Technical Information

37.2007

New cut-off machine STIHL TS 410, 420 – Series 4238

Contents

The new cut-off machines STIHL TS 410 and TS 420 replaces the model TS 400. They are supplied in two versions (with mount for cutting wheels measuring 12 in (300 mm) and 14 in (350 mm) in diameter) ensuring that the most compact machine is available for the respective applications.

Extended filter life, low-emission 2-cycle engine with stratified scavenging, effective anti-vibration system and light, compact design are characteristic features of these powerful all-purpose machines.

The machines can be used, for example, in the building trade, by construction industry and rental firms, landscaping, by municipal authorities, public utilities, the construction materials and steel trades, as well as by fire departments and emergency rescue teams.

The large variety of professional uses include free-hand cutting of construction materials, precast concrete parts, natural stone and pipes (concrete, steel, ductile cast iron), as well as cutting asphalt and prefabricated parts in combination with a STIHL Cutquik® cart.

The established long-life filter system with cyclone pre-separation which is utilized on the TS 700 and TS 800 has been further improved and sets revolutionary standards with regard to the filter life, which equals more than a year on average.

The low-emission 2-cycle engine with stratified scavenging not only conforms with present emission standards, but is also optimally prepared for future regulations. In addition, the effective anti-vibration system makes the TS 410 and TS 420 the cut-off machines with the lowest level of vibrations in the STIHL range.

All operating functions are comfortably controlled by conveniently arranged operating elements with pictograms. In addition, the ergonomically designed wrap around handlebar allows the machine to be held in various positions.

The newly developed magnesium guard can be mounted inboard or outboard as required for the job in hand. It is converted from one position to the other in a matter of minutes.

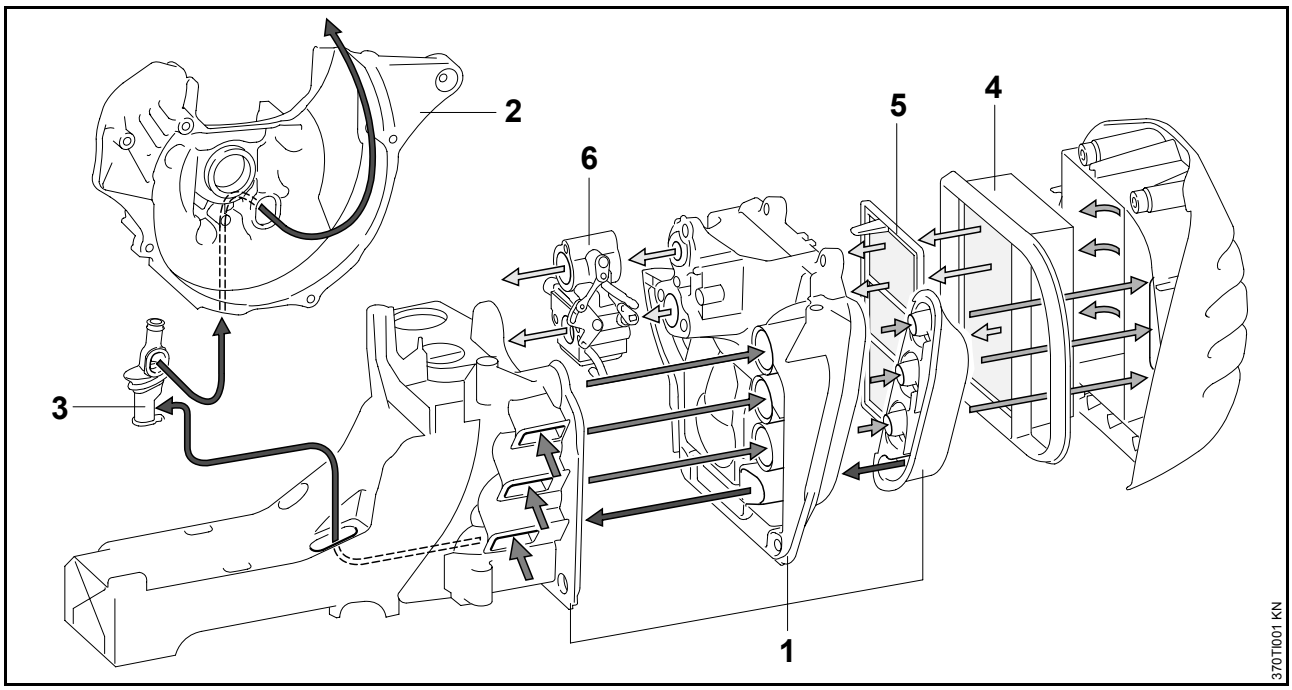
1. Technical description

1.1 Long-life air filter system with cyclone pre-separation

The long-life air filter system with cyclone pre-separation provides extended filter service intervals to more than a year on average.

For this reason:

The filter cover should only be removed and the air filter replaced if there is a noticeable loss of power or more than a year of extended use has passed since the last filter change. Do not clean the air filter as damage to the filter element and consequential engine damage could occur.



The tank housing (**1**) is shown with all its individual parts in order to illustrate the underlying principle.

Contaminated air is drawn in, through the tank housing (**1**) and is swirled by the cyclone pre-separation integrated into the tank housing (**1**). This rotation deflects the larger and heavier suspended particles downwards and returns them to the tank housing (**1**).

