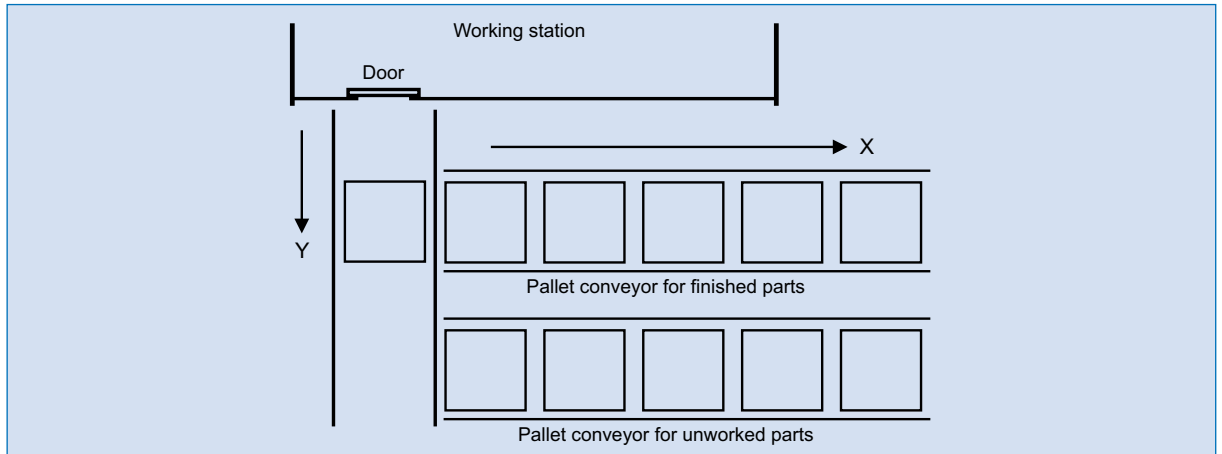
Solution:

As fewer than eight positions are required per drive, the control was selected via the PLC even though PROFIBUS was available on the machine. The PLC arranges the pallets, allocating the relevant motion task to the respective motor.

On leaving the machine, the parts are wet and covered with filings. This makes the KFM 05 with its fully enclosed design the ideal choice. Given their open design, the 3-phase motors with fans used prior to this needed metal sheets for protection. This created problems in terms of temperature.

The solution has proved effective in the relentless three-shift system commonly found in the automotive industry.

## KFM 05 as a turning unit

Remit:

Two lathes are standing directly next to each other. The workpieces have to be moved automatically.

The gripper picks the workpiece from machine 1 (left), swivels 180 degrees, and puts the workpiece onto machine 2 (right). Since the machines may not be the same height, it must be possible to move the gripper arm to different heights.

The required positions 1 to 4 should be entered and stored in teach-in mode.

The KFM 05 offers all the functions for this application, **without the need for any additional hardware or software.**
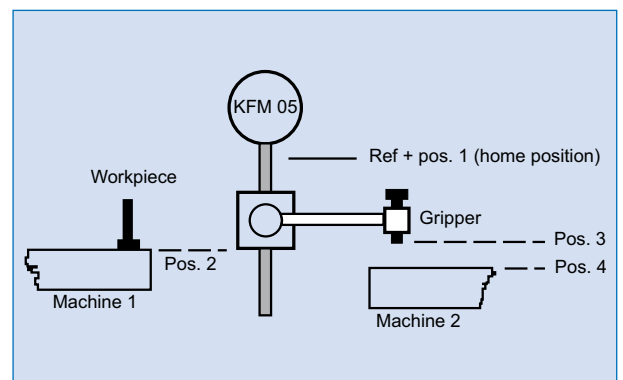
Solution:

The teach-in function uses potentiometer P2. The drive is at a standstill in the central position. Turning to the right moves the gripper up, whilst turning to the left moves the gripper down. The speed increases as the potentiometer gets closer to the limit stop. Opening switch 4 stores the position reached at the current time, depending on the status of inputs I1 and I2. Switches S1 and S2 are the PLC outputs. This means that 4 (8) positions can be stored.

