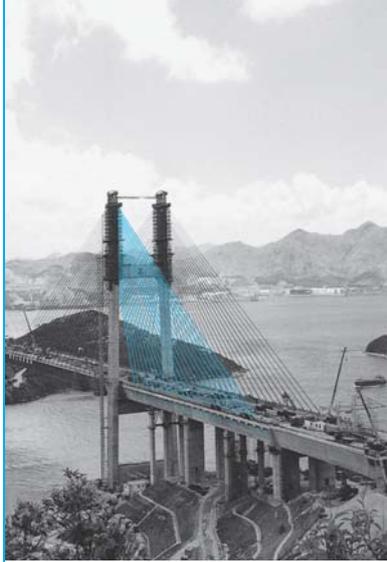


P R E S T R E S S E D
C O N C R E T E
T E C H N O L O G Y



Pushing Machines for Post-Tensioning Applications



*Hydraulic pushing machine with
strand unwinding from the coil*

Purpose

Tried and tested over decades

PAUL strand pushing machines have proved themselves in building site applications all over the world for decades. The pushing machines are supplied with electrical or hydraulic drives. The drive head consists of a basic compact aluminium body with either four or six pairs of driven rollers. For electrical operation the machine is mostly used with four pairs of rollers for a maximum pushing length of approx. 100 m.



Because of this the machine is ideal for the manufacture of single-span beams, floors, tanks etc. The hydraulically driven pushing machine with six pairs of rollers is suitable for the insertion of strands of maximum lengths of 200 to 300 m and is therefore ideal for bridge building.

The hydraulically driven pushing machine is generally supplied with a length counter and a large, spring-supported measuring wheel (2). In combination with a PAUL NCS-control, insertion is carried out accurately

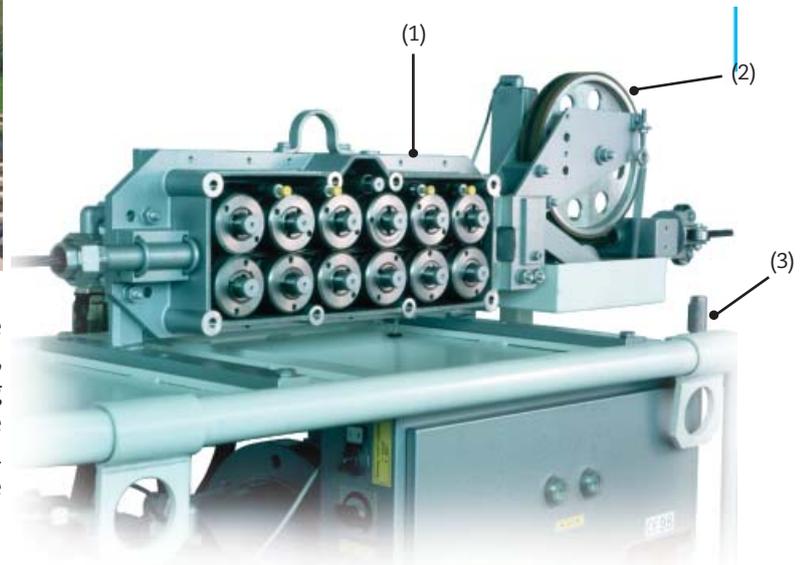


Force measuring and mounting device

to the programmed length. The electrically driven machine is usually operated by an electrical remote control.

As an option, however, a simple length counter can be supplied for the electrically driven machine.

In order to dismantle the drive rollers it is only necessary to remove the cover of the pushing machine (1). For retightening purposes or for converting to a different strand diameter, the drive rollers are slipped over the mounting device (3) and then they can be tightened or dismantled with a hook wrench.