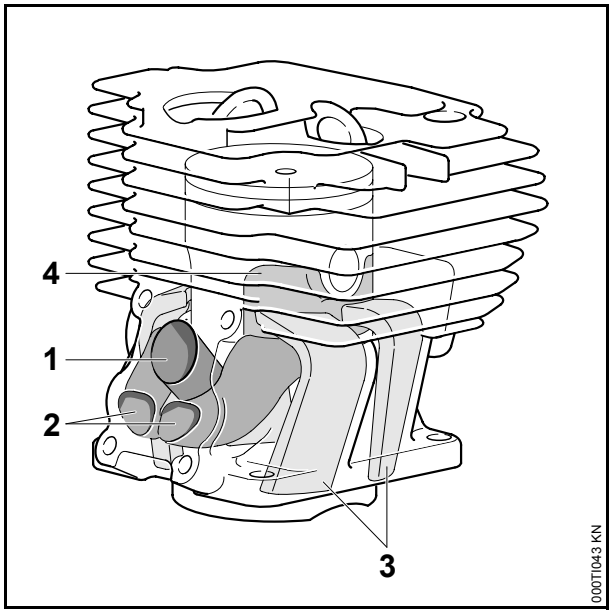
The contaminated air streams through the molded hose (**3**) to the fan-side half of the crankcase (**2**) and out of the machine.

This precleaned air flows through the air filter system – comprising the air filter (**4**) and auxiliary filter (**5**) – to the carburetor (**6**). This principle extends the filter life to more than a year on average and the service life of the shortblock at the same time.

1.2 Principle of operation, stratified scavenging

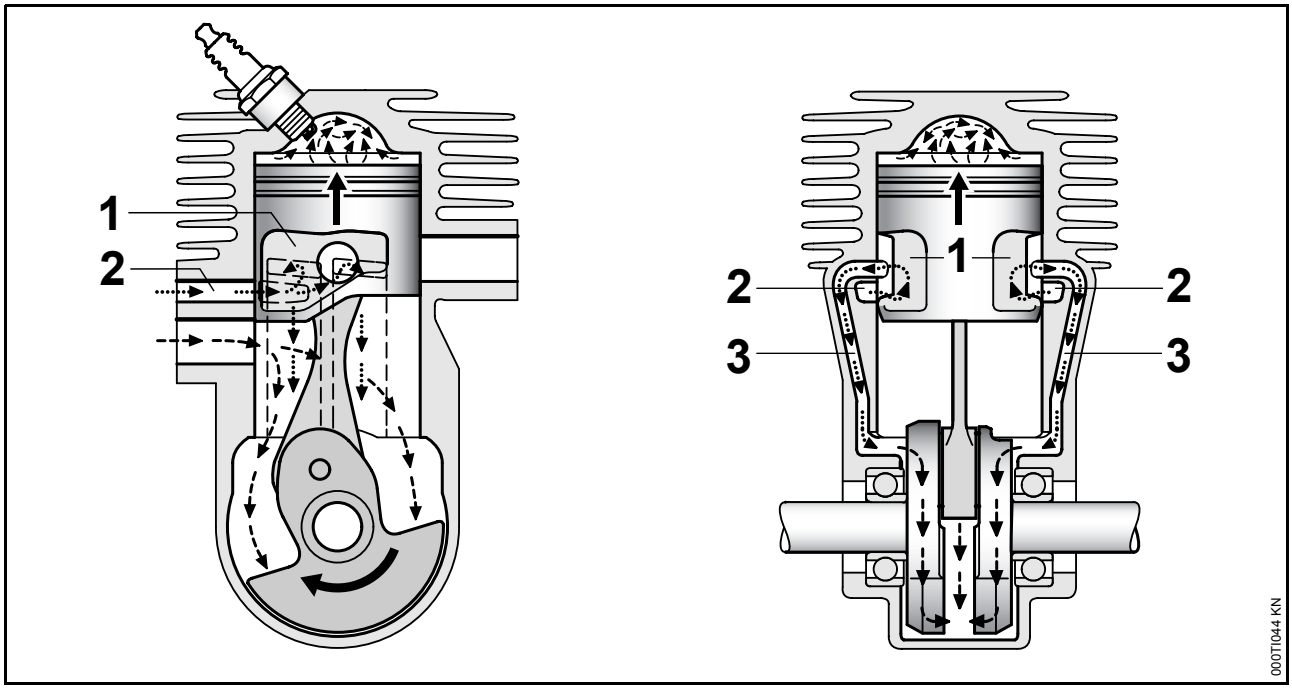
A cushion of air (fuel-free) separates the unburned fuel-air mixture from the exhaust gas. This cushion of air is located in front of the fuel-air mixture. At the start of the exhaust and scavenging cycle, fuel-free air enters from the transfer ports into the combustion chamber and scavenges the exhaust gas into the exhaust port. The fuel-free air prevents the unburned fuel-air mixture from entering the exhaust port, thus reducing the environmental impact by reducing scavenging losses and fuel consumption.

