FORKARDT HARDINGE

Operating Instructions
FNC+ Power Chucks

FNC+ Power Chuck Operating Instructions

These operating instructions provide all necessary information for the proper installation, operation, care, maintenance, and use of this product. They must be read, understood, and accessible to all users at all times, and kept in the immediate vicinity of the product. Illustrations are intended for general understanding, may be simplified, and can differ from the actual design. We reserve the right to make technical changes to improve the product.
Only by following these instructions can faults be avoided and trouble-free operation ensured. We accept no liability for damage or malfunctions resulting from non-observance. For any issues, please contact our customer service department (see section 9.0). These instructions apply exclusively to the product described herein.

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Warnings

Safety instructions to prevent danger to life or damage to property are highlighted in these operating instructions by the signal terms and pictograms defined here.

DANGER!
Means possible danger, death, serious bodily injury or considerable damage to property can occur if the precaution is not taken or the safety instruction is not observed.

WARNING / CAUTION!
Indicates an important note to prevent personal injury, property damage or undesirable operating conditions.

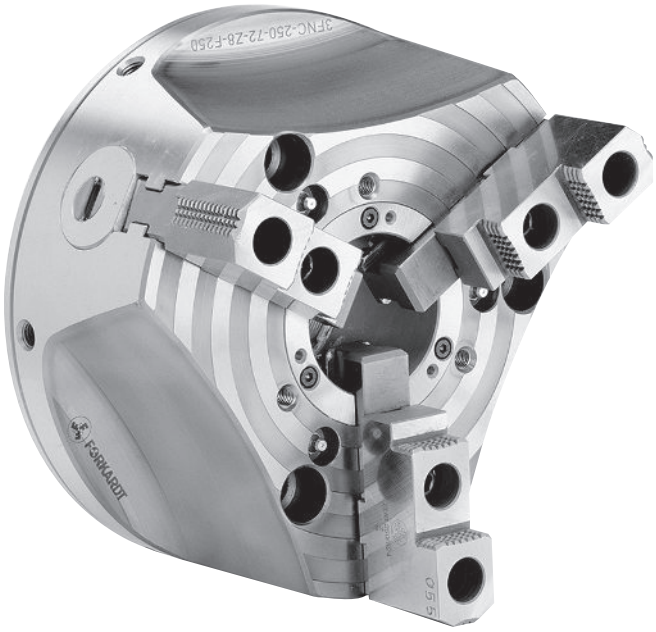
NOTE
Indicates a note on handling or further information.

Safety Instructions

Risks may arise from this product if its use and handling do not comply with the safety requirements. The product is built according to the state of the art and is safe to operate. Nevertheless, hazards may emanate from this product if it is used improperly or not as intended by unqualified persons.

The following instructions are for personal safety and to prevent damage to the described product or connected devices.

Read these operating instructions before working on the product and observe all safety instructions. Failure to follow the instructions contained in this manual may result in danger to life, serious injury or serious damage to property.



- Only qualified persons may work with the product. (see also 2.7 Personnel qualification)
- Unauthorized conversions and modifications to the product are not permitted.
- Only use the product when it is in perfect condition.
- Before working on the product, switch off the machine and secure it against being switched on again.
- Depressurize the hydraulic unit for the clamping process and secure it against being switched on again.
- Only use original assemblies and spare parts from the manufacturer. The use of third-party parts voids the warranty.
- Before commissioning the product, check that all protective devices are in place.
- The "lathe-clamping device-workpiece" system is largely influenced by the workpiece to be produced, which may result in a residual risk. This residual risk must be assessed by the operator.

The manufacturer accepts no liability for damage caused by nonobservance of the operating instructions.

Intended Use

The three-jaw power chuck Type FNC+, hereinafter referred to as power chuck, is actuated by a rotating clamping cylinder whose axial actuating force must be matched to the power chuck. The power chuck Type FNC+ may only be used as intended. The intended use is the clamping of workpieces on:

1. Lathes (rotating) or
2. Machine tools (stationary)

The max. axial force, the max. clamping force and the max. speed of the power chuck must not be exceeded. (For values, see Technical Data, Chapter 5) The required speed and clamping force must be determined by the operator for the respective machining case in accordance with the applicable rules of technology (e.g. VDI3106). Intended use also includes compliance with the commissioning, installation, operating and maintenance conditions specified by the manufacturer.

Any use beyond this is considered improper. The manufacturer is not liable for any damage resulting from this. The product is intended for industrial use.

The technical specifications of the product must not be exceeded.

Use not in accordance with the intended purpose an unintended use exists, for example, if:

- the product is used for machines, workpieces or processes not intended for this purpose
- the specified technical data are exceeded
- the product is operated without a protective device
- the product is used in inadmissible working environments
- clamping jaws not approved for the workpiece are used
- Workpieces are inserted incorrectly into the product
- Workpieces are not clamped and machined in compliance with the specified clamping forces and speeds

Operating and warning instructions

In accordance with the regulations of the Machinery Directive and the Employer's Liability Insurance Association, rotating clamping devices, such as this product, must be protected against contact by suitable guards.

If faults occur in the product during operation, the machine, hereinafter also referred to as the equipment, must be shut down immediately. It must not be put back into operation until the fault has been rectified.

The operation of the product is subject to the local safety regulations and accident prevention regulations of the respective employers' liability insurance association as amended.

The following special dangers / malfunctions can occur during transport, assembly, commissioning, operation, disassembly, maintenance!

DANGER!
Risk of injury due to falling of the product or components during transport, assembly or disassembly.

- Check the weight of the product and the permissible towing capacity of the equipment/conveyor used in advance. (crane, forklift, etc.)
- Increased caution in the hazardous area during handling of the product.
- Comply with current load securing regulations using all material handling equipment and devices.
- It is recommended to wear appropriate protective clothing (safety shoes min. S3; gloves etc.) during transport or assembly/disassembly of the product.
- Whenever working on the product, secure it accordingly to prevent objects from falling unexpectedly.

DANGER!
Risk of injury due to assembly errors

- When mounting the product, make sure that all fastening screws are tightened to the specified torque. The values specified in the drawings and in 3. tightening torques are binding.
- All components to be mounted must be attached to the interfaces provided for this purpose. The position and direction of installation are shown in the drawings in the appendix.
- Ensure that all components are firmly and correctly seated during installation and before the permissible torque is reached.

DANGER!
High risk of injury and property damage due to jaw breakage, as well as possible failure of the product due to exceeding the max. permissible technical data or malfunction (e.g. crash) and associated workpiece loss and/or flying components.

