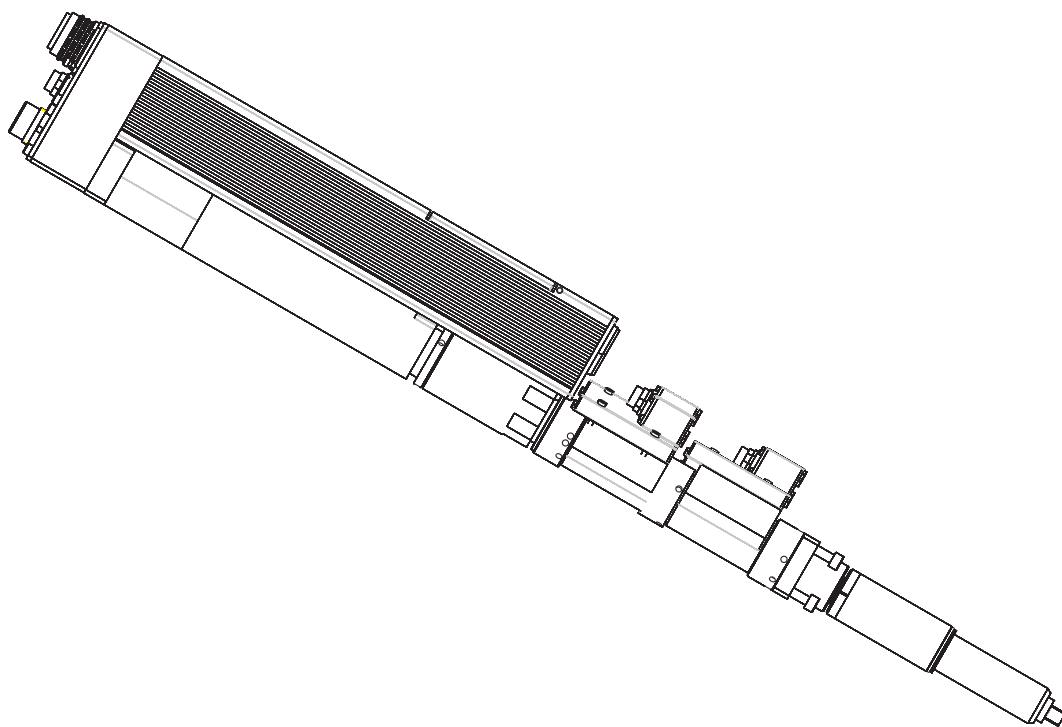


**Assembly Instructions**  
**P1916E/ENrev**  
2012-01



# **DGD-Intelligent spindles**

**Series BTS**



For additional product information visit our website at <http://www.apextoolgroup.com>

# About the assembly instruction

This assembly instruction is the – translation of the original assembly instruction – and provides important information on safe and correct installation.

## Secondary information

P1779E	System manual nutsetter control unit m-Pro-400S(E)
P1792E	Operator information Nutsetter control unit m-Pro-400S(E)
P1909E,	Spare parts sheet Tightening module
P1910E, P1911E, P1912E	Spare parts sheet Attachment
P1913E	Spare parts sheet Gearing
P1914E	Spare parts sheet Motor
P1915E	Spare parts sheet Transducer
P1917E	System handbook Modular fastening system m-Pro--400S DGD intelligent spindles
P1918E	Assembly instructions TS/TUS tightening module
P1919E	Assembly instructions Supply module CPS3
P1921E	Service manual DGD-intelligent-spindle

## Symbols in text

→	Identifies instructions to be followed.
•	Identifies lists.

## Abbreviations

m-Pro-400S(E)	Nutsetter control
m-Pro-400S-CPM...	Nutsetter control unit
TS/TUS	Tightening module
CPS3	Supply module
DGD-ISD	DGD intelligent spindles

## Symbols in graphics:

←	Identifies movement in a direction.
↓	Identifies function and force.

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# Contents

<b>1</b>	<b>Safety</b>	<b>5</b>
1.1	Warnings and notes .....	5
1.2	Basic requirements for safe working practices .....	5
1.3	Operator training.....	6
1.4	Personal protective equipment .....	6
1.5	Intended use .....	7
<b>2</b>	<b>Transport / Storage</b>	<b>7</b>
<b>3</b>	<b>Overview</b>	<b>8</b>
3.1	Components .....	9
<b>4</b>	<b>Installation</b>	<b>10</b>
4.1	Drilling templates in mounting plate.....	10
4.2	Attaching the DGD-IS to the mounting plate.....	14
<b>5</b>	<b>Initial operation</b>	<b>15</b>
<b>6</b>	<b>Cables</b>	<b>17</b>
6.1	KMAG type .....	17
6.2	KMAW type.....	18
<b>7</b>	<b>Maintenance / Service</b>	<b>19</b>
<b>8</b>	<b>Disposal</b>	<b>19</b>



# 1 Safety

## 1.1 Warnings and notes

### DANGER!



A symbol combined with the word **DANGER** warns of an **impending health risk** or risk of fatal injury to personnel. If this danger note is not adhered to, severest injury that may lead to the death of people, is the consequence.