1.2.1 Mechanical design



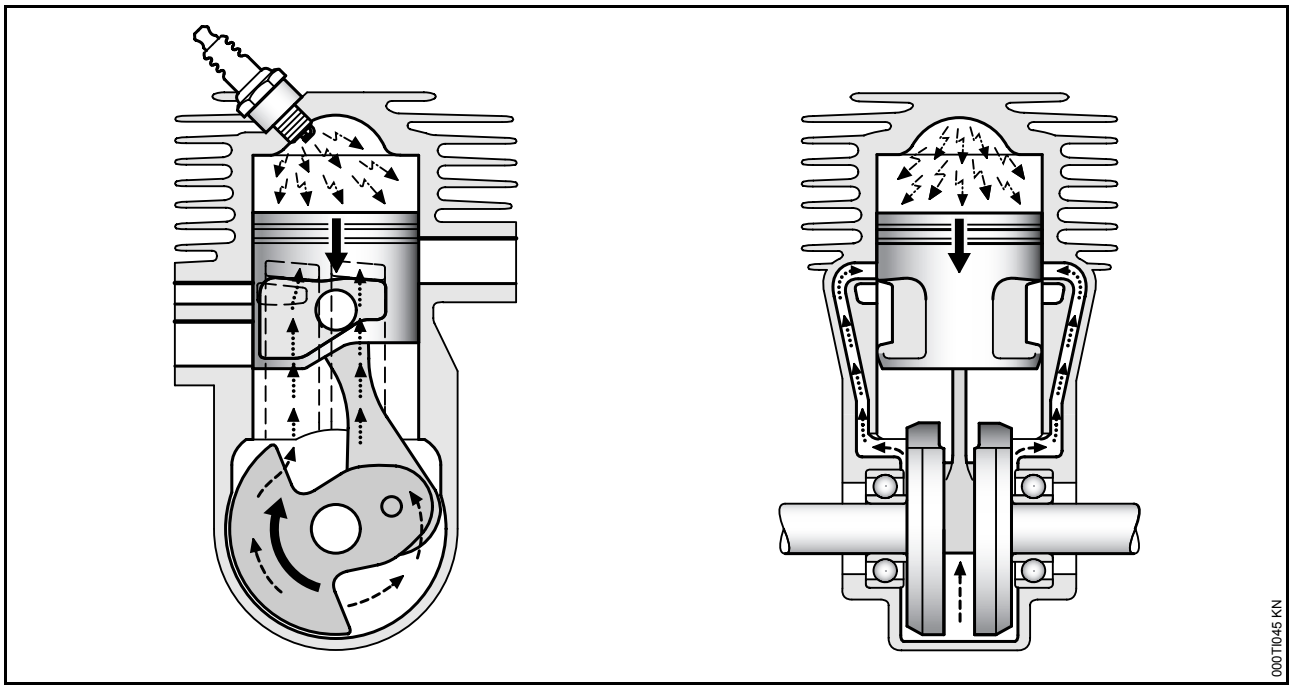
The fuel-air port (**1**) is separate from the fresh air ports (**2**). An integrally molded control slot (**4**) in the piston skirt opens and closes the connection between fresh air ports (**2**) and transfer ports (**3**).

1.2.2 Compression and intake



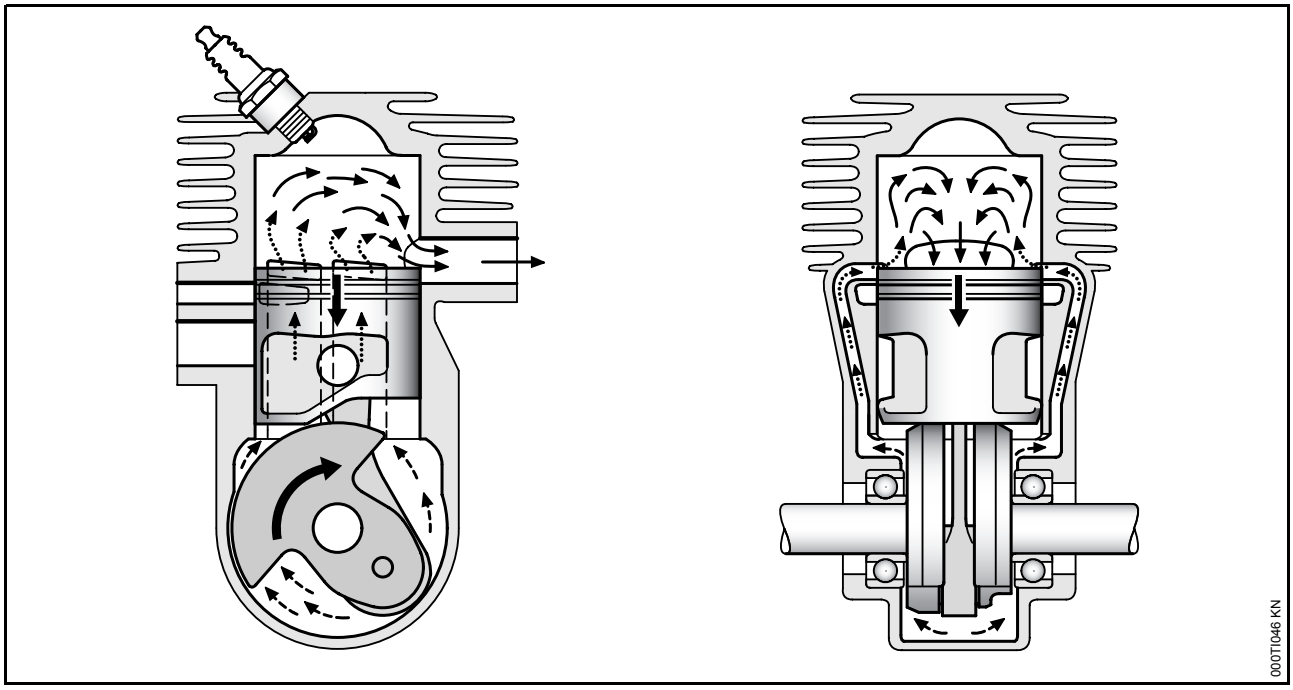
Fresh fuel-air mixture (**---** arrows) streams into the crankcase. At the same time, the piston opens the fuel-free air port (**2**) via the control slot (**1**) in the piston skirt and fresh air (●●● arrows) streams through the control slot into the transfer ports (**3**). The fuel-air mixture in the combustion chamber is compressed.