- The technical data specified for this product must not be exceeded under any circumstances. Especially in connection with additional special components (e.g. special clamping jaws), the prescribed technical data of the weaker product are decisive and must be observed.
- The product may only be used on equipment that meets the minimum requirements of the EC Machinery Directive.
- The technical equipment must include technical protective measures that protect operators from possible technical hazards.

DANGER!
Risk of injury and material damage due to changes in cutting data

- The product is designed for specific operating conditions in combination with clamping jaws. A change during operation can lead to severe damage.
- Never set the cutting data above / below checked and released values.
- Watch for unusual signs (workpiece rattles, large vibrations, etc).

DANGER!
High risk of injury from clothing or hair being caught and pulled into the machine if caught on the product

- Work on the product with tight-fitting clothing and hairnet if necessary.
- Do not operate the product while persons are in contact with it. If this is not possible due to the current process (e.g. manual changing of workpieces), special care must be taken.
- The equipment on which the product is operated must meet the minimum requirements of the EC Machinery Directive.
- The technical equipment must include technical protective measures that protect operators from possible mechanical hazards.

DANGER!
High risk of injury and property damage in case of product failure due to noncompliance or neglect of maintenance and servicing schedules.

- The maintenance and repair instructions given in this manual must be observed in all cases.
- The product or individual components must be tested within the specified time periods using the necessary test equipment/procedures.
- Work on the product may only be carried out by qualified personnel. (see also 2.7 Personnel qualification).

DANGER!
High risk of injury and property damage in the event of a power failure of the device due to the workpiece falling down / flying around.

- The manufacturer of the technical equipment as well as the operator of this equipment must ensure, on the basis of a performed and documented risk assessment, that in the event of a power supply failure, the function of the product is maintained until the equipment comes to a standstill by means of suitable measures. (e.g. pressure accumulator for hydraulic systems, for maintaining a necessary clamping pressure).
- The product may only be used on equipment that meets the minimum requirements of the EC Machinery Directive.

The technical equipment must include, in particular, technical protective measures that protect against possible mechanical hazards.

DANGER!
High risk of injury and material damage due to exceeding the max. permissible maximum speed of the product, especially in connection with the use of additional add-on components.

- The product has a fixed maximum speed, which is described in these instructions. This must not be exceeded under any circumstances.
- If the product is operated with additional attachments (e.g. clamping jaws), make sure to specify a new max. permissible speed. However, this must not exceed the max. permissible speed of the product.
- If the equipment is capable of reaching a higher maximum speed than the product, a speed limiter must be provided. This must ensure that the product can only be operated at the permissible speed for the intended processing.

WARNING!
Danger of crushing and jamming during installation and removal, as well as when replacing moving components

- Observe safety and accident prevention regulations.
- Wear protective clothing (safety shoes min. S3; gloves etc.).
- Secure all components against slipping / falling.
- Do not reach between moving components.

WARNING!
Risk of slipping and falling due to contamination (greases, oils, cooling lubricants)

- Observe safety and accident prevention regulations.
- Wear suitable protective clothing (safety shoes min. S3; gloves etc.).
- Ensure that work surfaces are clean.

WARNING!
Risk of vibration due to unbalance

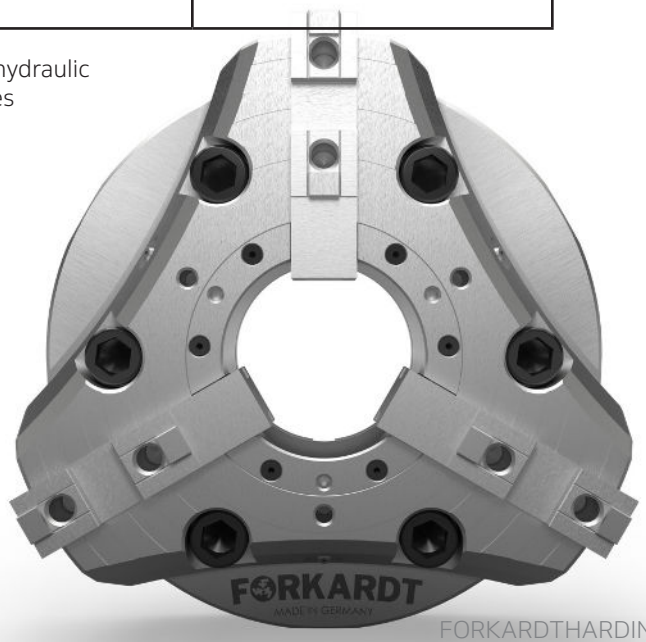
- Check concentricity and axial runout of the product.
- Reduce speed.
- Look for ways to eliminate the imbalance.

Safety-related conditions for safe operation

The safety-related conditions for the operation of this product are defined in the test principles of the professional associations, as well as the DIN, VDE and VDI guidelines. The individual test conditions are ensured by the following measures:

Test condition	Ensured by
The machine spindle must not start until the Clamping pressure in the clamping cylinder is reached and the permissible working range for the tension is reached.	1. Pressure switch in the tension lines 2. Pressure gauge Manometer
The machine spindle must not start until the voltage is within the permissible range.	Clamping path monitoring at the Actuating cylinder
The voltage can only be applied at standstill, the machine spindle can be loosened.	Standstill monitoring at the machine spindle
In the event of a failure of the clamping energy, the workpiece remains in place until firmly clamped to the spindle standstill.	Unlockable check valves in the Actuating cylinder
In case of power failure and / or return, no change occurs of the switching positions.	Pulse controlled directional control valve with detented end positions
In the event of a failure of the clamping energy, a signal to the automatic or manual spindle stop. At 1/5 of the maximum actuating force, the clamping device used must open and close.	Pressure switch in the tension line

Only applies to hydraulic clamping devices



Function test

After mounting the product, the following functions must be checked before commissioning:

Stroke control
The product must have a safety range (residual stroke) for safe clamping and unclamping of a workpiece. A clamping stroke monitoring system must be used to check whether the product is within the limits for the application.

Clamping force measurement
At max. actuating force (axial force of clamping cylinder), the clamping force specified for the product must be reached (at standstill). It should be noted that a different clamping force is achieved when measuring with clamping jaws. This must be recalculated for each application. For a dynamic clamping force measurement, the centrifugal force of the clamping jaws must be taken into account. (Compare VDI 3106)

Changes to the product

This product may not be modified without prior approval of the manufacturer.

If the operator makes significant changes to the product, the conformity with the Machinery Directive 2006/42/EC, as well as the warranty expires!

Transport, handling and storage

If transport damage is detected, report this immediately to the carrier. Report missing parts to the manufacturer in writing immediately.

If the product is not assembled immediately after delivery, it must be stored temporarily in a protected place. When doing so, cover the parts properly and protect them from dust and moisture.

For protection, all bare parts of the product, as well as all accessories are provided with a preservative on delivery.