### WARNING!



A symbol combined with the word **WARNING** warns of a **potentially dangerous** situation for the health of personnel, which could result in death or serious injury if not avoided.

### CAUTION!



A symbol combined with the word **CAUTION** warns of a **potentially harmful** situation for the health of personnel or damage to property or the environment. If this warning is not observed, injuries, property or environmental damage may occur.

### NOTE



This symbol indicates a **general** instruction.  
General instructions include application tips and special useful information, but no warnings against dangers.

## 1.2 Basic requirements for safe working practices

Take the fastening system into service only after you have read and completely understood the following safety instructions and this document. Failure to observe the instructions below may result in electric shock, fire and serious injuries.

### DANGER!



High leakage current –  
Fatal electric shock could occur!

- Always disconnect the power supply before performing maintenance work on the DGD-IS and the m-Pro-400S-CPM....
- Always disconnect the system cable, motor or motor cable from the m-Pro-400S-CPM... or DGD-IS before making throughput, resistance and short circuit measurements.
- Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.

### WARNING!



High temperature –  
the motor on the DGD-IS may heat up and cause burns during removal.  
(max. engine temperature 90 °C). Wear gloves.

### CAUTION!



Risk of flying parts.  
Components of the spindle may rotate, come loose and cause injury.  
Avoid speed increases of over 3 m/s<sup>2</sup> on all axes.

**CAUTION!** Work area

- Close all safety devices.
- Ensure that there is enough space in the work area.
- Keep the work area clean.

## Electrical safety

- Do not operate the DGD-IS outdoors.
- Observe the safety notes on the DGD-IS.

## Safe working with and around fastening tools

- Inspect screw bits and retaining ring for visible damage and cracks.  
Replace damaged parts immediately.
- Always disconnect the power supply to the DGD-IS before changing screw bits.
- Only use screw bits for machine-controlled fastening tools.
- Make sure that the screw bits are retained securely.

- We do not claim that these safety notes are complete. Read and observe all applicable, general and local safety and accident prevention rules.
- Follow a safety-conscious maintenance program which takes into account the local regulations for maintenance and servicing in all phases of operation of the fastening electronics.

## 1.3 Operator training

- The fastening system may only be operated by personnel that have been trained and instructed correspondingly and authorized by the operator.
- The fastening system may only be maintained and serviced by personnel instructed by qualified staff from Apex Tool Group.
- The operator must make sure that all new operating and maintenance personnel are instructed in the operation and maintenance of the fastening system to the same extent and with the same care and attention.
- Personnel who are being trained may work on the fastening system only under the supervision of an experienced operator.

## 1.4 Personal protective equipment



## When working

- Wear the protective goggles to protect against spurting metal splinters.

## Danger of injury by being wrapped up in and caught by machinery

- Wear close-fitting clothing.
- Do not wear jewelry.

## 1.5 Intended use

The owner is responsible for using the machine according to its designated use.

When assembling the incomplete DGD-IS machine, the following conditions must be fulfilled so that the other components can be attached correctly to the machine and assembly can be completed without affecting the safety and health of personnel:

- The DGD-IS is designed for stationary operation only and is intended exclusively for fastening and loosening thread connections. Do not use as a hand-held tool.
- Always use the DGD-IS in combination with the nutsetter control unit m-Pro-400S-CPM....
- The DGD-IS must be fully assembled. Insert and lock all connecting cables.
- Secure the DGD-IS to an electroconductive mounting plate.
- Always use the DGD-IS in combination with the control unit m-Pro-400S-CPM....
- Only cable types approved by DGD may be used.
- Only accessory parts approved by DGD may be used.
- Unauthorized alterations, repairs and modifications are prohibited for reasons of safety and product liability.
- Do not operate the DGD-IS outdoors.

### NOTE



- Always remove the complete DGD-IS from a unit.
- Do not open the transducer, offset attachment or angle head attachment as this will void the warranty. A repair is only permitted by DGD authorized personnel. If repair is required, send the complete component to Sales & Service Center.
- Do not open the TS/TUS or CPS3 as this will void the warranty.  
This does not include the service panel. A repair is only permitted by DGD authorized personnel. If repair is required, send the complete component to Sales & Service Center.
- Read the following documents when replacing the DGD-IS
  - These assembly instructions
  - The system manual m-Pro--400S DGD intelligent spindles
  - Service manual DGD-IS
  - Spare part sheets

## 2 Transport / Storage

- Transport only in the original packing.
- If the package is damaged, check the part for visible damage.  
Inform the carrier or Sales & Service Center, if necessary.

### WARNING!



Sharp cooling fins on the m-Pro-400S-CPM... may cause cutting injuries.

- Wear gloves when transporting and assembling the machine.