1.2.3 Expansion and crankcase compression



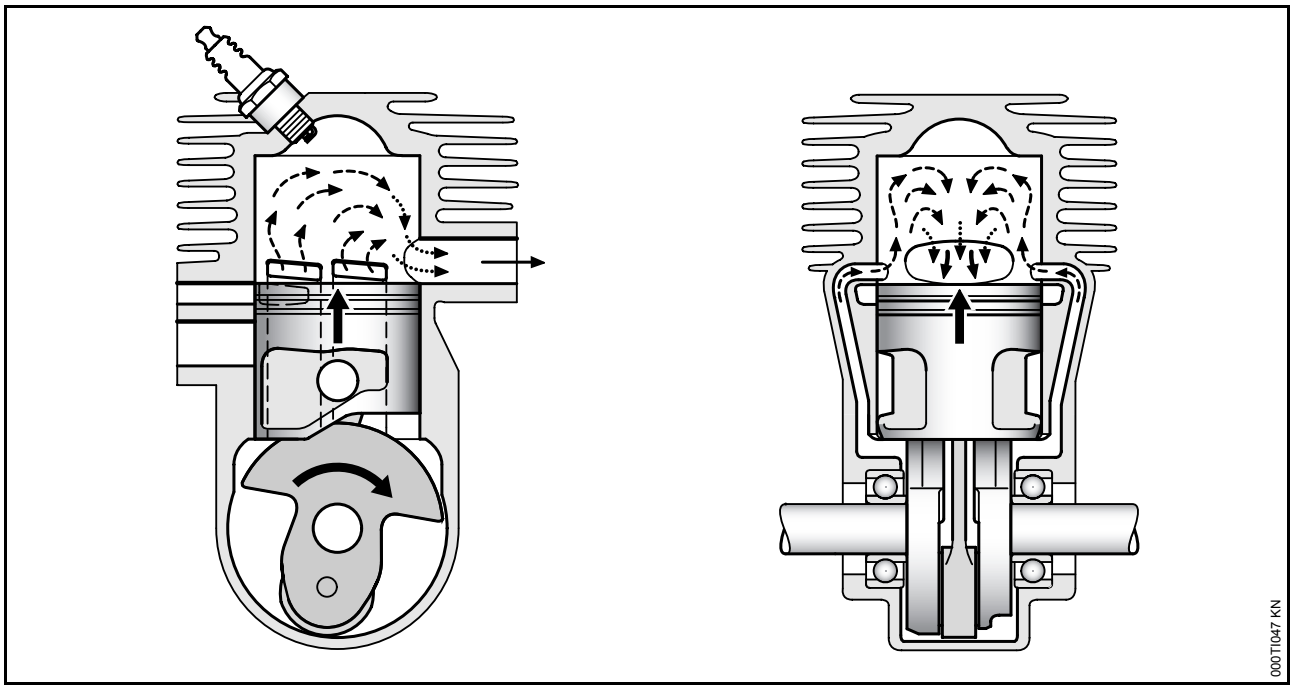
Shortly before the piston reaches top dead center (TDC), the mixture is ignited by the spark plug.
The fuel-free air (●●● arrows) in the transfer ports and the fuel-air mixture (**---** arrows) in the crankcase are then compressed as the piston travels downward.

1.2.4 Exhausting and scavenging



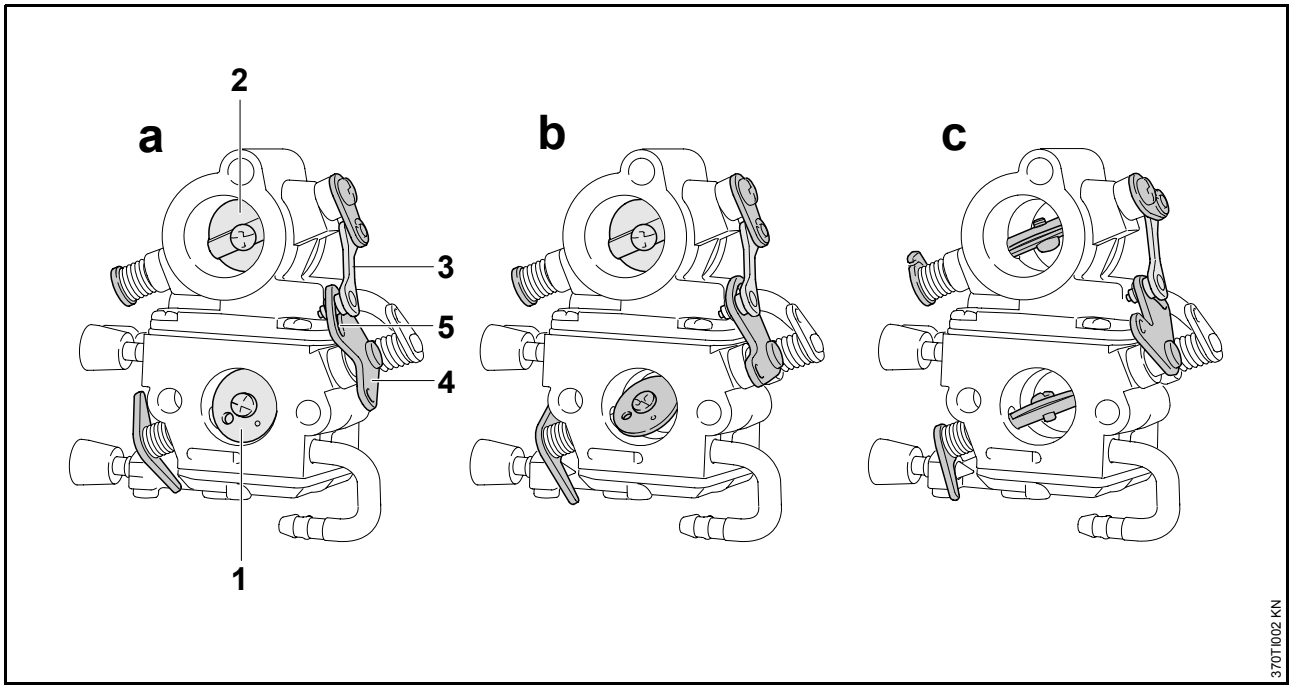
The piston continues its downward movement, opening first the exhaust port and then the transfer ports. The fuel-free air (●●● arrows) streams into the combustion chamber and scavenges the exhaust gas (— arrows) from the combustion chamber.

1.2.5 Return flow and scavenging



When the fuel-free air has scavenged the exhaust gas (— arrows) from the combustion chamber, fresh fuel-air mixture (- - - arrows) streams into the combustion chamber and mixes with the remaining fuel-free air.