Potentiometer P1 is used to change the speed during automatic operation if teach-in mode has been exited.

In a more recent version, the two potentiometers have been replaced by PLC analogue outputs. This has no effect, however, on how the KFM 05 functions.

⊃ KFM 05 as a clock feed for a press

A conveyor positions a workpiece carrier to the left until ES 1 becomes active. There is a defined amount of travel between the detection of the workpiece carrier and the first workpiece. There then follows a clock feed from workpiece to workpiece with three different preset relative motions (as there are three different workpieces). When the last workpiece is reached, the workpiece carrier is sent to the next working station using additional relative positioning.

A manual process occurs after every clock feed (contacts are pressed in).

Remit:
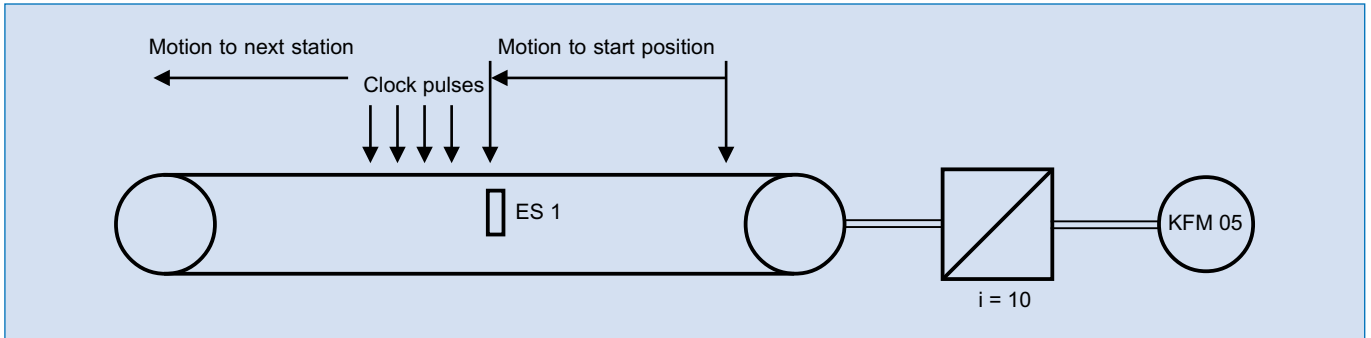
Solution:

The KFM 05 offers all the requirements of this positioning task as standard. Motion to the sensor is achieved using the pressmark function.

Manual processing must be carried out after every clock feed. This requires the protective housing to be opened and the 230 V AC power supply for the motor to be switched off. This enables manual intervention to proceed safely.

As the 24 V DC control voltage remains unaffected, the KFM 05 is able to carry on operating as normal after the protective housing has been closed, and execute the next instance of relative positioning without losing any information.

⊃ KFM 05 as a stacker

Remit:

A vertical conveyor moves a workpiece carrier (WPC) upwards to a sensor (ES 1).

The workpieces are then inserted in clock cycles, with the WPC initially being lowered each time by 20 mm, before being lifted by 80 mm after insertion. Up to 10 workpieces are stacked on top of each other using this method.

The process is reversed at the end of the assembly system, where the WPC is unloaded following the same steps in reverse order.

Although PROFIBUS was available on the machine, a simple solution using I/O was selected.
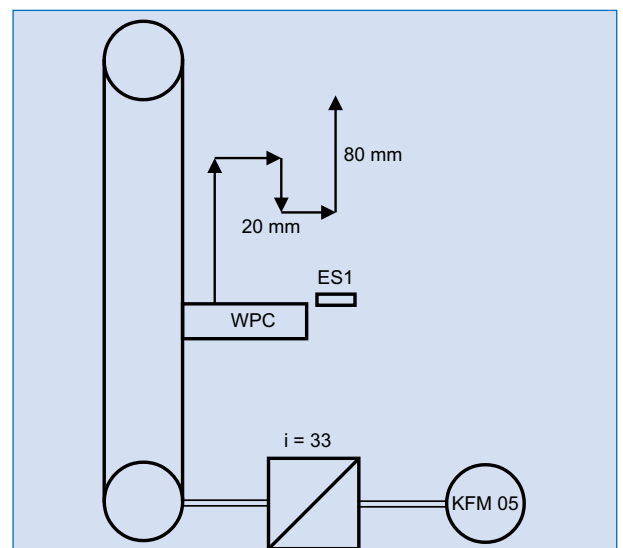
Solution:

The KFM 05 offers all the requirements of this positioning task as standard. Motion to sensor ES1 is achieved via the pressmark function.