Personnel qualification

This product may only be operated in the life cycle phases transport, assembly / commissioning, use and disassembly by qualified and safety instructed personnel. (see also Table 2: Personnel qualification)

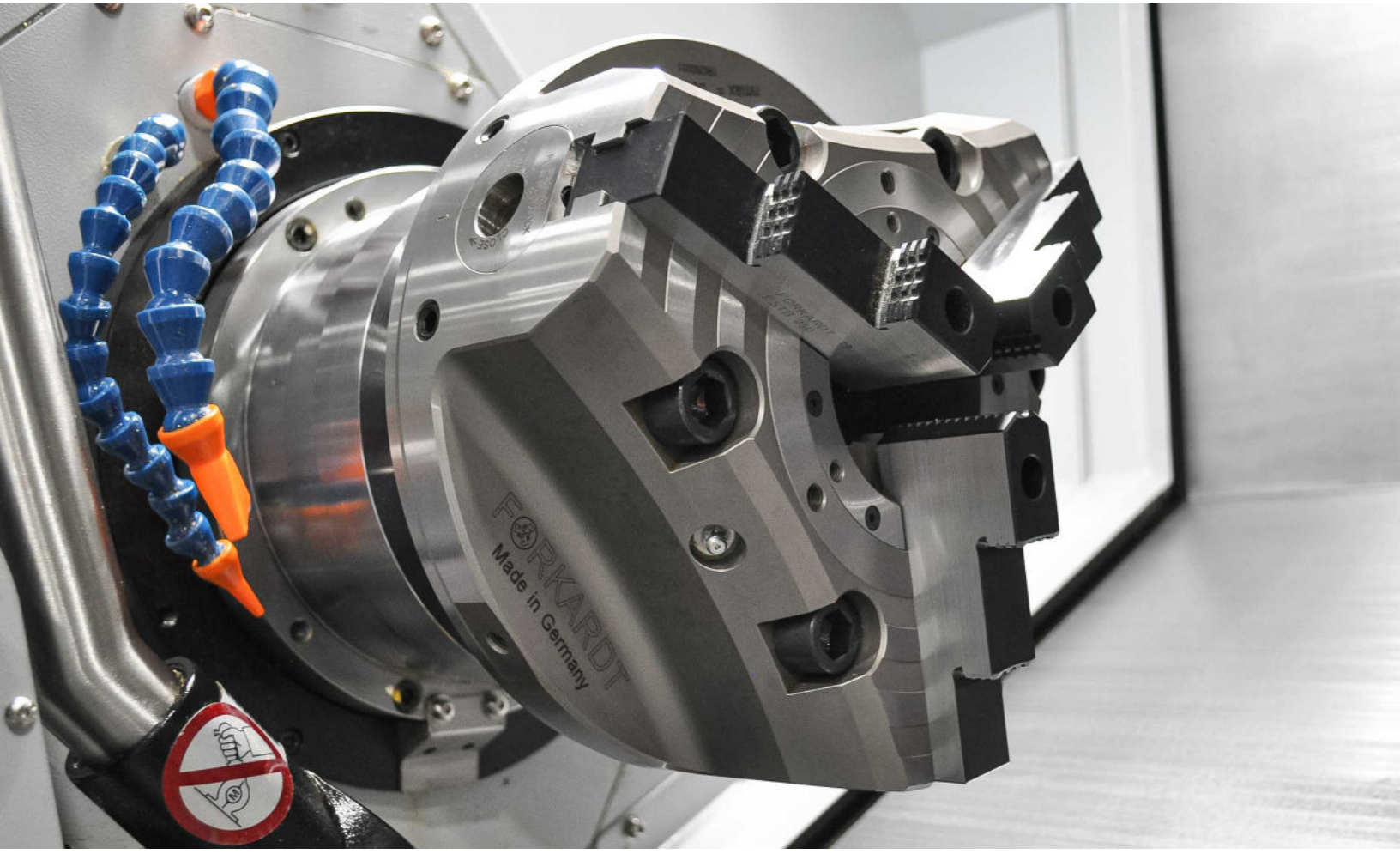
Qualified persons are:

- Persons who have been instructed as operators in the use of the product and who are provided with these instructions.
- Persons who have been trained as commissioning and service personnel and are qualified to commission and repair this product.
- Trainees may only work at facilities where this product is operated under the supervision of qualified personnel.

The operator is recommended to prepare internal safety instructions for his personnel.

For operation, maintenance and repair of the product, the notes and contents of these operating instructions must be read and understood.

[i]	Machinery Directive 2006/42/EC, Annex I, No. 1.1.1 d: "Operating personnel" the Person or persons responsible for installation, operation, setup, maintenance, Cleaning, repair or transport of machines are responsible.
[ii]	Analogous to DIN VDE 0105-100: One person is considered a trained/instructed person, who was instructed about the tasks assigned to her and the possible hazards in the event of improper behavior and, if necessary, trained. She was also instructed about the necessary protective equipment and protective measures. Personnel to be trained, instructed or undergoing general training may only work under the constant supervision of an experienced person.
[iii]	Analogous to DIN VDE 0105-100: A specialist is defined as a person who works on is able to assess the work assigned to it and recognize possible hazards on the basis of its technical training, knowledge and experience. Furthermore, they have knowledge of the relevant regulations.



Phases of life	Examples of tasks of the operating personnel	Required qualification of theoperating personnel [i].		
		Layman	Trained/ instructed personnel [ii]	Specialist [iii]
1. Transport	Lifting		X	
	Loading		X	
	Packing		X	
	Transport		X	
	Unloading		X	
	Unpacking the machine or machine parts	X		
2. Assembly and installation commissioning	Settings on the chuck and its components			X
	Assembly / mounting of the chuck and change parts			X
	Connection to power supply		X	
	Demonstration			X
	Charging, filling, introduction of auxiliary fluids (e.g. lubricant, grease)		X	
	Preparations for the installation		X	
	manual insertion of workpieces		X	
	Operation of the machine without load			X
	Testing			X
	Tests under load / maximum load			X
3. Use				
3a. Setup/Teach-in/Changeover	Adjusting and setting up protective devices and other attachments			X
	Set and set up or check the functional parameters (e.g. pressure, Clamping force, strokes			X
	Clamping the workpiece			X
	Feeding, filling, introduction of raw materials		X	
	Functional tests; trials			X
	manual / automatic insertion of workpieces		X	
	Replacing components		X	
	Checking the final product		X	
3b. Operation	Driving the machine			X
	manual / automatic loading / unloading		X	
	minor setting and setup operations for functional parameters of the Chuck (e.g. pressure, clamping force, strokes)			X
	minor interventions during operation (e.g. removal of waste products, Removal of blockages, cleaning)			X
	Restart of the clamping device after shutdown / interruption			X
	Monitor		X	
	Checking the final product		X	