1.2.6 Carburetor



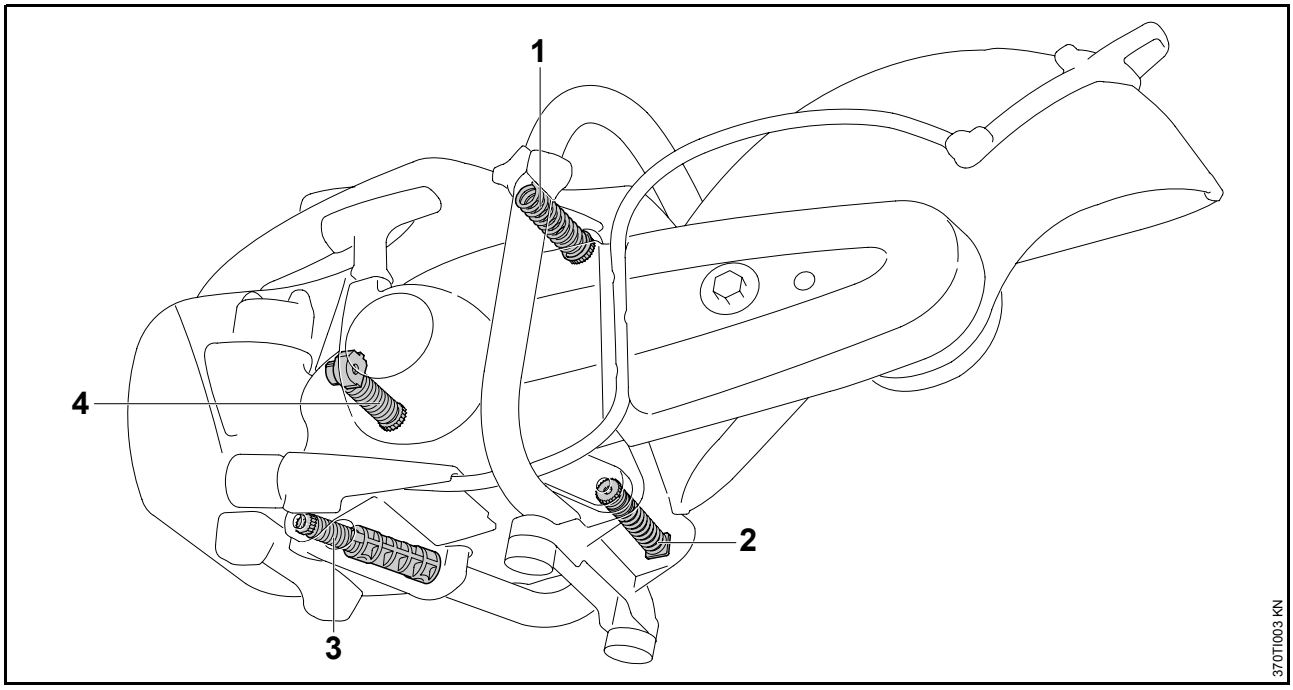
The fuel-free air and fuel-air mixture follow separate paths. Each has its own throttle shutter. The throttle shutter (**2**) of the fuel-free air path is actuated via a throttle rod (**3**) from the throttle shutter (**1**) of the fuel-air mixture path. The oblong hole (**5**) in the actuating lever (**4**) ensures that the throttle shutter (**2**) in the fuel-free air path opens later.

	Operating condition	Throttle shutter (**1**) of the fuel-air mixture path	Throttle shutter (**2**) of the fuel-free path
a)	Idle speed	Completely closed	Completely closed
b)	Part throttle	Opening angle < 35°	Completely closed
	Part throttle	Opening angle > 35°	The throttle shutter of the fuel-free air path opens more and more with increasing load
c)	Full throttle	Completely open	Completely open

1.3 Setting of the choke lever for starting

- ⊤ when the engine is **cold**
- ⊤ when the engine is **warm** (even if the engine has already run but is still cold and also if the hot engine has been switched off for less than 5 minutes)
- ⊤ when the engine is **hot** (if the hot engine has been switched off for more than 5 minutes)

1.4 Anti-vibration system



The effective anti-vibration system is made up of spring elements which reduce the transmission of vibrations from the engine to the user's hands and arms.

Cutting starts smoothly and continues smoothly, thus ensuring optimum convenience.

1 = Anti-vibration element on the clutch side, between handlebar and crankcase

2 = Anti-vibration element between support and crankcase

3 = Anti-vibration element at the bottom of the crankcase

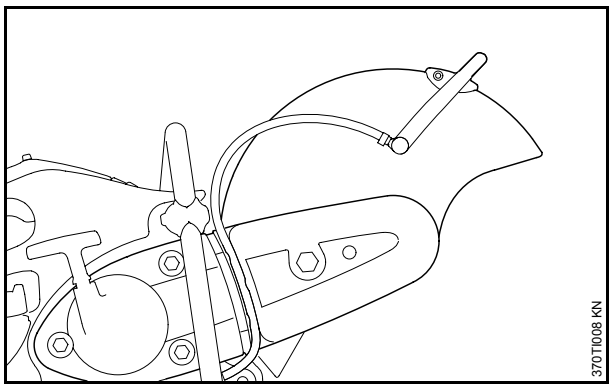
4 = Anti-vibration element between tank housing and crankcase – near the carburetor

1.5 Guard

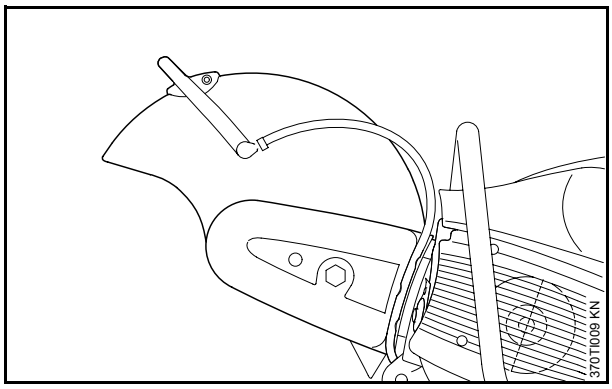
The cast arm with newly developed magnesium guard is mounted on the inboard side by the manufacturer. Depending on requirements, the cast arm with guard can also be remounted on the outboard side in a matter of minutes.