In spite of the considerable weight difference (80 kg) depending on whether the WPC was full or empty, it was possible to parameterise the drive in such a way that the same acceleration and deceleration behaviour was achieved during both upwards and downwards motion.

This was based on the ability of the KFM 05 to assign different V/f characteristics for each positioning instance.

The ability to set acceleration and deceleration ramps separately, depending on the direction of rotation, also proved valuable in this case.

⟳ KFM 05 as a user door

Remit:

The user door can often be the cause of increased non-productive time at working centres. Pneumatic solutions are not maintenance-free and raise doubts from a safety perspective. Servo drives could be used to address the problem, but there are cost issues with this approach.

The KFM 05 offers a cost-effective solution. The following application example refers to the user door on a lathe.

The data required is as follows:

• Door width: 1200 mm
• Weight: 120 kg
• Opening time: 1.2 sec.
• Closing time: 1.6 sec.
• User safety by means of torque limitation

Thanks to the integrated incremental encoder, there is no need for end switches on the doors. Once the mains supply has been switched on, the reference point is sought by means of a blockade, whereby the door travels in either the "OPEN" direction with an adjustable speed and torque.
Alternatively, a reference switch can be installed, although this is not absolutely essential. If the "Separate supply" option is used, the 24 V DC voltage makes it possible to buffer the internal encoder and the counter logic.
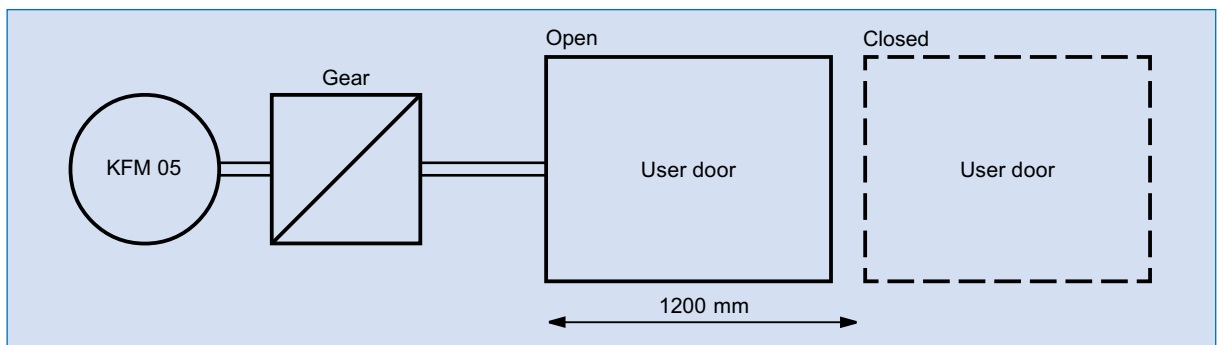
Solution:

The KFM 05 is designed to deal with typical user door applications. It only requires a special parameter file.

The following safety features are provided as standard:

• Torque limitation, separately adjustable for opening and closing
• If the maximum torque is exceeded during closing:
  • Reverse motion, duration can be selected
  • Maximum 150 N closing power, adjustable in line with the standard
  • Input for external closing power limitation

Given that the degree of protection is either IP 54 or IP 65, it is possible to install the drive in the working area of the machine itself.

A good value solution that really works!

