Scientific

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

26 mm

20 mm

16 mm

Labtech Engineering

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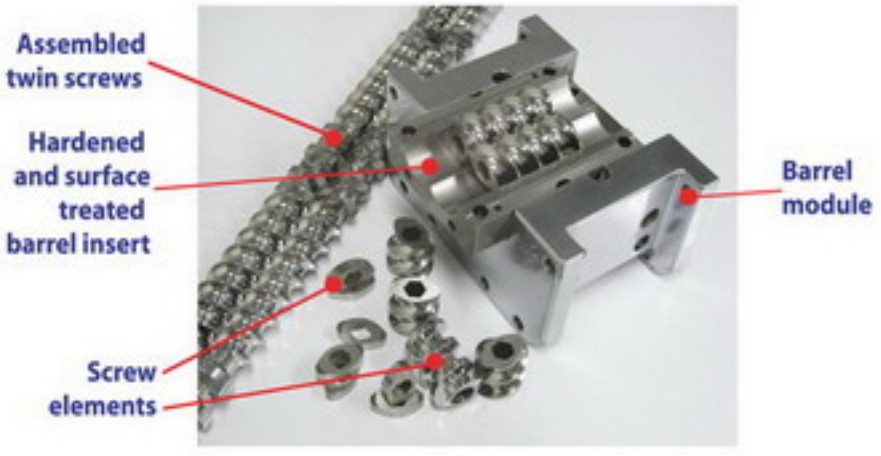
CLAM SHELL BARREL TYPE FOR EASY CLEANING AND FOR VISUALIZATION OF MELT PROCESS ON SCREWS

Labtech's ***Scientific*** twin-screw extruders are as standard built with a clamshell-type barrel designed with extremely high precision which ensures a completely leak-free operation at all times. On the 20 and 26 mm versions, the barrel can optionally also be supplied in a fully closed version.

The whole clamshell barrel assembly is split in the center and can be easily swung open after loosening the barrel bolts. This gives easy access to the screws for cleaning or changing of screw elements and/or barrel inserts as well as to observe the melt and compounding characteristics of the polymer being processed. The top half of the barrel is balanced so that very little force is needed to open it up and with this the hazard of accidental heavy closing is eliminated.

MODULAR BARREL SECTIONS



A barrel module with its hardened insert

The barrel, whether clamshell or of fully closed design, is built in modular, interchangeable sections of 4 D lengths. Each module is equipped with our new unique wear resistant insert system that enables easy and very economic replacements.

The precision ground through hardened inserts also functions as clamshell seals. Due to their extremly hard surfaces, they are virtually impossible to scratch or dent, thus ensuring a perfect leak-free barrel closure.

These clamshell barrel inserts are made for high temperature processing of up to 400 C and the entire insert is made of a high-grade tool steel with through hardening of over 60 HRC. In addition, the surfaces facing the screws are nitrided giving a low friction coating with a surface hardness of 65 to 70 HRC. The screw components are also made of the same steel grade as the inserts and they have been through hardened slightly softer than the barrel inserts to ensure optimum life expectancy of both screws and barrel.

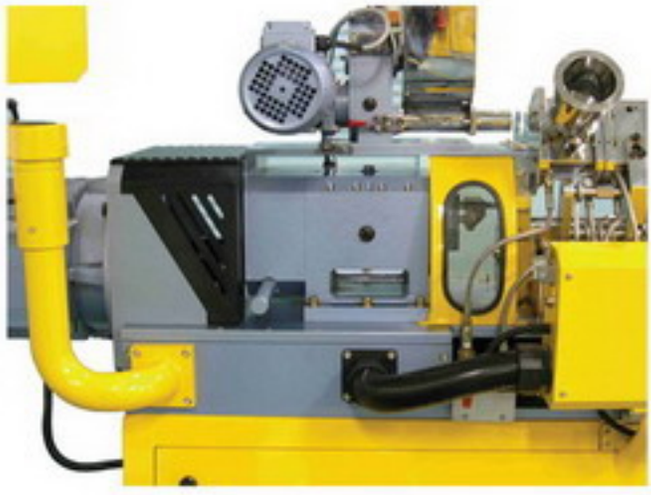
The screws are built up from individual single elements mounted on hexagonal, hardened shafts. Each individual kneading element is supplied in different angles to enable optimization of screw configurations for best possible mixing and dispersion efficiency.