Inboard mounting is recommended for free-hand cutting due to the more advantageous center of gravity.

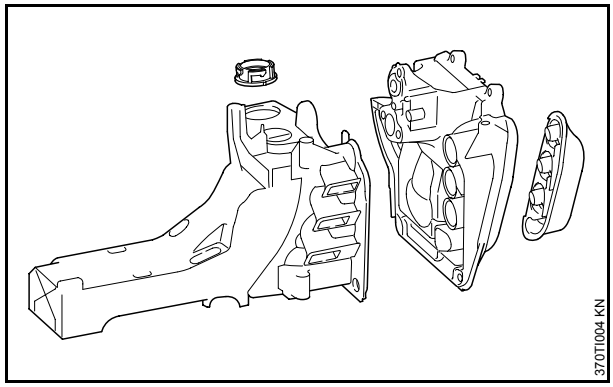
1.5.1 Inboard mounting



1.5.2 Outboard mounting



1.6 Tank housing



The tank housing comprises four individual parts welded together. It is characterized by high rigidity and low weight.

The following functions are integrated:

- Cyclone pre-separation
- Filter base
- Fuel hose
- Tank vent
- Fuel overflow

2. Specifications

2.1 Shortblock

STIHL 2-cycle engine with stratified scavenging	TS 410	TS 420
Displacement:	4.07 cu in (66.7 cm³)	4.07 cu in (66.7 cm³)
Bore:	1.97 in (50 mm)	1.97 in (50 mm)
Stroke:	1.34 in (34 mm)	1.34 in (34 mm)
Power output to ISO 7293:	4.3 hp at 9000 1/min	4.3 hp at 9000 1/min
Engine torque:	2.8 lbf ft (3.8 Nm)	2.8 lbf ft (3.8 Nm)
Torque at the cutting wheel:	5.6 lbf ft (7.6 Nm)	5.9 lbf ft (8.0 Nm)
Idle speed:	2500 rpm	2500 rpm
Clutch engages at:	3800 rpm	3800 rpm
Engine cutoff speed:	10100 rpm	10100 rpm
Max. spindle speed to ANSI B175.4-2006:	5350 rpm	5350 rpm
Starter mechanism:	Single-pawl system	Single-pawl system
Starter rope: – Diameter x length	0.177 in x 37.2 in (4.5 mm x 945 mm)	0.177 in x 37.2 in (4.5 mm x 945 mm)

2.2 Fuel system

The STIHL 2-cycle engine is mixture-lubricated and must be operated with the recomended mixture of gasoline and engine oil.

2.2.1 Fuel

Fuel mixture:	See instruction manual

2.2.2 Fuel tank

Capacity:	26.0 oz (0.77 l)

2.2.3 Carburetor

All-position diaphragm carburetor with booster pump	
Standard setting with limiter cap on the high speed screw H:	
Low speed screw L:	1 turn open
High speed screw H:	Carefully turn counterclockwise as far as the stop, max. 3/4 turn
Basic setting without limiter cap:	
Low speed screw L:	1 turn open
High speed screw H:	1.5 turns open

2.3 Ignition system

Ignition module with integrated electronic speed limitation	
Spark plug (suppressed):	BOSCH WSR6F
Electrode gap:	0.020 in (0.5 mm)

2.4 Tool drive

	TS 410	TS 420
Ribbed poly belt:		
– Dimensions:	0.46 in x 29.1 in (11.7 mm x 740 mm)	0.46 in x 31.5 in (11.7 mm x 801 mm)
– Designation:	5PJ 740 LB	5PJ 801 LB
Transmission ratio:	2.00	2.11

2.5 Weight / dimensions

	TS 410	TS 420
without cutting wheel, without fuel	20.7 lb (9.4 kg)	21.2 lb (9.6 kg)
Length including cutting wheel	26.57 in (675 mm)	28.54 in (725 mm)
Height up to guard	14.76 in (375 mm)	16.14 in (410 mm)
Width including handle bar	11.81 in (300 mm)	11.81 in (300 mm)

3. Cutting wheels

	TS 410	TS 420
Diamond cutting wheels: Depending on version, can be used for cutting asphalt, concrete, stone (hard rock), abrasive concrete, green concrete, clay bricks and clay pipes		
Diameter:	12 in (300 mm)	14 in (350 mm)
Composite cutting wheels: Depending on version, can be used for cutting asphalt, concrete, stone, ductile cast iron pipes and steel		
Diameter:	12 in (300 mm)	14 in (350 mm)

4. Accessories

Part name	Part No.	Use
Cutquik® cart FW 20 with support attachment kit for TS 410, 420	4224 200 0004	Cutting with guidance on level surfaces
– Support attachment kit for TS 410, 420	4238 790 0702	For mounting on the Cutquik® cart FW 20
– Water tank mounting kit	4224 007 1011	For dusty conditions
– Guide wheel kit	4205 007 1009	Accurate guidance along a drawn line
Water tank	4223 670 6000	For dusty conditions
Wheel kit	4224 007 1014	