System components	Storage temperature	Relative humidity
DGD-IS	-20 to 70 °C	0 to 90 % no condensation
m-Pro-400S-CPM...	-20 to 70 °C	0 to 90 % no condensation
TS/TUS	-20 to 70 °C	0 to 90 % no condensation
Motor	-20 to 70 °C	0 to 90 % no condensation
CPS3	-25 to 70 °C	0 to 90 % no condensation





### 3.1 Components

Component	Size									
	1		2		3		4		Best.-Nr.	Code
	Code	Order no.	Code	Order no.	Code	Order no.	Code	Order no.		
<b>B</b> Motor	1BT	935560	2BT	935561	3/4BT	935562	3/4BT	935562	935562	3/4BT
	1BUT	935563	2BUT	935564	3/4BUT	935565	3/4BUT	935565	935565	3/4BUT
<b>C</b> Tightening module	TS	961146	TS	961146	TS	961146	TS	961146	961146	TS
	TUS	961147	TUS	961147	TUS	961147	TUS	961147	961147	TUS
<b>D</b> Reversing gearing	–	935797	–	935798	–	935799	–	935799	935799	–
<b>E</b> Gearing	1B012A	927346	2B110A	935548	3B300A	935590	4B360A	929541	929541	4B360A
	1B035A	927344	2B200A	935549			4B500A	935780	935780	4B500A
	1B060A	927345					4B660A	935781	935781	4B660A
<b>F</b> Transducer	1K1KB	934283	2K1KB	934293	3K2KB	934302	4K1KB	934314	934314	4K1KB
	1K2KB	934284	2K3KB	934292			4K2KB	934315	934315	4K2KB
	1K3KB	934285					4K3KB	934316	934316	4K3KB
<b>G</b> Attachment, centric	1ZB	927222	2ZB	927227	3ZB	927233	4ZA	927236	927236	4ZA
							4Z1250A	S976950	S976950	4Z1250A
							4Z1600A	S976951	S976951	4Z1600A
Attachment, offset	1VK1B	935862	2VK1B	934334	3VK2B	934342	4VK2B	934353	934353	4VK2B
	1VK2B	935861	2VK3B	934333			4VK3B	934354	934354	4VK3B
	1VK3B	935860					4VK4B	934355	934355	4VK4B
Attachment, angle head	1WK1B	934364	2WK1B	934372	3WK2B	934382	4WK2B	934393	934393	4WK2B
	1WK2B	934365	2WK3B	934373			4WK3B	934394	934394	4WK3B
	1WK3B	934366								
<b>H</b> Adapter		935796		–		–		–	–	–
<b>J</b> Transducer cable	KMAW	961089-002	KMAW	961089-002	KMAW	–	KMAW	–	–	KMAW
	KMAG	961088-002	KMAG	961088-002	KMAG	961088-002	KMAG	961088-002	961088-002	KMAG
		961088-003		961088-003		961088-003		961088-003	961088-003	
		961088-004		961088-004		961088-004		961088-004	961088-004	
		961088-005		961088-005		961088-005		961088-005	961088-005	

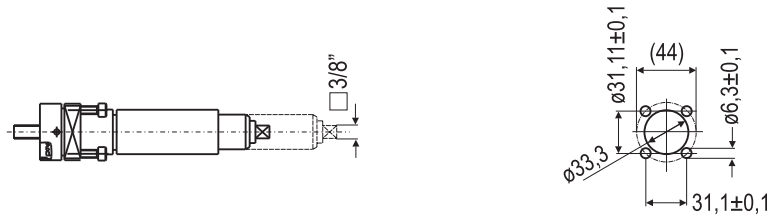
## 4 Installation

- The DGD-IS can be mounted in any direction.
- Screw the DGD-IS to a grounded, electroconductive mounting plate.
- Observe the following points during installation:
  - the service panel is accessible for one-off setting of the ARCNET address.
  - warm air must not be produced under the DGD-IS, also from other components.
  - there are no objects obstructing the air flow at the top or bottom.
  - the housing is not exposed to direct sunlight.

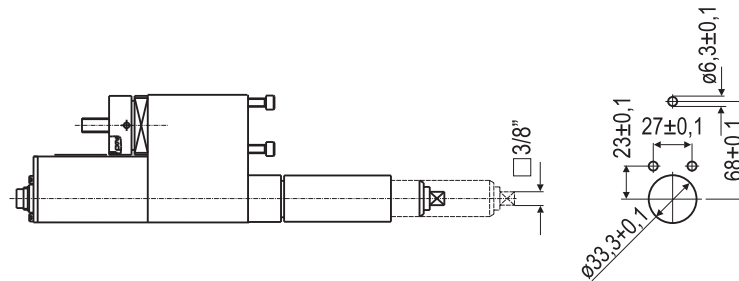
#### 4.1 Drilling templates in mounting plate