This table is based on EN ISO 12100:2010

Phases of life	Examples of tasks of the operating personnel	Required qualification of theoperating personnel [i].		
		Layman	Trained/ instructed personnel [ii]	Specialist [iii]
3c. Maintenance / Servicing	Cleaning		X	
	Disassembly / removal of components			X
	Lubrication / refilling of operating materials		X	
	Exchange of interchangeable parts		X	
	Replacement of wear parts			X
	Re-setting the chuck			X
	Checking components, chuck equipment			X
3d. Troubleshooting and fault elimination	Disassembly / removal of components			X
	Troubleshooting (e.g. optical, metrological)			X
	Energy separation		X	
	Restart after malfunctions			X
	Restart after blocking			X
	Repairs		X	
	Replacement of components / equipment on the chuck			X
	Rescue trapped persons		X	
	Re-setting the chuck			X
	Checking components, chuck equipment			X
4. Disassembly	Disassembly of the chuck			X
	Lifting		X	
	Loading		X	
	Packing		X	
	Transport		X	
	Unloading		X	

Tightening torques

For the tightening torques, the data from the drawings belonging to these instructions and noted in the appendix apply. If no separate values are given for cap screws, the data from the following tables apply:

Chuck Attachment

Tightening torques for cap screws DIN 912 / ISO 4762 (screw quality 10.9)

Screw size	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30	M33	M36
Preload force F v [N] (0,9)	16940	23100	25200	34650	42400	66400	83200	95600	126000	154000	192000	224000
Tightening torque M A [Nm]	25	43	56	90	124	244	332	420	620	840	1120	1480

Jaw Mounting

Tightening torques for cap screws DIN 912 / ISO 4762 (screw quality 10.9)

Screw size	M6	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Preload force F v [N] (0,9)	13200	19360	26950	39200	53900	74200	116200	145600	167300	220500	269500
Tightening torque M A [Nm]	15	29	50	75	120	155	305	415	525	775	1050

Chuck Attachment

Tightening torques for cap screws DIN 6912 / ISO 7984 (screw quality 10.9)

Screw size	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30	M33	M36
Preload force F v [N] (0,9)	13552	18480	20160	27720	33920	53120	66560	76480	100800	123200	153600	179200
Tightening torque M A [Nm]	20	35	45	72	99	195	266	336	496	672	896	1184

Jaw Mounting

Tightening torques for cap screws DIN 6912 / ISO 7984 (screw quality 10.9)

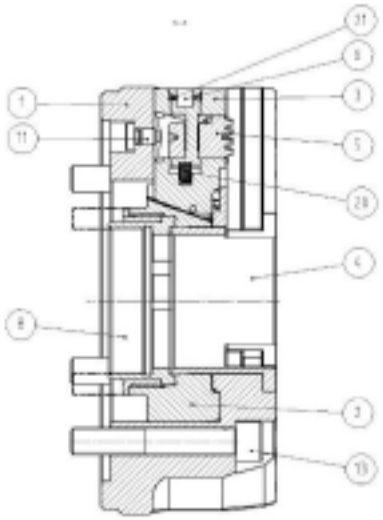
Screw size	M6	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Preload force F v [N] (0,9)	10560	15488	21560	31360	43120	59360	92960	116480	133840	176400	215600
Tightening torque M A [Nm]	12	23	40	60	96	124	244	332	420	620	840

Structure and mode of action

General description
The power chuck type FNC+ is a wedge hook chuck with quick-change jaw system and is suitable for all NC lathes on which smaller or medium batch sizes are machined that require frequent changeover of the clamping jaws.

Constructive structure

Item no	Naming
1	Chuck body
2	Piston
3	Driving jaw
4	Protective bushing
5	Coupling pin
6	Eccentric
8	Threaded bush
9	Raste
11	Locking screw
13	Cheese head screw
20	Pressure spring
21	Ball



The Power Chuck Type FNC+ consists in its main components from:
- the one-piece chuck body (1) with centric seating
- the piston (2) with the threaded bushing (8)
- the three driving jaws (3) with integrated coupling pins (5) and spring-loaded eccentric (6)
- and the protective bushing (4), which prevents dirt and chips from entering the guide of the drive jaws or piston guide. The threaded bushing (8) is attached to the piston (2) by means of a second threaded bushing. To secure the drive jaws (3), locking screws (11) are located in the chuck body to prevent them from falling out unintentionally. The clamping jaws are unlocked or locked by means of the coupling pins (5), using a special chuck key.

To engage the clamping jaws, there is a spring-loaded detent (9) in the driving jaw, which also determines the correct position of the clamping jaws in relation to the coupling pins.

Technical data

Feed data

Type FNC+	185	215	260	315	400	500	630
Max. Actuating force FAx [daN]	3200	5000	7500	10000	12000	12500	12500
Max. Clamping force FSp [daN]	6000	9000	13500	18700	24000	25000	25000
Max. Speed [1/min]	7000	6000	5000	4000	3000	2200	1700
Piston stroke [mm]	20	22	22	28	28	33	33
Jaw stroke [mm]	7.2	8	8	10.2	10.2	12	12
Jaw width	20	22	26	32	32	45	45
Chuck intake centering Ø...H6 DIN ISO702-4	140 (Z5)	170 (Z6)	220 (Z8)	300 (Z11)	300 (Z11)	380 (Z15)	380 (Z15)
Spindle thread	M60x2	M75x2	M90x2	M115x2	M135x2	M165x2	M175x2
Weight approx. [kg]	11	18.3	25	50	80	135	197
Operating temperature [C°]	10-55						

For workpiece machining, the user must determine the required clamping forces and speeds.

The maximum speed and actuating force of the product must not be exceeded.

In the case of top-mounted or special jaws, ensure that the weight and projection of the jaws are as low as possible.

Clamping force

General

The connection between the power chuck and the workpiece is frictional, i.e. the force is transmitted by pressing the clamping jaws against the workpiece. The contact pressure required to establish this frictional connection is referred to as the clamping force. Various influences act directly or indirectly on the clamping force:

- Variable adhesion coefficients between workpiece and clamping jaw
- Ratio of clamping diameter and working diameter
- Size of the cutting force on the cutting tool
- Throat of the clamping jaws from the clamping point
- Decrease of the clamping force due to the centrifugal force of the clamping jaws during external clamping. Rotating chucks are subject to the influence of centrifugal force, which increases with the square of the rotational speed. The centrifugal forces counteract the clamping force at external clamping, and this is reversed at internal clamping. The force of the clamping jaws still available at high spindle speed to hold the workpiece depends on the amount of clamping force available at standstill, the weight of the clamping jaws and their center of gravity radius.