Technical data

| Motor type		KFM 05 / 180 6-pole	KFM 05 / 310 4-pole	KFM 05 / 510 4-pole	KFM 05 / 500 L 4-pole forced cool.*)
Power supply		230 V AC ± 10 % / 50 Hz			
Rated power	W	188	314	512	507
Motor torque	Nm	1.8	2.0	2.8	1.9
Rated speed	rpm	1000	1500	1750	2550
Motor frequency	Hz	60	55	65	98
Rotor inertia torque	kgcm^2	11.7	7.2	15.5	7.2
Mains current	A	1.3	2.0	3.1	3.5
Power supply	V	230 V AC ± 10 %, 50 Hz			
Overload		100 % for 60 seconds			
Interface		RS 232 serial, PROFIBUS optional			
Analogue setting		0 to 5 V (setting potentiometer) or 0 to 10 V, or 0 to 20 mA			
Range of output frequency		0 to 120 Hz			
Acceleration/deceleration		0 to 50 and 50 to 0 Hz in 0.05 to 2500 seconds (0.02 to 1000 Hz/sec.)			
Control inputs/outputs 24 V		5 digital inputs/3 digital outputs via optocoupler, programmable			
Position control/DC braking		Programmable			
Positioning control		16 positions (any can be set with PROFIBUS) programmable with 32-bit resolution			
Position encoder resolution		512 pulses per revolution, linearity error max. ±10 pulses 2048 pulses per revolution in the pipeline			
Control/parameter changes		Analogue and digital I/O, RS 232, PROFIBUS up to 12 MBaud (CANopen fieldbus in the pipeline)			
Protection functions		Undervoltage/overvoltage, overcurrent, overtemperature (safe stop in the pipeline)			
Fault RESET		Automatic fault reset, programmable with restart			
Fault memory		EEPROM			
Program memory (firmware)		FLASH-ROM, externally programmable			
Parameter memory		EEPROM			
Low Voltage Directive		EN 50178, EN 954-1			
Interference emissions/interference immunity		EN 50081-1 / EN 50082-2			
24 V supply (option)		24 V ± 10 %, 250 mA			
Mechanical connection		Standard IEC flange B14			
Electrical connection		Cable bushing (metric), cable inlet or plug version			
Holding brake (option)		24 V DC or 230 V AC, the drive becomes approx. 50 mm longer on installation			
Degree of protection		IP 54 (IP 65 as an option)			IP 44
Weight	kg	7.8	8.1	11.7	9.6
Approvals		C E			