### 4.1.1 Size 1

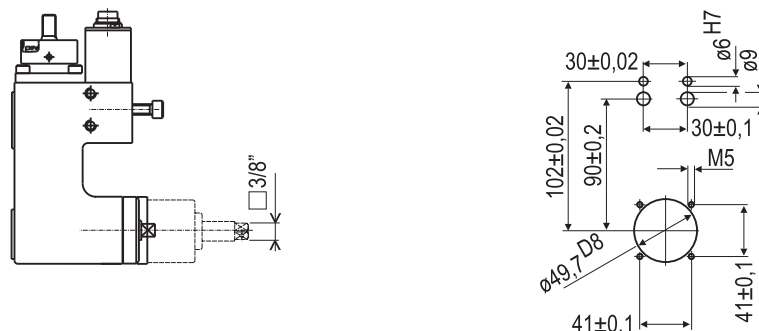
### Straight attachment 1ZB



## Offset attachment 1VK...B

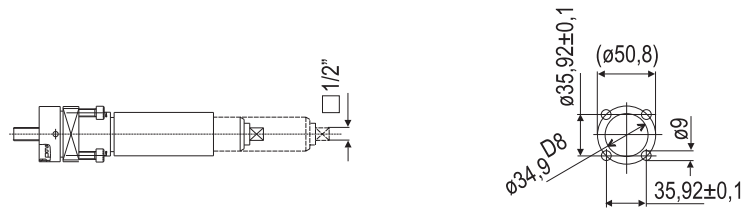


### Angle head attachment 1WK...B

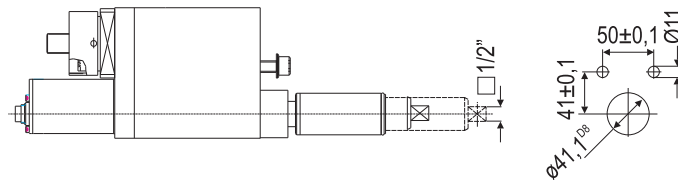


### 4.1.2 Size 2

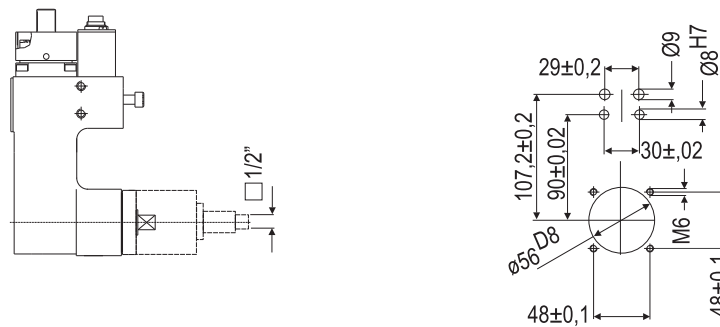
### Straight attachment 2ZB



### Offset attachment 2VK...B

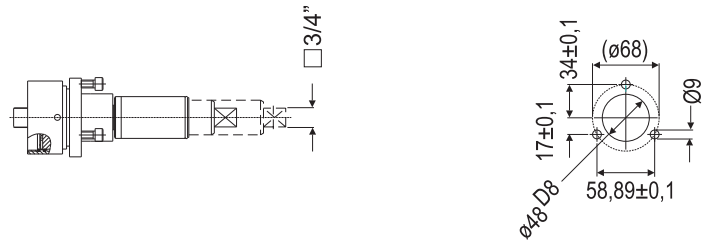