4.1 Cutquik® cart FW 20 with support attachment kit for TS 410, 420

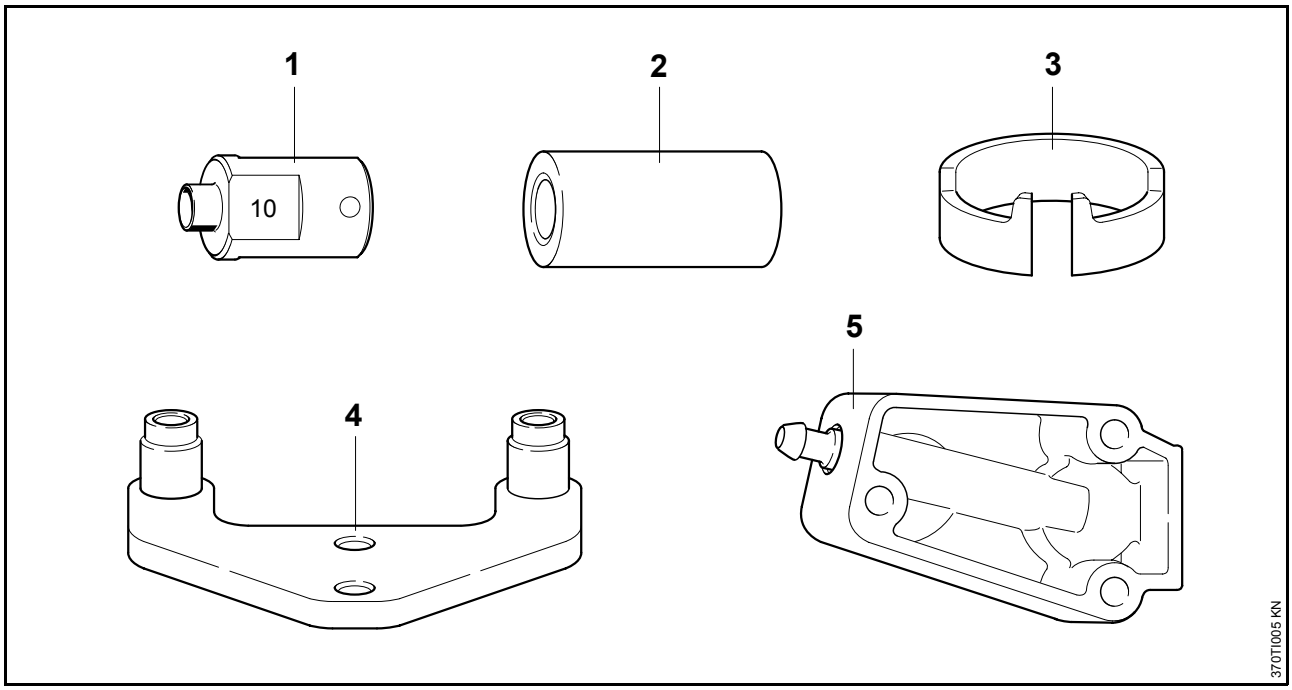
The STIHL Cutquik® cart FW 20 (4224 200 0004) combines the Cutquik® cart (basic unit) with the new support attachment kit (4238 790 0702) for TS 410, 420.

The new support attachment kit (4238 790 0702) for TS 410, 420 can be mounted on an existing STIHL Cutquik® cart FW 20.

Only the corresponding attachment kit is needed when converting the FW 20 for use with another STIHL cut-off machines.

5. Servicing accessories

5.1 New special tools



	Part name	Part No.	Use
1	Sleeve	5910 893 1707	Fit hookless snap rings in piston
2	Press sleeve	4238 893 2400	Press in oil seal
3	Ring	4238 893 7000	Tension the piston rings
4	Clamping plate	4238 890 2100	Mounting the cut-off machine on the assembly stand
5	Flange	4238 890 1200	Leakage testing