*) Integrated fan; does not require separate power supply; always active if 230 V applied
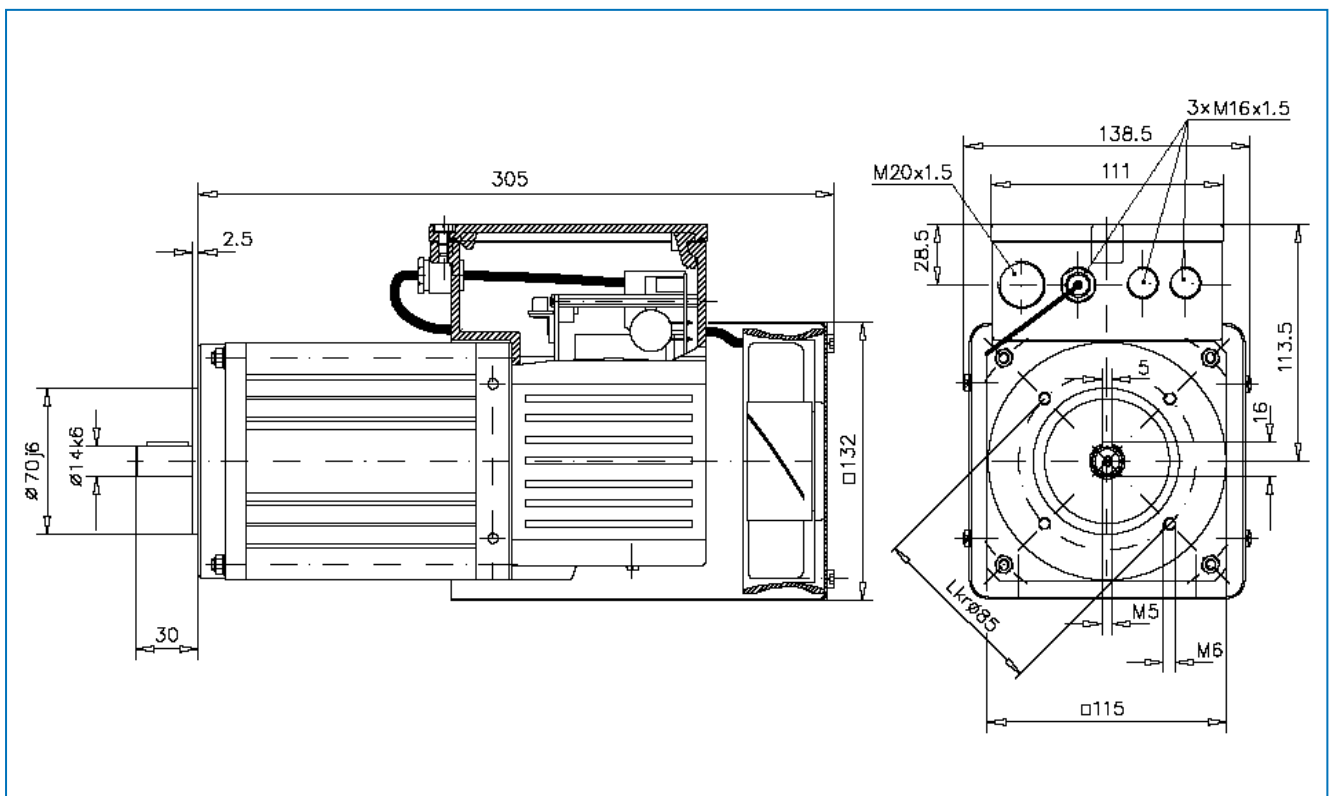
Series KFM 05

Dimensions for KFM 05 types 180, 310 and 510

Dimensions - mm

Respective overall lengths increase by 50 mm if holding brake installed.
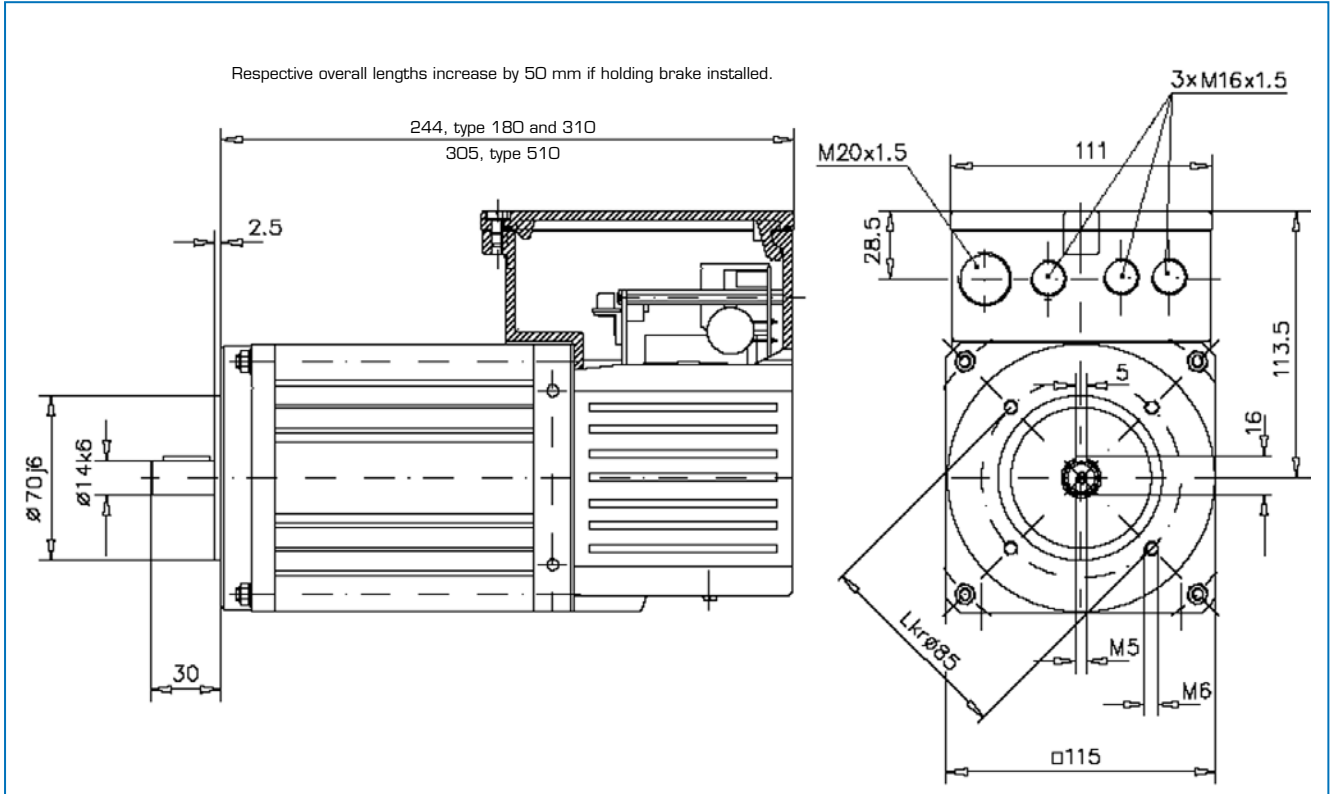
Dimensions for KFM 05 type 500 L