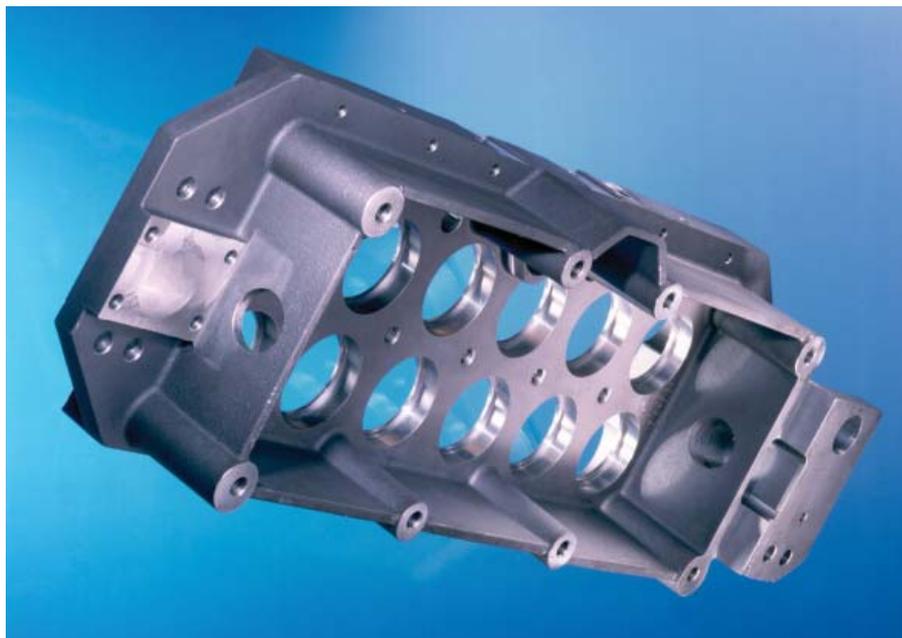
Hydraulic pushing machine on pump unit: Insertion into post-tensioning ducts using a flexible strand guide.

Drive rollers

The machine has 8 or 12 driven rollers which are seated on axles and can be exchanged quickly for example when changing the diameter of the prestressing steel. Housing and cover are made from lightweight alu-

minium. When pushing PE-coated strands the drive rollers can be fitted with plastic or rubber rings and when bright steel strands are inserted then steel rings are used.

	Type 1	Type 2	Type 3
Drive rollers with ...	Plastic ring	Rubber ring	Steel ring
Use:	Mainly for coated strands	Mainly for coated strands	For bright steel strands (ear protectors necessary)
Characteristics:	Protects the strands and is silent	Protects the strands and is silent	Wear-resistant, high service life
Capacity:	Max. 1000 m/h (top capacity 2 m/s)	Medium capacity	High capacity
Max. pushing force:	Approx. 3 kN (with 6 pairs of rollers)	Approx. 3 kN (with 6 pairs of rollers)	Approx. 5 kN (with 6 pairs of rollers)



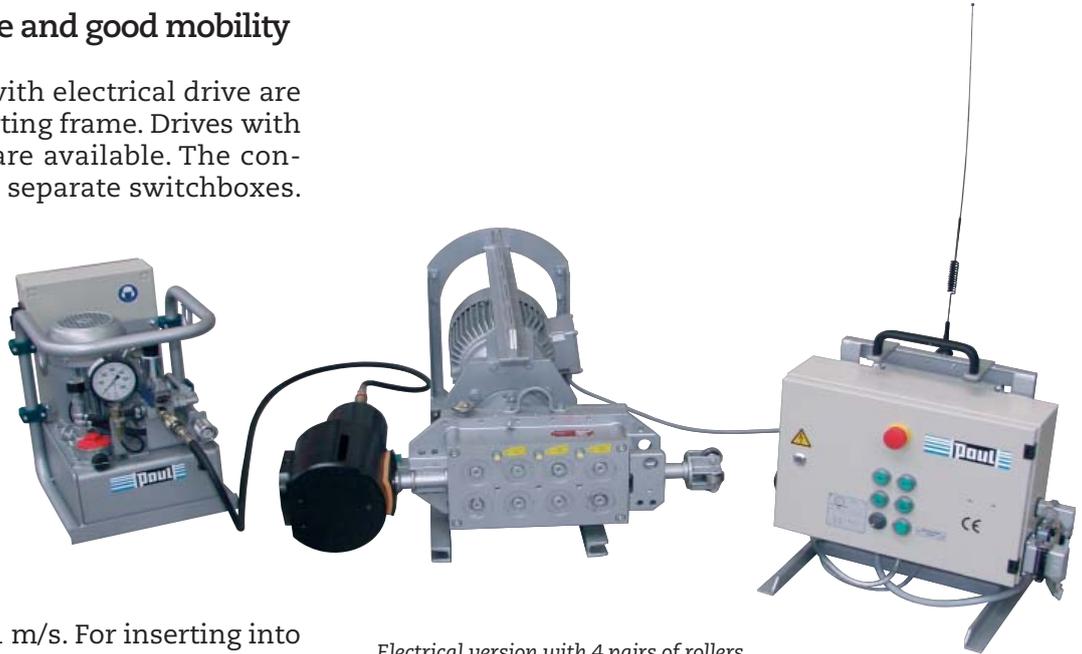
The base body of the pushing machine is made of lightweight cast aluminium.