HIGH EFFICIENCY HEATING AND COOLING SYSTEMS

Each barrel zone on the 20 and 26 mm versions is equipped with both water-cooling and electric cartridge heating. This allows for complete process control at each zone of the barrel, and the water-cooling coupled with the high wattage heating enables fast temperature changes of each zone when changing processing conditions from one compound to another. The water-cooling is done from fine channels inside each barrel module and regulated with individual solenoid valves from its designated temperature controller. An additional feature is that the barrel modules are insulated against each other with an air gap, and the only solid connection between the modules is the end sections of the barrel inserts. With this a much better individual temperature regulation is possible for each module with little heat or cooling conducted from one barrel to another.

HEAVY-DUTY GEARBOX

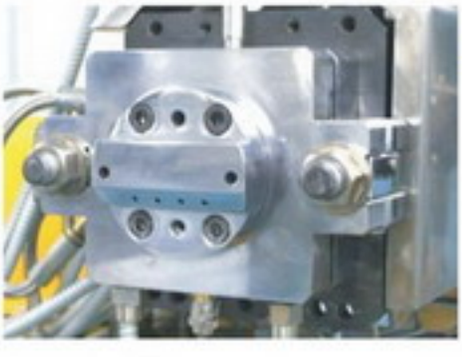
The screws are driven by a heavy-duty gearbox, designed and produced by us, utilizing precision gears with a high load factor to ensure long lifetime. Each screw gear shaft is supported by special multi stage trust bearings, ensuring they can withstand much higher pressures than the allowed maximum. The drive motor is flange mounted to the gear box through a torque limiting coupling, which will protect the screws from overloads. The torque limiter is electronically connected to the motor controls and will stop the motor instantly in case of overload.



A programmable frequency inverter regulates the motor speed. The 26 mm twin screw extruder is available in two drive versions, for standard motor power of 11 kW and max RPM of 800 as well as a high RPM version with 22 kW motor drive.

HOPPER FEEDER

Our hopper feeders are made in house with heavy-duty drive and custom built gearbox for screw and agitator. They are available with either single or twin feeding screws. The feeder is mounted on a low friction sliding base and can easily be removed from the in-feed chute and turned, as shown here, to purge out the hopper. The hopper feeder is equipped with an infinitely variable speed drive controlled from the control panel. All parts in contact with the feedstock are made in polished stainless steel and are held together with quick locks for easy and fast disassembly when cleaning. As with all our extruders, the hopper is equipped with a sight mirror so that the batch level can be seen from a distance.



STRAND DIE SUPPLIED AS STANDARD

All twin-screw extruders are equipped, as standard, with a strand die mounted on a hinged flange that can be opened only by loosening two bolts, as shown opposite. The barrel end of the die is also equipped with an easily removable breaker plate, which allows production either with or without screens.

This die is very easy to clean and is ideal for short runs with frequent colour changes, etc. An adaptor with C-clamp can be supplied to replace the flanged strand die in case the extruder is to be used with our other downstream equipment such as chill-roll line, etc.

OPTIONAL SIDE-FEEDERS

The 20 and 26 mm extruders can be equipped, as an option, with one or more twin-screw side-feeders that can be fitted to the side of one of the barrel sections. A special barrel section having an opening (as well as a plug) for side feeding is needed for this option..

The extruders can be supplied with several plugged side-feeder barrel sections for optimum flexibility of feeder location. The sidefeeders have infinitely variable speed drives of the twin screws and an L/D ratio of 10. The entire barrel of the side-feeder is equipped with water-cooling as standard.

BARREL VENTING WITH BUILT IN VACUUM

Both the 20 and 26 mm twin-screw extruders are equipped with one vent barrel for the 32 L/D versions and additional vent opening on the 40 L/D versions. The second vent can here be used for atmospheric venting or exchanged for vacuum venting with the first vent.

The vacuum vent zone, shown right, has a stainless steel vent port housing equipped with a sight glass and vacuum regulator with gauge. The housing is connected to a large vacuum filter, shown left, and to a vane type vacuum pump mounted in the sub cabinet.