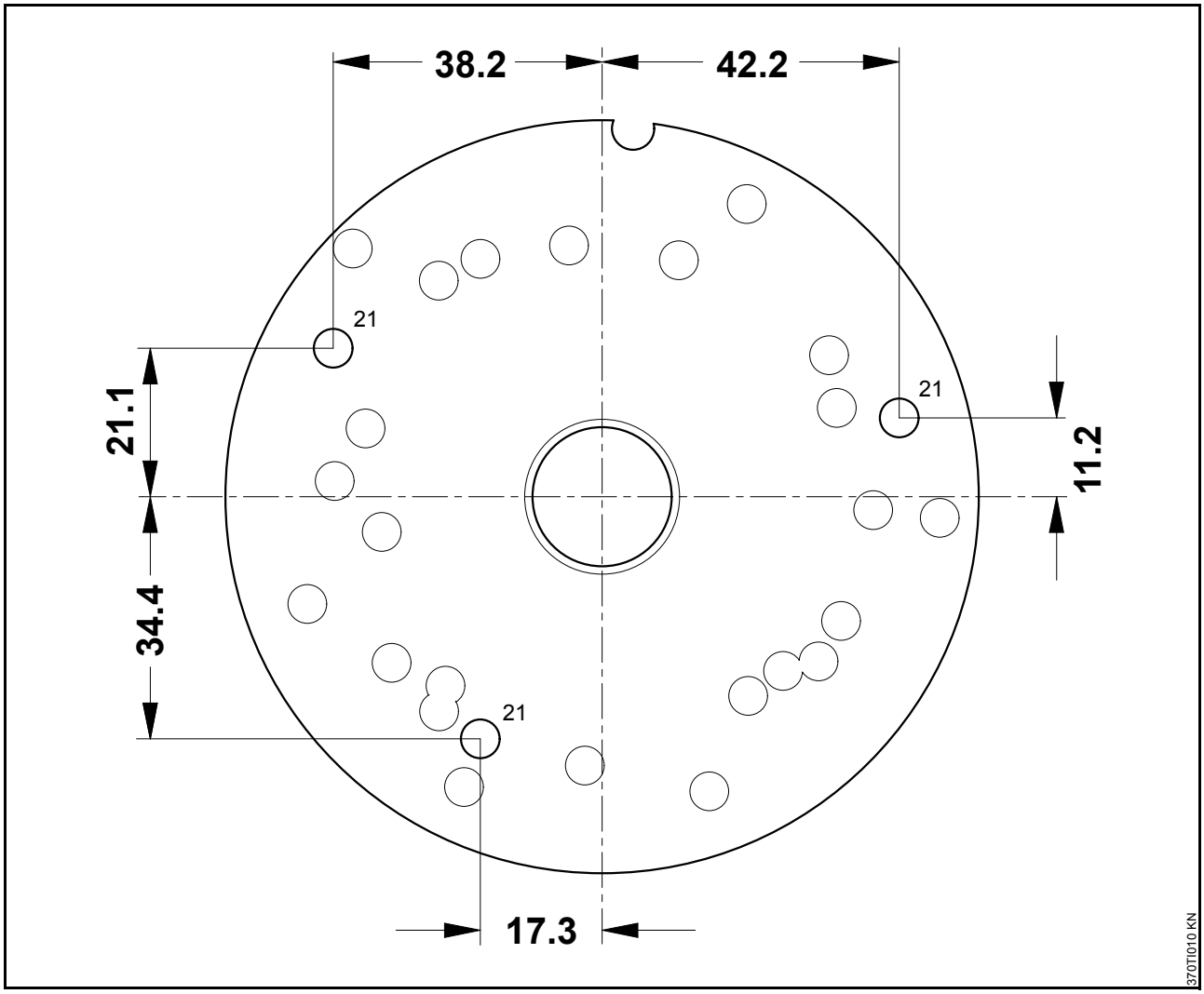
5.2 Existing special tools

The existing special tools are listed in the Service Manual TS 410, 420.

5.2.1 Rework note: Washer 5910 893 2102 from service tool 5910 007 2200

Service tools 5910 007 2200 supplied from factory will in the future include the modified washer and three additional holes with a diameter of 7/32" (5.5 mm) for use with the TS 410, 420. An existing washer without these holes can be reworked in accordance with the template drawn to scale below.

To mark the new holes, copy the template, cut it out and place it on the washer. The figure 21 must be stamped on the upper side, alongside each of the new holes, for identification.



5.3 Servicing accessories

Part name	Part No.	Use
Set of gaskets	4238 007 1003	Shortblock
Set of carburetor parts	4238 007 1060	Carburetor C1Q-S118
Lubricating grease (225 g tube)	0781 120 1111	Oil seals, sliding and bearing points
STIHL special lubricant	0781 417 1315	Bearing bore in the rope rotor, rewind spring in the starter cover
Press Fluid OH 723	0781 957 9000	
STIHL multi-purpose grease	0781 120 1109	
Tube of sealant Dirko HT red	0783 830 2000	Engine pan, oil seals (outside)
Loctite 242	0786 111 2101	
Loctite 270	0786 111 2109	
Loctite 648	0786 111 2117	
Standard solvent-based degreasant not containing any chlorinated or halogenated hydrocarbons		Cleaning the mating faces and carburetor, crankshaft stub and cone in flywheel

6. Spare parts

The spare parts lists for TS 410, 420 will be available when the machines are launched on the market.
The new machines are included in the STIHL Service Communication System (SCS / MediaCat CD-ROM) from edition 03/2007 onwards.

7. Servicing

The specific national safety regulations and the safety instructions in the instruction manual must be observed if the machine has to be started up during servicing.

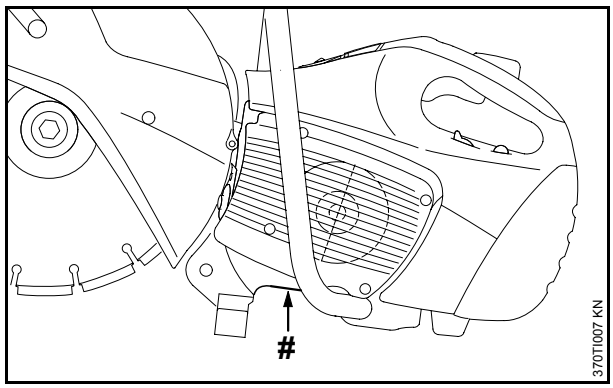
7.1 Tightening torques

Tightening torques are specified in the Service Manual STIHL TS 410, 420.

7.2 Service note

The Service Manual STIHL TS 410, 420 is available for servicing and repair of the machines.

7.3 Serial number



The serial number is located on the tank housing, underneath the machine, as illustrated above.

7.4 Repair times

The specified repair times apply for trained and qualified personnel as well as for properly equipped repair shops.

The repair times are specified in minutes.

	Repair activity	TS 410, TS 420
1	Replace engine or short block	-
2	Replace wheel guard	20
3	Replace wheel bearing bracket assembly.	25
4	Replace belt pulley on wheel arbor.	15
5	Replace wheel arbor shaft.	15
6	Replace arbor shaft bearing.	25
7	Replace belt pulley on clutch end.	25
8	Replace drive belt.	15
9	Replace front handlebar.	15
10	Replace cast arm from engine to wheel.	25
11	Replace crankcase, crankcase gasket or re-seal crankcase. Includes air leak test.	160
12	Replace crankshaft main bearing(s). Includes air leak test.	170
13	Replace crankshaft seal(s). Includes air leak test.	70
14	Perform engine air leak test.	30
15	Replace cylinder and/or piston. Includes air leak test and repair of components causing failure.	90
16	Replace ignition module or flywheel. Includes stop circuit test.	25
17	Replace fuel tank line, vent line, or fuel pick-up body.	40
18	Replace intake or transfer port manifold or intake flange.	35
19	Repair or replace carburetor. Includes fuel system testing.	45
20	Repair or replace rewind starter.	15
21	Repair or replace clutch, clutch shoes or clutch springs.	20
22	Replace rear handle frame or handle housing.	45
23	Replace muffler	25
24	Replace air filter or filter housing	15
25	Repair or replace stop switch. Includes circuit testing.	35
40	Miscellaneous repairs and other repairs not listed.	15
45	Handling allowance only-no labor.	10
50	No Labor	0