Electrical version

High pushing force and good mobility

Pushing machines with electrical drive are installed in a supporting frame. Drives with one or two speeds are available. The controls are installed in separate switchboxes.

A range of control units is available for drives with either one or two speeds as well as for length counting operation. For insertion into tanks, drives are frequently selected with one or two speeds for a maximum pushing speed of 0.25 to 1 m/s. For inserting into cable ducts up to about 70 m long, machines are used with a drive power of 3 kW operating at about 2.4 m/s. For cable duct lengths up to about 100 m, 4.5 kW machines are used with a speed of 3.4 m/s (see price list for sample quotations).



Electrical version with 4 pairs of rollers, radio control, 300 kN hydraulic cutter, NG15 mini pump unit



Radio control transmitter

Cable-free version

The maximum ease of operation is offered by a radio-operated remote control which is in Europe free of registration and taxes and works within a frequency range of 433-434 MHz.

The transmitter, which is the size of a mobile phone, weight 270 g, ensures the greatest mobility and can also withstand the rough usage on the building site.

In addition the high-performance transmitting and receiving equipment provides optimum and constant radio communication even over greater distances.

The range of the radio unit with at least 80 m, is so great that the operator can be positioned at a great distance from the machine so that he can monitor the pushing operation (see brochure B 106.18/1).

Hydraulic version

Simple and flexible operation

The pushing machine is driven by a hydraulic motor which is flange-mounted on the side of the drive head. For generating the pressure a mobile hydraulic unit is used which is fitted with a low-noise variable displacement pump. The variable displacement pump has a delivery capacity of 80 l/min.

The large-volume, car-sized pneumatic tyres make transport easy over the uneven ground on building sites. The parking brake ensures safe and stable stopping even on sloping ground.

The strand is led to the tendon through flexible hoses or tubes from the pushing machine which is mounted on the cover of the hydraulic unit. The operator can fill the tendon by using the remote control without any additional help.

Thanks to its weight-saving design, the pushing machine can be mounted directly on the tendon in certain applications, for which it is then necessary to install hoses from the hydraulic unit to the pushing machine (e.g. when inserting strands into stay cables if there is little space available).

In both cases – positioning of the pushing machine on the hydraulic unit or on the tendon – the operator can stand at a position from where the inserting process is easy to