Dimensions - mm

⊃ Model and codes

The following table shows standard motors according to price list.
Please refers to next page for further models.

Model	Code	Rated power at 230 V AC	Description
KFM-05/180	S9K01	180W	
KFM-05/310	S9K02	310W	
KFM-05/500-L	S9K03	500W	Forced cooling fan
KFM-05/510	S9K04	510W	
KFM-05/180-DP	S9K05	180W	PROFIBUS integrated
KFM-05/310-DP	S9K06	310W	PROFIBUS integrated
KFM-05/500-L-DP	S9K07	500W	Forced cooling fan - PROFIBUS integrated
KFM-05/510-DP	S9K08	510W	PROFIBUS integrated
KFM-05/180-B	S9K09	180W	Brake
KFM-05/310-B	S9K10	310W	Brake
KFM-05/500-L-B	S9K11	500W	Forced cooling fan - Brake
KFM-05/510-B	S9K12	510W	Brake
KFM-05/180-DP-B	S9K13	180W	PROFIBUS integrated - Brake
KFM-05/310-DP-B	S9K14	310W	PROFIBUS integrated - Brake
KFM-05/500-L-DP-B	S9K15	500W	Forced cooling fan - PROFIBUS integrated - Brake
KFM-05/510-DP-B	S9K16	510W	PROFIBUS integrated - Brake

Additional ordering information:

Gear	Detailed description
Varnishing	• Standard, unvarnished (aluminium cast) - Standard varnishing for KFM 05 L 500 black - Special varnishing on request
Software	• Standard software on CD-ROM - Customer-specific software (detailed description) on request - Special software on request - Parameter set
Operating manual	• Standard manual in German or English - Manual in PDF format on request - Manual numbers for several motors - Other languages on request

Series KFM 05

⊃ Type code

The following table shows the type code for other models and allows the user to create an order number which reflects their requirements.