Static clamping force Fsp0:

The max. clamping forces Fsp0 given in Table 5 Chapter 5 can only be achieved under favorable conditions. The prerequisites for this are:

- Perfect condition of the power chuck
- Optimum lubrication of all sliding surfaces in the chuck
- Maximum actuating force FAx
- Short jaw throat
- Standstill n = 0 (or low speed)

The clamping force at standstill is measured with a static clamping force gauge, e.g. SKM 1200 / 1500, measured.

Operating clamping force Fsp:

The operating clamping force Fsp is the total clamping force (daN) of all jaws in the barrel and represents a minimum value for the usable clamping force under normal operating conditions. The clamping force at standstill results from the power chuck data. However, this value alone is not decisive for operation. The clamping jaws have a significant influence on the operation of a power chuck. Which clamping jaw is used depends on the specific individual case. The clamping force is influenced by the weight of the jaws and the speed. Dimensions of the jaws can be found in our catalog or on our website (www.forkardthardinge.com).

The speed is limited to a clamping force loss of 67% due to centrifugal force. (DIN EN1550)

Calculation formulas

Operating clamping force:
Fsp = Fsp ± Δ Fsp Eq.:1

Clamping force Fsp0 at standstill:
$Fsp0 = \frac{.1}{.2+} \times Fax$ Eq.:

Loss of clamping force due to centrifugal force of the jaws
Δ Fsp = ± 0.0008 x (C3 + Ma) x ^{n2} Gl.:3
(+ for internal voltage - for

Operating clamping force:
Fsp= .2+x Fax ± 0.0008 x (C3 + Ma) x ^{n2} Eq.:
(+ for internal voltage- for

Centrifugal moment:
$Ma = \frac{2\ (Dsp \pm Yab) \times G \times i}{1000}$ Eq.:

Legend

Fsp	Operating clamping force [daN], the total clamping force of all jaws in the barrel
C1, C2, C3	Feed constant
Fax	Max. Actuating force [daN]
n	Speed [min-1]
Ma	Centrifugal moment of the top clamping jaws [kgm]
Dsp	Clamping diameter [mm]
YAB	Center of gravity distance of clamping jaw from clamping diameter [mm]
Ysga	Center of gravity distance base jaw for external clamping
Ysgi	Center of gravity distance base jaw for internal clamping
Ysha	Center of gravity distance hard top jaw external clamping
Yshi	Center of gravity distance hard top jaw internal clamping
Yswa	Center of gravity distance soft top jaw external clamping
Yswi	Center of gravity distance soft top jaw internal clamping
a	Jaw projection [mm]
i	Number of clamping jaws
G	Weight of one clamping jaw [kg]
Ra	Center of gravity distance of the clamping jaw from the chuck center [mm]

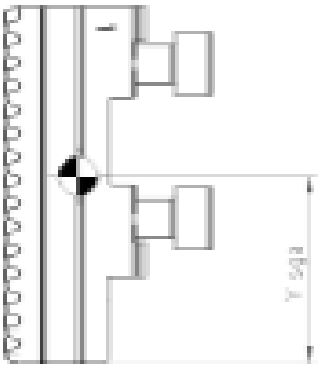
Feed constant

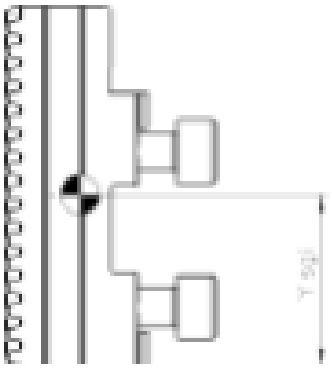
TYPE FNC+	185	215	260	315	400	500	630
C1	749	837	972	1186	1813	2290	3151
C2	387	433	510	614	883	1109	1487
C3	0.044	0.079	0.150	0.302	0.443	1.234	1.659

Clamping data

Base jaws
Center of gravity distance Ysga (external stress)
/ Ysgi (internal stress)

Chuck type	Base Jaw			
	FGB No. (Jaw connection)	Ysga	Ysgi	Weight G in kg
FNC+185	D180567000 (F160)	38.84	35.16	0.26
FNC+215	D180577000 (F200)	45.46	44.54	0.42
FNC+260	D180588000 (F250)	56.39	53.61	0.7
FNC+315	D180596000 (F315)	63.13	61.87	1.08
FNC+400	D180596000 (F315)	63.13	61.87	1.08
FNC+500	D180606000 (F400)	81.55	78.45	2.38
FNC+630	D180606000 (F400)	81.55	78.45	2.38

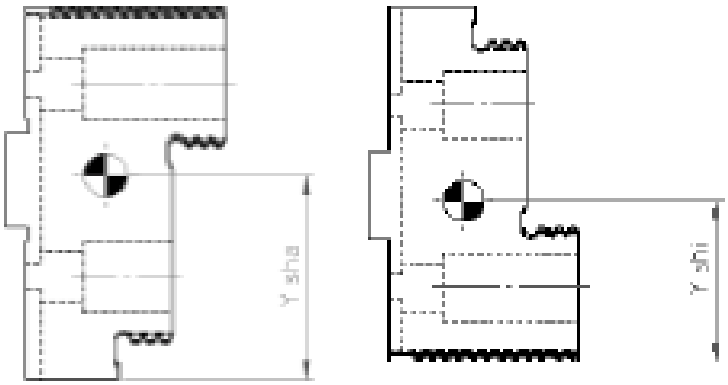




Clamping data cont'd

Hard top jaws
Center of gravity distance Ysha (external stress)
/ Yshi (internal stress)

Chuck type	Hard Top Jaw			
	FHB No.	Ysha	Yshi	Weight G in kg
FNC+185	D1070016624	35.51	28.09	0.2
FNC+215	D1070021624	40.98	31	0.28
FNC+260	D1070026524	48.31	41.93	0.68
FNC+315	D1070033524	57.35	47.65	1.11
FNC+400	D1070033524	57.35	47.65	1.11
FNC+500	D1070038524	70.11	59.89	2.21
FNC+630	D1070038524	70.11	59.89	2.21



Soft Top Jaws

Chuck type	Soft Top Jaw			
	FWB no.	Yswa	Yswi	Weight G in kg
FNC+185	D1070016525	40.9	44.1	0.39
FNC+215	D1070021525	51.6	53.4	0.66
FNC+260	D1070026425	60.29	64.71	1.33
FNC+315	D1070033425	71.12	73.88	2.05
FNC+400	D1070033425	71.12	73.88	2.05
FNC+500	D1070038425	87.13	92.87	4.16
FNC+630	D1070038425	87.13	92.87	4.16