### Angle head attachment 2WK...B

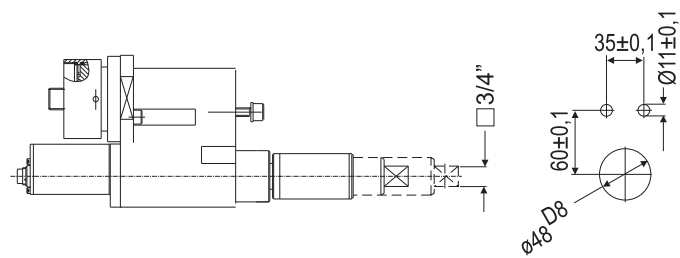


### 4.1.3 Size 3

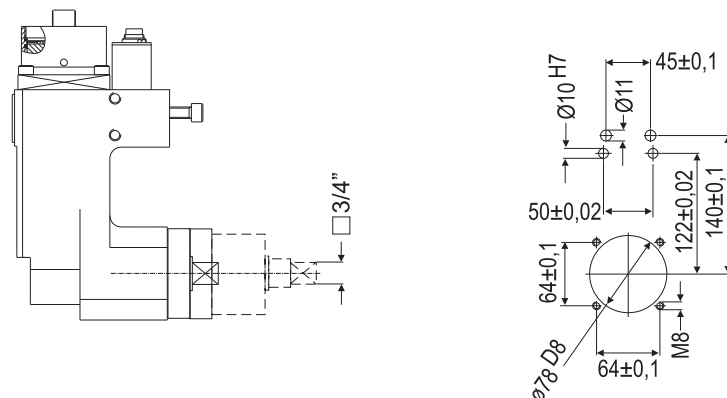
#### Straight attachment 3ZB

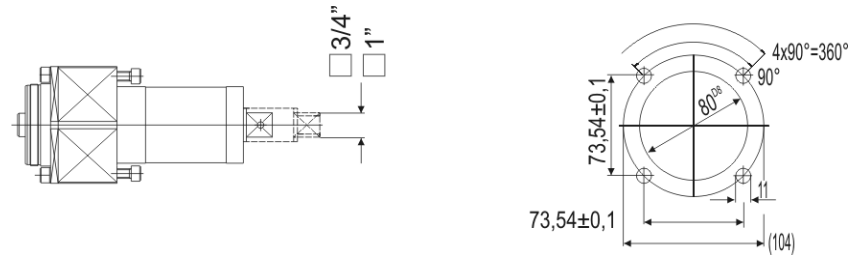
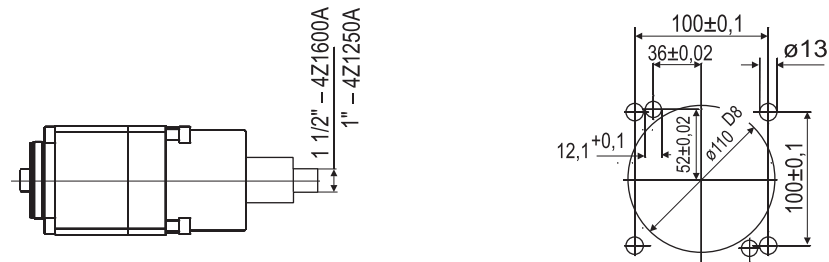
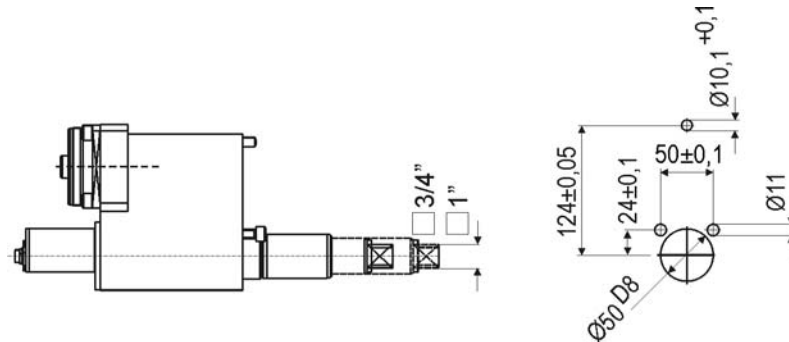
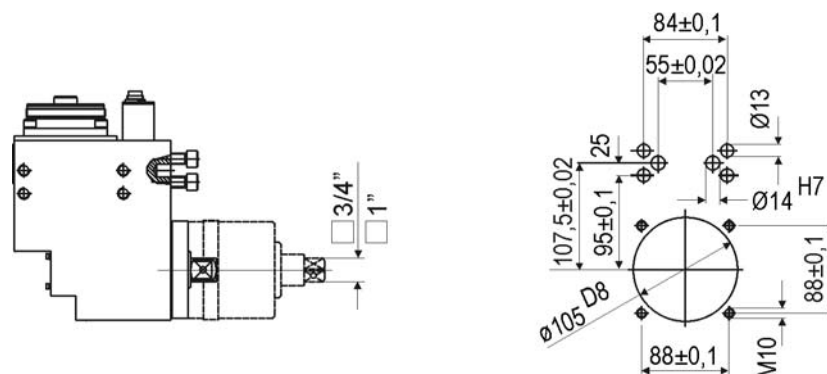