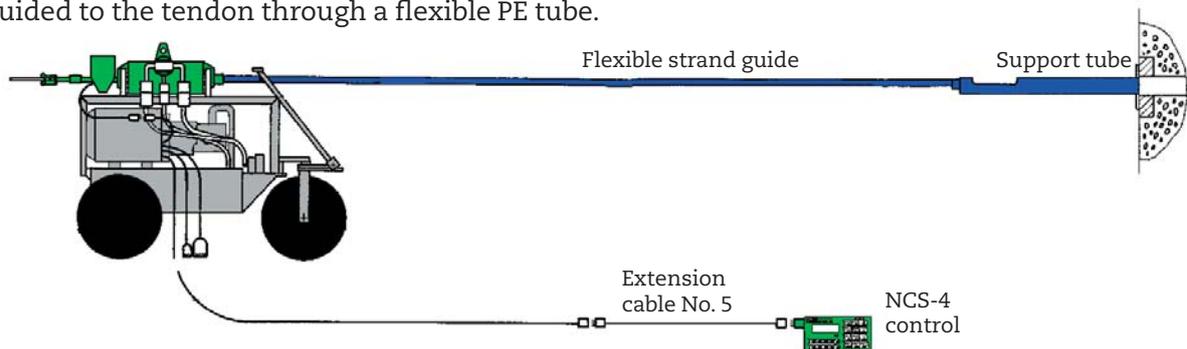


Connected to the hydraulic unit by hydraulic hoses the pushing machine works directly at the prestressing tendon.

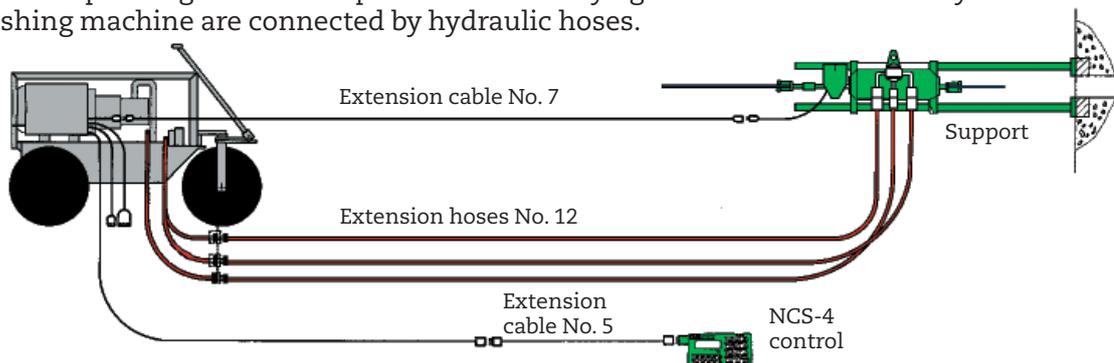
monitor or where the strands have to be cut to length or threaded in. The portable NCS controls always ensure the maximum freedom of movement.

Flexible use

In this example the pushing machine can be mounted on the hydraulic unit. The strand is guided to the tendon through a flexible PE tube.



Optional the pushing machine is positioned directly against the tendon. The hydraulic unit and pushing machine are connected by hydraulic hoses.



Hydraulic version

The control unit

The NCS-4 control that has proved successful for many years is connected by a cable to the electrical equipment on the mobile hydraulic unit. The cable transmits the measuring signals from the length counter and the control signals to the variable displacement pump. The NCS-4 control is very light and user-friendly – allowing pushing work to be carried out and monitored by just one person. The electrical equipment on the pump unit is additionally fitted with a manual control so that in special circumstances the work can be carried out even without the NCS-4 control.



The portable NCS-4 control

The newly developed NCS-5 control eliminates the need for a cable connection. Both the measuring signals from the length counter and the control signals to the variable displacement pump are transmitted by radio. The keypad and the method of operation are identical to that of the NCS-4 control.

In Europe the NCS-5 control is free of registration and taxes and works within a frequency range of 433.15-434.75 MHz. The range of the radio unit is approx. 70-200 meters (depending on environment). The software has been designed for site operation only. It includes a strand slippage monitoring function to stop the feed drive as soon as the length counter stops transmitting measuring signals during operation. This avoids damage being done to sensitive PE-coated strands.