Calculation example:
What is the clamping force at standstill when clamping the workpiece (n = 0) and at operating speed n = 4000 min-1?
Clamping diameter Dsp = 160 mm Jaw
weight G = 0.61 kg / jaw

>Center of gravity radius: Ra - Yab = $\frac{160}{2}$ - 4= 76mm Dsp

>Total centrifugal torque: M^2 = $\frac{Ra \times G \times i\ 76x0.61x3}{1000}$ = 1000 = 0.139kgm 1000

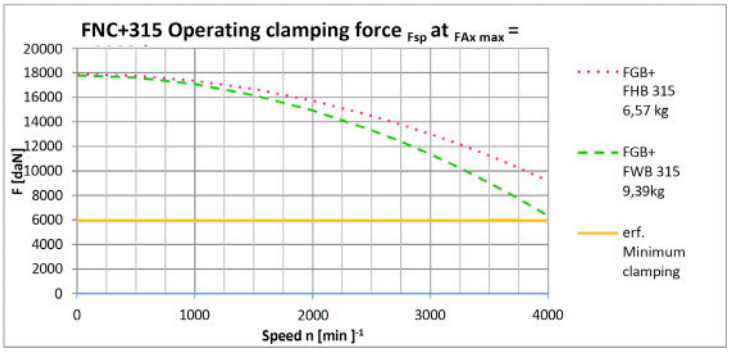
>Clamping force at standstill FNC+215 (n = 0): Fsp0 x Fax = $\frac{837}{433+32}$ x5000 = 9000N

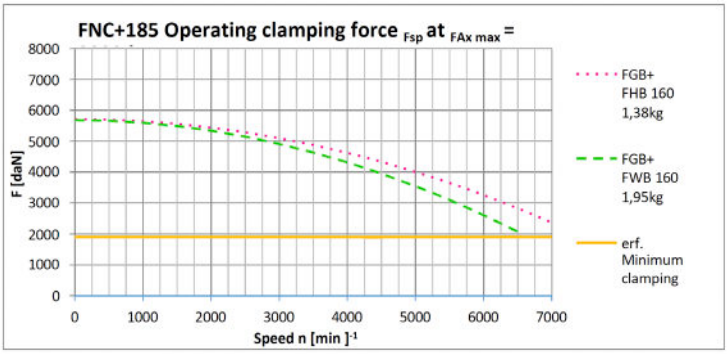
>Clamping force at working speed n = 4000 $^{min-1}$: Fsp= $\frac{C2 + a}{.2+Ci}$ x Fax ± 0.0008 x (C3 + Ma) x ^{n2}

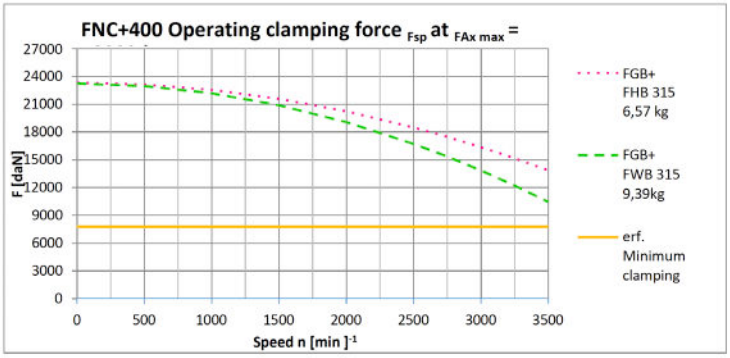
= $\frac{837}{433+32}$ x5000 - 0.0008 x (0.079 +0.139) x 40002= 6209.6N

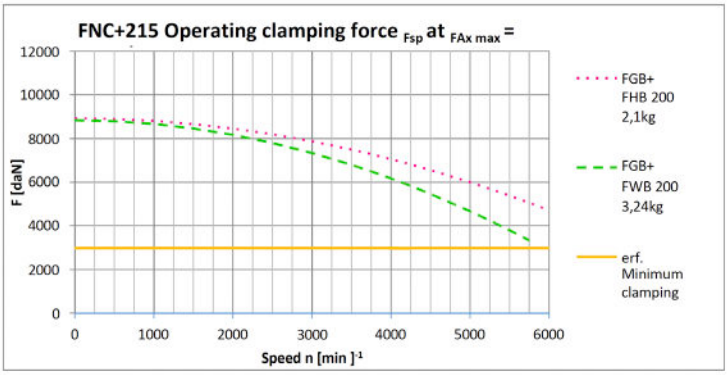
Clamping force speed diagrams

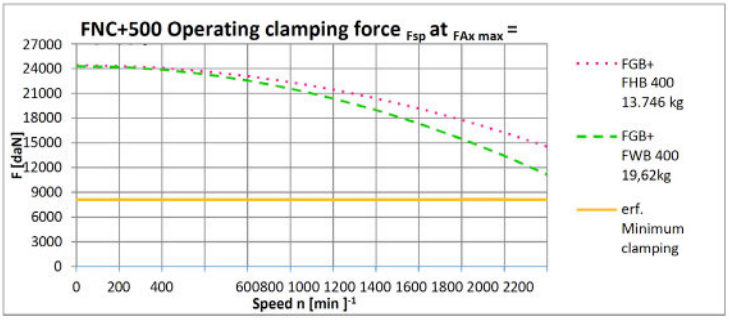
The following diagrams have been determined for a specific clamping diameter using the specified top jaws and with the associated base jaws. Thus, they serve only as guide values. Maximum speeds must be recalculated for each machining case and must not exceed the maximum permissible speeds of the chucks.

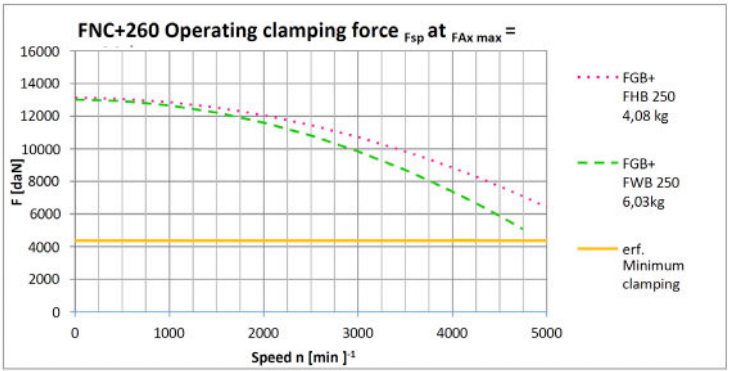


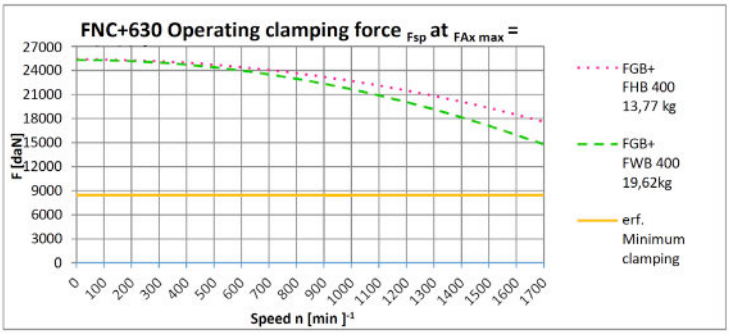












Safety - Notes

- When the power chuck is rotating, the operating clamping force must be determined with a dynamic clamping force measuring device, e.g. FORSAVE D.
- Determine dynamic clamping force loss during each setup operation and ensure that the clamping force is sufficient for the cutting task.
- If the clamping force determined with a clamping force meter falls below the calculated value, the power chuck must be relubricated.
- Use light top jaws for high speeds.