#### Offset attachment 3VK...B

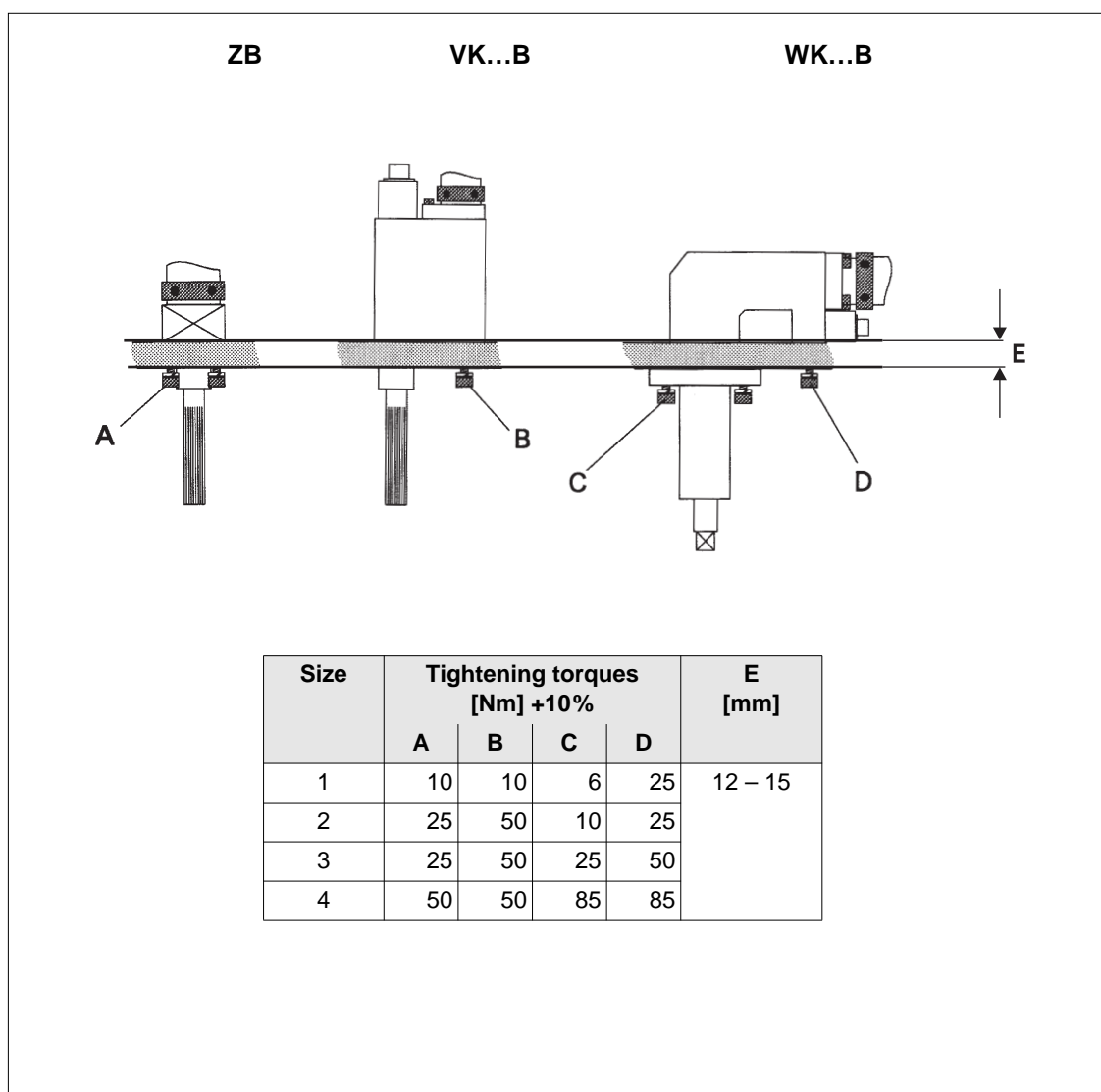


#### Angle head attachment 3WK...B



**4.1.4 Size 4****Straight attachment 4ZA****Straight attachment 4Z1250A, 4Z1600A****Offset attachment 4VK...B****Angle head attachment 4WK...B**

## 4.2 Attaching the DGD-IS to the mounting plate



## 5 Initial operation

When operating the machine for the first time, read and observe the system manual or the operator information for the m-Pro-400S(E).

1. Position the DGD-IS components together via flat toothed interfaces, see Service manual.  
Turn size 1 in 15° increments.  
Turn sizes 4 to 2 in 10° increments.
2. Connect all components, see System handbookm-Pro--400S DGD intelligent spindles.
3. An additional earth connection to the tool plate to ensure function is not necessary. Protective earthing of the DGD-IS is guaranteed by conductor in the system cable.
4. However, protective earthing of moving parts has to be made acc. to EN 60204-1.

### CAUTION!



Risk of tripping or falling over loose cables on the ground.  
Lay all connected cables safely.

5. Close all plug connectors and lock.

### NOTE



The red ring around the outer diameter of plug connectors with a slide lock should not be visible.

### NOTE



Always terminate the ARCNET with an ARCNET terminator at the bus end, i.e. at the last DGD-IS, order no. 961127. This terminator is installed permanently in the nutsetter control unit m-Pro-400S-CPM... (bus start).

6. Connect the mains cable to the nutsetter control unit.

### DANGER!



High leakage current – Fatal electric shock could occur.  
Establish a grounding connection (PE) to the nutsetter control unit before taking into operation!

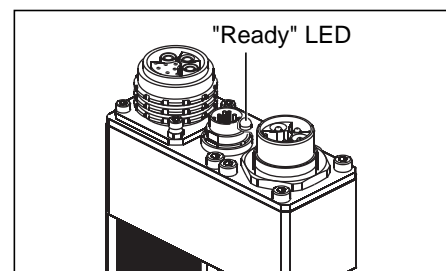
7. Preset the ARCNET address on each DGD-IS under the service panel, see System handbookm-Pro--400S DGD intelligent spindles.

### NOTE



Each address can be used only once in the system!

8. Close the service panel.
9. Close the protective devices (e.g. safety grilles).
10. Switch on the machine control unit (PLC/SPS).
11. Switch on the nutsetter control unit.  
If there are no faults pending after switching on the unit, the "Ready" LED on the DGD-IS lights up green.  
Otherwise see See system manual m-Pro--400S DGD intelligent spindles, Troubleshooting.
12. Enter the parameters for the torque / angle setting via the m-Pro-400S-CPM...  
Apex Tool Group specialist staff are responsible for programming the m-Pro-400S-CPM... prior to initial operation.  
The first time the nutsetter control unit is switched on, the parameters for controlling fastening sequences must be read in via the keyboard or a valid parameter file. See m-Pro-400S operator information for details of nutsetter control unit process programming.