Article number for KFM 05		880	X	X	X	-	X	X	X	X
Article name	KFM 05									
Power	Special design .... 0 180 W .... 1 310 W .... 2 500 W (with fan) .... 3 510 W 4									
Fieldbus	None (standard) .... 0 PROFIBUS .... 1 (CAN bus) 2									
Brake	None (standard) .... 0 Holding brake, 24 V .... 1 Holding brake, 230 V..................................... 2 Emergency stop brake, 230 V........................ 3 Brake relay without brake .... 4 Holding brake, 24 V, Brake relay without brake .... 5 Holding brake, 230 V, with brake 6									
External electronics supply	None (standard) .... 0 DC/DC 24 V .... 1 Safety function .... 2 DC/DC 24 V with safety function.................... 3									
Analogue input 1	5 V ....Controller 1.....0 10 V (standard)...................................Controller 1.....1 20 mA ....Controller 1.....2 24 V ....Controller 1....3 Adjustable via DIP S3/S4....................Controller 2.....4 No analogue input (fieldbus version)..... Controller 2.....5									
Analogue input 2	5 V ....Controller 1.....0 10 V (standard)...................................Controller 1.....1 20 mA ....Controller 1.....2 24 V ....Controller 1.....3 Adjustable via DIP S5 / S6 ....Controller 2.....4 No analogue input (fieldbus version)..... Controller 2.....5									
Housing	Standard (metric union) .... 0 Standard plug design, IP 54 .... 1 Metric unions, IP 65 (without shaft) .... 2 Plug design IP 54 (heavy-duty)....................... 3 D-Sub 9 plug on right-hand side .... 4 Cable inlets (IP 20) .... 5 Metric/DP bus plug M12 .... 6 Customer-specific, based on diagram 9									

Example of order number: KFM 05 880 112-1124

Article number for KFM 05		880	1	1	2	-	1	1	2	4
Article name	KFM 05									
Power	180 W 1									
Fieldbus	PROFIBUS 1									
Brake	Holding brake, 230 V..................................... 2									
External electronics supply	DC/DC 24 V 1									
Analogue input 1	10 V ....Controller 1.....1									
Analogue input 2	20 mA ....Controller 1.....2									
Housing	D-Sub 9 plug on right-hand side 4									

→ Inverters

ADV20 & 50	**ADV200**	**ADV200-DC**	**AFE200**	**Cabinet**
• V/f & Sensorless Vector • 0.4... 11 kW • 110...120 Vac, 1ph • 200...240 Vac, 1ph • 200...240 Vac, 3ph • 380...480 Vac, 3ph	• Vector Field Oriented • 0.75 kW... 1.2 MW • 400...480, 690 Vac, 3ph	• Vector Field Oriented • 18,5... 355 kW • 450 ... 750 Vdc	• "Active Front End" Regenerative Converter • 18.5... 355 kW • 380 ... 480 Vac, 3ph	• Vector Field Oriented • 90 kW ... 1.2 MW • 400...480, 690 Vac, 3ph • IP23 or IP54/IP55 Cabinet

→ Inverters and LIFT solutions

ADL100	**ADL200**	**AVRy**	**AVy LIFT**	**TSM Motors**
• Sensorless Vector • Speed range up to 1,2m/s • Gearless • New installation and Retrofitting • 4 ... 22 kW	• Sensorless Vector • Speed range up to 3m/s • Geared and gearless • New installation and Retrofitting • 4 ... 22 kW	• Built-in power recovery • Speed range up to 3m/s • Gearless • Output current from 14 to 33 Arms	• Flux Vector • Speed range up to 5m/s and beyond • New installation and Retrofitting • 0.75 ... 160 kW	• Gearless motors • Static charge up to 2250 kg • Speed range from 38 to 255 rpm • Holding Brake and Feedback devices

→ Brushless   ## → KFM 05

XVy-EV Servodrive	**SHJ** Servomotors	**SBM** Servomotors	**KFM 05** Asynchronous Positioning Motor with Integrated Frequency Inverter
• Brushless and Asynchronous • 1.5 ... 315 kW (2 ... 450 Hp) • 230 ... 480 Vac, 3ph	• 230Vac and 400Vac • 3000, 4000, 4500, 6000, 8000 rpm • from 0.33 to 3.8Nm	• 400Vac • 1500, 2000, 3000 and 4000 rpm • from 2 to 442Nm	• Motor outputs: 180 W to 510 W • 1 x 230 Vac

→ Digital DC

TPD32
• 20 A ... 4800 A (2 and 4 quadrants)
• 230 ... 690 Vac, 3ph

Download brochures or see more details at

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