Mounting

Measures before starting assembly

Inspection of the spindle head to accommodate the chuck flange

In order to achieve a high concentricity of the power chuck, the mounting surfaces on the spindle head must be checked with the dial gauge.

- Radial runout of the locating centering: max. 0.005 mm.
- Axial runout of the contact surface: max. 0.005 mm.

Check the flat surface for evenness using the straight edge. The surface of the plane surface
must be deburred and clean at the holes.

Inspection of the mounted chuck flange
The power chuck has a centric mounting. For direct mounting of the power chuck on the machine spindle with short taper according to DIN, ISO and ASA standards, a corresponding chuck flange is attached to the spindle head of the lathe. If the user makes the chuck himself, the chuck flange must be finished on the machine spindle and balanced before mounting the power chuck. After mounting the chuck flange, the concentricity and the axial runout must be checked as indicated in section 7.1.1!

Remove any dirt or chips from the machine spindle. Clean the centering receptacle and the contact surface of the chuck flange. Check the flat surface for evenness using a straight edge. Tapped holes for the fastening screws must be countersunk so that the threads cannot be pulled out. The screw mounting surface to the power chuck must not be crowned or hollow. The flange must be in contact with the entire surface! Make sure that the outer collar on the lining does not rest against the spindle.

Assembly of the power chuck:
If an eyebolt is used, it is screwed into the threaded hole located on the circumference of the chuck body and struck by the hoist by means of hooks and brought to the appropriate height of the spindle head.

1. Center the power chuck on the chuck flange.
2. Threaded bushing of chuck piston with mounting wrench on the screw on the draw tube until it is flush with the threaded bushing.
3. Tighten the power chuck with the fastening screws on the chuck flange using a torque wrench.
4. Insert and fasten the protective bushing.

Observe the tightening torques of the fastening screws, see section 3.

After the power chuck has been installed, the unbalance must be checked and any residual unbalance must be corrected. Also check the axial and radial runout on the test surfaces.
Radial runout : 0.01 mm (guide value)
Axial runout : 0.01 mm (guide value)

If the power chuck is sluggish without clamping jaws, the chuck body may be braced. Check the flat surface of the chuck mounting for evenness, check the short taper diameter!

Service and maintenance

Notes

For maintenance or repair work, section 2 Safety instructions must be observed! Operational malfunctions caused by insufficient or improper maintenance, repair or servicing can result in high costs and downtime. Careful lubrication is necessary for trouble-free operation. The operational reliability and service life of the power chuck depend, among other factors, on proper maintenance.

After a collision, stop the machine tool immediately and check the clamping device for damage. In addition to easily visible damage, hidden damage such as hairline cracks in the chuck body, jaws and damage to the sealing elements can also occur.

In such a case, inspect the affected parts of the clamping device for cracks using a suitable, non-destructive testing method and replace them if damaged.

Maintenance

Before starting maintenance, inspection or other work on the machine, always stop the machine spindle first and secure the lathe against restarting! Extend the piston of the clamping cylinder to the right. Depressurize pressurized hydraulic lines for the clamping cylinder. Put up warning sign.

Maintenance condition is to be checked with a static tension force gauge, e.g. SKM 1200/1500, to check.

Due to the different operating conditions, it is not possible to determine in advance how often maintenance, wear control or repair is required and must be determined accordingly according to the degree of load and contamination. Minimum maintenance as described in the table below is recommended.

Maintenance Intervals

Operating hours / period	Control point / maintenance instructions
Daily	Checking the screw connections for tightness
Daily	For high stress and use of cooling lubricants: • lubricate • clamping force measurement
After 24 hours	For normal stress and use of cooling lubricants: • lubricate • clamping force measurement
Weekly	In case of heavy soiling, complete cleaning
Weekly	Checking the wedge hooks of the chuck piston and the driving jaws for wear

For lubrication of the product we recommend grease listed under 9.2.

Customer Service

Spare parts
For safety reasons and to ensure proper functioning, use only original Forkardt Hardinge parts. The spare parts and their assignment to the product can be found in the corresponding drawings and parts lists noted in the appendix.

Manufacturer's warranty only for original Forkardt Hardinge parts. There is no claim for product liability for damage caused to our products by the use of third-party parts.

Stocking the most important spare and wear parts at the installation site is an important prerequisite for the continuous function and operational readiness of the tensioning device.

- For safety reasons, use only original Forkardt Hardinge spare parts!
- The use of third-party parts on our products releases us from our product liability obligations to the extent that any damage is directly or indirectly attributable to the use of such third-party parts.
- Only for the original - spare parts supplied by us we take over a warranty.

Please note that there are often special manufacturing and delivery specifications for in-house and third-party parts and that we always offer you spare parts according to the latest technical standards.

To order spare parts, please provide the following data:
Designation Quantity Part number

Tools and accessories

The following tools and accessories are used to perform and facilitate maintenance work

- All pin wrenches according to DIN 911 for the cap screws
- Torque wrench 5- 30 Nm for idle torque
- Torque wrench -300 Nm
- Load trestle for transport
- Degreasing agent
- Preservative
- Grease PF2
- Clamping force measuring device (static/ / dynamic)

This must be provided by the operator! If required, these products can be supplied by us when ordering.

Designation	Type	Ident - No.	Can contents
Special Grease	PF2	4101400085	1.0 Kg
Hand lever - grease gun	HH1	101400121	

Customer service
If you need a service technician, please inform our service department using the contact details below.

Forkardt Hardinge
1 Hardinge Drive
Elmira, NY 14903

833-791-9681
sales@forkardthardinge.com
www.forkardthardinge.com

Disposal

When the chuck has reached the end of its service life, it must be disposed of in an environmentally friendly manner. Any liquids remaining in the chuck must be disposed of in accordance with local regulations. In case of doubt, local authorities can provide information. Dismantle plastics and light metals and dispose of them separately. Steel parts are returned to the scrap metal.