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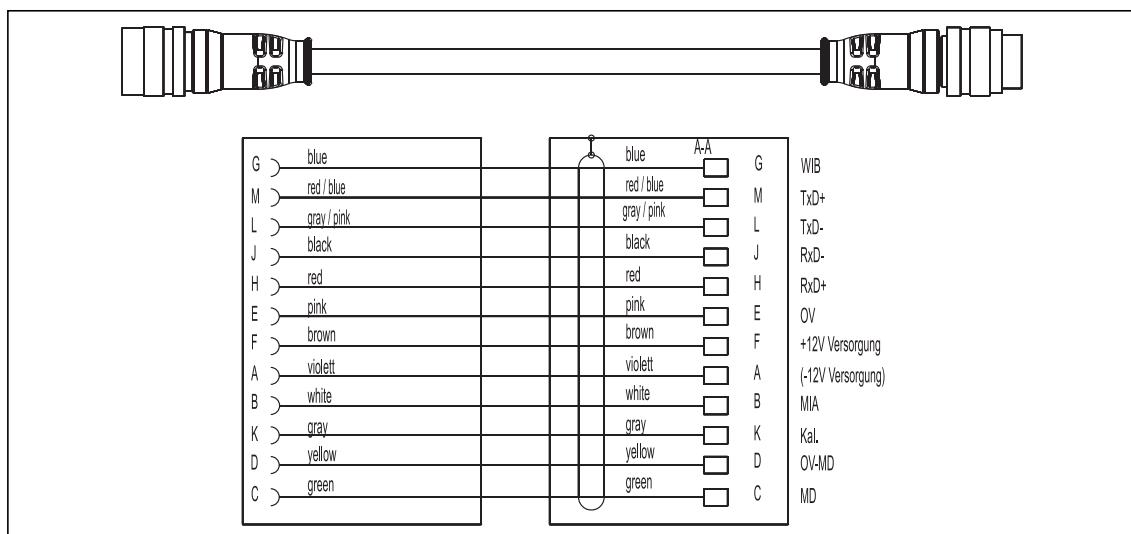


## 6 Cables

### 6.1 KMAG type

Cable between transducers – tightening module TS/TUS

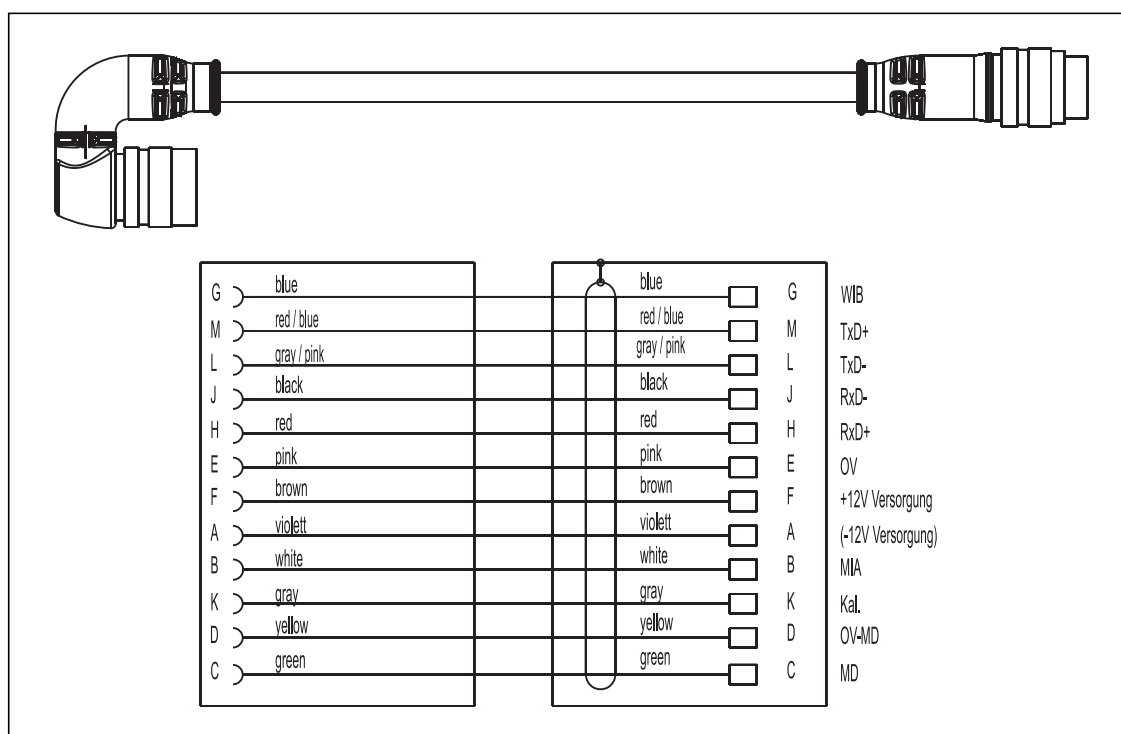
Order No.	
961088-002	Length 0.7 ft (0,2 m)
961088-003	Length 1.0 ft (0,3 m)
961088-004	Length 1.3 ft (0,4 m)
961088-005	Length 1.6 ft (0,5 m)
961088-006	Length 2.0 ft (0,6 m)
Thermal properties	
Ambient temperature	-58 ...+158 °F (-50 ...+70 °C) in fixed applications -40 ...+158 °F (-40 ...+70 °C) in flexible applications
Flammability	Flame-retardant and self-extinguishing in accordance with EN 50265-2-1, IEC 60332-1 and UL1581
Chemical properties of the coating	
Coating material	PUR, low-adhesion, resistant to hydrolysis and microbes, UV-resistant, abrasion-resistant, tear-resistant, cut-resistant, notch-resistant
Oil resistance	Oil-resistant in accordance with DIN VDE 0472, part 803 ASTM oil 1 to 3
Resistance to hydrolysis	In accordance with VDE 0283, part 10
Color	Gray RAL 7040
Mechanical properties	
Diameter	approx. 0.3 in (8 mm)
Bending radii: Single bends Multiple bends	1.2 in (30 mm) min. 3.1 in (80 mm) min. flexing action
Torsional length (±180 ° around separate central axis)	19.7 in (500 mm) min.
Max. acceleration	328 ft/s <sup>2</sup> (100 m/s <sup>2</sup> )