Dimensions and weight of transmitter incl. antenna:
160 x 60 x 285 mm
1 kg
Degree of protection: IP65

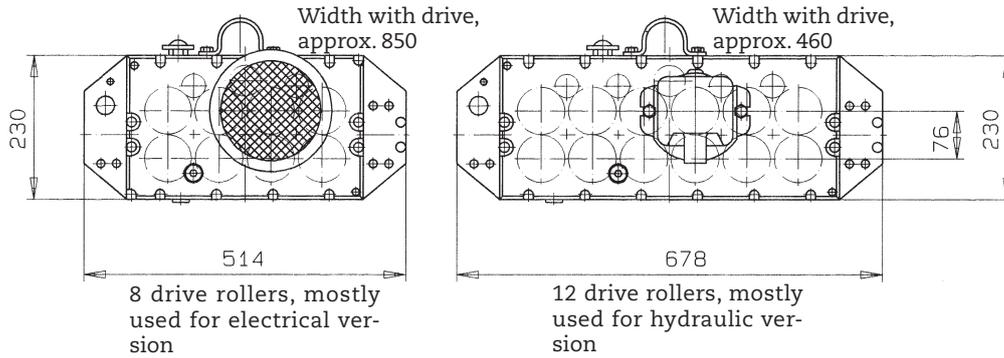
Existing pushing machines with NCS-4 control can easily be converted to radio control. The NCS-4 control is just removed from the connection cable and replaced by the radio receiver. The receiver is fastened to a bracket on the machine hood. That's it! The radio control comes with a second set of batteries including charger so that always fresh batteries are available. The transmitter can also be connected directly to the charger.



The NCS-5 control

Both control types have a robust, water-tight housing with an integrated LCD display. Via the keypad the required pushing length and speed as well as the parameters for acceleration, deceleration, counting pulses etc. are transmitted to the control. The NCS-4 control is primarily used for manufacturing the tendons in the factory. It is available with software for different operating modes for the tendon production (input of lists of lengths/numbers of strands to be pushed).

Pushing machine (drive head)



Max. pushing force (sliding force) ***

	Plastic (N)	Steel (N)
8 drive rollers	2000	3300
12 drive rollers	3000	5000

*** depending upon strand purity level

Hydraulic version

Pump delivery capacity 28 cm³/rev.

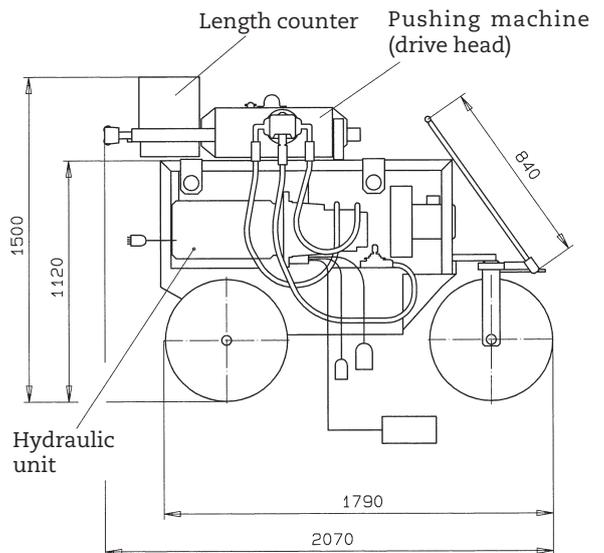
Displacement volume of hydr. motor 35 cm³/rev.

Characteristic value approx. 0.54 Nm/bar

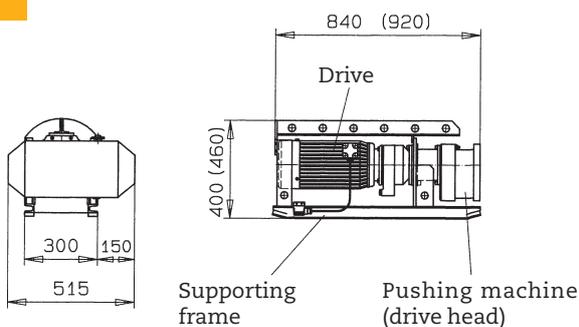
Total weight with hydraulic oil approx. 760 kg (with 22 kW)
approx. 830 kg (with 30 kW)

Dimensions

L x W x H (in mm) = 2070 x 820 x 1500



Electrical version



Dimensions for drives up to 3.0 kW
Dimensions in brackets for 4.5 kW drive