Declaration of incorporation
In the sense of the EC - Machinery Directive EC-RL 2006 / 42 * EC The manufacturer hereby declares, Forkardt Hardinge of the incomplete machine with the designations:

Description: Power operated three jaw chuck
Type: FNC+ 185-52, FNC+215-66, FNC+260-81, FNC+315-104, FNC+400-125, FNC+500-155, FNC+630-165

- The basic safety and health protection requirements according to Annex I of the above-mentioned directive have been applied and complied with.
- The special technical documentation according to Annex VII Part B has been prepared.
- The aforementioned special technical documents shall be submitted to the competent authority as required.
- The following harmonized standards (or parts thereof; depending on the product) have been applied:
- DIN EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction
- DIN EN 1550:2008-11 Safety of machine tools - Safety requirements for the design and construction of workholding chucks
- Other applied standards and specifications: DIN ISO 702Machine tools - Spindle heads and lathe chucks, connection dimensions VDI3106:2004-04 Determination of the permissible speed of rotary chucks.
- Commissioning is prohibited until it has been determined that the machine in which the above-mentioned machines are installed complies with the provisions of the Machinery Directive.

Documentation Officer:
Forkardt Germany GmbH
Hannes Beck
Lachenhauweg 12
D - 72766 Mittelstadt
Date: 30.07.2021
Place: Mittelstadt

(Managing Director Hannes Beck)

This declaration loses its validity in the event of modification or disassembly of components of the product without our express permission.

Appendix A / Annex to the Declaration of Incorporation

Essential health and safety requirements according to 2006/42/EC, Annex I, which are applicable and have been fulfilled for the scope of the partly completed machinery.

Product name: Power operated three jaw chuck

A	Not relevant
B	For the scope of the incomplete machine meets
C	To be provided by the system integrator for the complete machine

		A	B	C
1.1	**General**			
1.1.1	Definitions		X	
1.1.2	Principles for the integration of security		X	
1.1.3	Materials and products		X	
1.1.4	Lighting			X
1.1.5	Design of the machine in terms of handling		X	
1.1.6	Ergonomics			X
1.1.7	Operator seats			X
1.1.8	Seats			X
1.2	Controls and command devices			
1.2.1	Safety and reliability of controls			X
1.2.2	Actuators			X
1.2.3	Startup			X
1.2.4	Shutdown			X
1.2.4.	Normal shutdown			X
1.2.4.	Operational shutdown			X
1.2.4.	Emergency shutdown			X
1.2.4.	Entirety of machines			X
1.2.5	Selection of control or operating modes			X
1.2.6	Power supply failure			X
1.3	**Protective measures against mechanical hazards**			
1.3.1	Risk of loss of stability		X	
1.3.2	Risk of breakage during operation		X	
1.3.3	Risks from falling and ejected objects			X
1.3.4	Risks due to surfaces, edges, corners		X	
1.3.5	Risks due to multiple combined machines			X
1.3.6	Risks due to changes in the conditions of use		X	

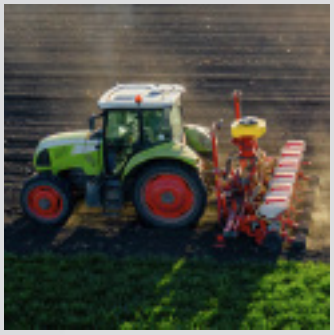
		A	B	C
1.3	**Protective measures against mechanical hazards**			
1.3.7	Risks due to moving parts		X	
1.3.8	Choice of protection devices against risks from moving parts			X
1.3.8.	Moving parts of the transmission			X
1.3.8.	Moving parts involved in the work process			X
1.3.9	Risk of uncontrolled movements			X
1.4	**Requirements for protective devices**			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.	Fixed guards			X
1.4.2.	Movable guards with interlocking device			X
1.4.2.	Access restricting adjustable guards			X
1.4.3	Special requirements for non-separating protective devices			X
1.5	**Risks from other hazards**			
1.5.1	Electrical power supply			X
1.5.2	Static electricity			X
1.5.3	Non-electric power supply			X
1.5.4	Assembly error		X	
1.5.5	Extreme temperatures		X	
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise		X	
1.5.9	Vibrations		X	
1.5.10	Radiation			X
1.5.11	Radiation from outside	X		
1.5.12	Laser radiation	X		
1.5.13	Emission of hazardous materials and substances	X		
1.5.14	Risk of being trapped in a machine			X
1.3.8	Choice of protection devices against risks from moving parts			X
1.5.15	Risk of slipping, tripping and falling			X
1.5.16	Lightning strike			X

		A	B	C
1.6	**Maintenance**			
1.6.1	Machine maintenance		X	
1.6.2	Access to the control stands and the intervention points for the		X	
1.6.3	Separation from the energy sources			X
1.6.4	Interventions of the operator			X
1.6.5	Cleaning of internal machine parts			X
1.7	**Information**			
1.7.1	Information and warnings on the machine		X	
1.7.1.	Information and information facilities		X	
1.7.1.	Warning devices			X
1.7.2	Warning of residual risks		X	
1.7.3	Marking of the machines	X		
1.7.4	Operating instructions		X	
1.7.4.	General principles for writing the operating instructions		X	
1.7.4.	Contents of the operating instructions	X		
1.7.4.	Sales brochures		X	
	Further breakdown from Annex 1			
2	Additional Essential Health and Safety Requirements for certain types of Machines			X
3	Additional Essential Health and Safety Requirements to eliminate the hazards arising from the mobility of machinery			X
4	Additional Essential Health and Safety Requirements to eliminate hazards due to lifting operations.			X
5	Additional essential health and safety requirements for machines intended for use underground X			X
6	Additional essential health and safety requirements for machinery presenting hazards due to the lifting of persons			X

Destination
These operating instructions are intended for the installation, operating and monitoring personnel. They are an integral part of the product and contain instructions and drawings of a technical nature which may not be reproduced, distributed or used for competitive purposes without authorization or communicated to others, either in whole or in part.

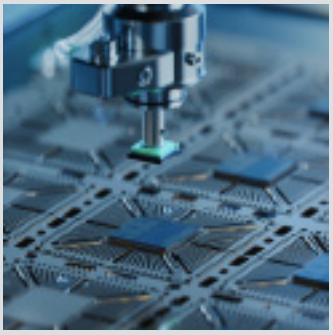
Document no: BA FNC+
Date: 08.2021
Change Index: 02
Modification date: 13.01.2022
Change: Lubricating grease recommendation

Forkardt Hardinge, a solution for every industry







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