## 6.2 KMAW type

Cable between transducers – tightening module TS/TUS

Order No.	
961089-002	Length 0.7 ft (0,2 m)
961089-003	Length 1.0 ft (0,3 m)
Thermal properties	
Ambient temperature	-58 ...+158 °F (-50 ...+70 °C) in fixed applications -40 ...+158 °F (-40 ...+70 °C) in flexible applications
Flammability	Flame-retardant and self-extinguishing in accordance with EN 50265-2-1, IEC 60332-1 and UL1581
Chemical properties of the coating	
Coating material	PUR, low-adhesion, resistant to hydrolysis and microbes, UV-resistant, abrasion-resistant, tear-resistant, cut-resistant, notch-resistant
Oil resistance	Oil-resistant in accordance with DIN VDE 0472, part 803 ASTM oil 1 to 3
Resistance to hydrolysis	In accordance with VDE 0283, part 10
Color	Gray RAL 7040
Mechanical properties	
Diameter	approx. 0.3 in (8 mm)
Bending radii: Single bends Multiple bends	1.2 in (30 mm) min. 3.1 in (80 mm) min. flexing action
Torsional length (±180 ° around separate central axis)	19.7 in (500 mm) min.
Max. acceleration	328 ft/s² (100 m/s²)



## 7 Maintenance / Service

Only trained personnel are permitted to perform maintenance. See service manual DGD-IS.

**DANGER!**

High leakage current –

Fatal electric shock could occur!

- Always disconnect the power supply before performing maintenance work on the DGD-IS and the m-Pro-400S-CPM....
- Always disconnect the system cable, motor or motor cable from the m-Pro-400S-CPM... or DGD-IS before making throughput, resistance and short circuit measurements.
- Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.
- Establish a grounding connection (PE) to the nutsetter control unit m-Pro-400S-CPM... before taking into operation!

**WARNING!**

High temperature –

the motor on the DGD-IS may heat up and cause burns during removal.  
(max. engine temperature 90 °C). Wear gloves.

Regular maintenance reduces operating faults, repair costs and downtime. Implement a safety-related maintenance program that takes the local regulations for repair and maintenance for all operating phases of the tool into account.

## 8 Disposal

**CAUTION!**

Injuries and environmental damage from improper disposal.

Components of the DGD-IS pose risks to the health and the environment.

- The DGD-IS contains components that can be reused as well as components that require special disposal. Separate the components and dispose of them by segregating them clearly.
- Catch auxiliary materials (oils, greases) when drained and dispose of them properly.
- Separate the components of the packing and dispose of them by segregating them clearly.
- Follow the locally applicable regulations.



Observe generally valid disposal guidelines such as, in Germany, the Electrical and Electronic Equipment Act (ElektroG):

- Hand in the DGD-IS at your company collection point or return to Sales & Service Center.

## Sales & Service Centers

**Note:** All locations may not service all products. Please contact the nearest Sales & Service Center for the appropriate facility to handle your service requirements.

Dallas, TX

**Apex Tool Group  
Sales & Service Center**  
1470 Post & Paddock  
Grand Prairie, TX 75050  
USA  
Phone: +1-972-641-9563  
Fax: +1-972-641-9674

Detroit, MI

**Apex Tool Group  
Sales & Service Center**  
2630 Superior Court  
Auburn Hills, MI 48326  
USA  
Phone: +1-248-391-3700  
Fax: +1-248-391-7824

Houston, TX

**Apex Tool Group  
Sales & Service Center**  
6550 West Sam Houston  
Parkway North, Suite 200  
Houston, TX 77041  
USA  
Phone: +1-713-849-2364  
Fax: +1-713-849-2047

Lexington, SC

**Apex Tool Group**  
670 Industrial Drive  
Lexington, SC 29072  
USA  
Phone: +1-800-845-5629  
Phone: +1-803-359-1200  
Fax: +1-803-358-7681

Los Angeles, CA

**Apex Tool Group  
Sales & Service Center**  
15503 Blackburn Avenue  
Norwalk, CA 90650  
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Fax: +1-562-802-1718

Seattle, WA

**Apex Tool Group  
Sales & Service Center**  
2865 152nd Avenue N.E.  
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USA  
Phone: +1-425-497-0476  
Fax: +1-425-497-0496

York, PA

**Apex Tool Group  
Sales & Service Center**  
3990 East Market Street  
York, PA 17402  
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Phone: +1-717-755-2933  
Fax: +1-717-757-5063

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5925 McLaughlin Road  
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Fax: +1-905-501-4786

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