CLOSED-LOOP WATER COOLING SYSTEM

The twin-screw extruders are supplied with fine cooling channels in each barrel module and it is important that the cooling water used has been properly treated so that it does not contain any impurities or minerals that can clog the channels and thus reduce the cooling efficiency. Our optional closed-loop cooling system enables you to isolate the cooling of the barrel modules from the rest of the cooling system. It comprises a large stainless steel cooling tank with a built-in heat exchanger and a water pump supplying the extruder with a constant pressure of demineralized water.

EXTRUDER CONTROLS

MANUAL VERSION

Our large standard control panel has been very well received thanks to its user friendliness where all parameters can be seen instantly, even from a distance. It contains clearly visible instruments with easy adjustments of all extruder parameters. Even inexperienced operators can use the extruder almost immediately, and the panel has easy-to-understand international symbols describing all instrument functions.

The panel also contains warning lamps for all major functions that will instantly light up and stop the extruder when any fault in the system is detected.

The panel contains the following:

Control functions:

- Temperature controllers for each barrel zone
- Digital melt temperature indicator for every second zone and screw tip.
- Pressure controlling instrument
- Digital RPM setting of screw and feeders
- Digital motor power in % of full load
- Selector switch for Vacuum pump
- Control functions for side feeder

Alarm functions:

- Overload of main motor
- Overload of hopper feeder
- Trip of torque limiter
- Zone temperature has not reached set value
- Low water pressure
- Vacuum pump overload
- Over pressure on die
- Clam shell not fully closed
- Hopper feeder not fully assembled

The 20 mm twin-screw extruder has all the temperature controllers mounted in the lower part of the sub cabinet while all the important instruments showing the running parameters are mounted on the swing-away control panel

Table Top *Micro Scientific* 16 mm twin screw extruder

Large infeed screw D/d ratio enables easy feeding of pellets

The smallest twin-screw extruder in our range has a screw diameter of 16 mm. It is equipped with modular barrel sections of 4 D and can be supplied with a total L/D of 40. The barrel modules are available with vent outlets for vacuum and/or atmospheric venting.

Supplied complete with hopper feeder and with quick lock strand die as well as pressure transducer

Screw elements are of same construction as the larger 20 and 26 mm twin screw extruders and are mounted on hexagonal shafts. Barrel modules and screw elements made of through hardened high-grade tool steel with nitrided barrel surface for optimum wear resistance.

Each barrel zone has electric heating and water-cooling is supplied on the in feed section.

High torque 4 KW motor drive with screws RPM of up to 800

Bench Top Water bath with strand suction and quick lock strand guide rolls.

Bench Top Mini Pelletizer type LZ-80 for up to 2 strands

With infinite variable cutter speed and optional variable strand feeding for other pellet lengths down to micro sizes.

Sub cabinets on casters for twin-screw extruder, water bath and pelletizer.

The twin screw sub cabinet contains all electric and electronic components as well as vacuum pump with filter while the other sub cabinet contains the ring blower for the strand suction and is equipped with a practical adjustable shelf at the short end to hold the container for the pelletizer.

TECHNICAL DATA

Description	16 mm Twin-Screw Extruder	20 mm Twin-Screw Extruder	26 mm Twin-Screw Extruder
	40 L:D	40 L:D	40 L:D
Screw RPM	0 to 800	0 to 800	0 to 800 High Power version 0-1100
Motor power	2.2 kW	5.5 kW	11 kW High Power version 22 kW
Max. extrusion output pressure	100 bar	100 bar	100 bar
Max. dynamic thrust bearing load	3.2 kN	20 kN	45 kN
Maximum torque at 600 RPM	2 x 18 Nm	2 x 44 Nm	2 x 90 Nm High Power version 2 x 90 Nm at 1100 RPM
Outer and inner screw diameter ratio (D/d)	1.73	1.71	1.64
Max barrel temp. Standard	400˚C	400˚C	400˚C
Heating power per barrel section	0.8kW	1.6 kW	2.0 kW
Heating power for strand die	0.4 kW	0.8 kW	1.0 kW
Total max power for 40 L/D	11 kW	22 kW	31 kW
Minimum water pressure and water consumption	3 bar / 7 lt/min	3 bar / 15 lt/min	3 bar / 20 lt/min
Water pump power for optional closed-looped cooling system	0.75 kW	O.75 kW	O.75 kW
Approximate maximum output LDPE	5 kg/hr	20 kg/hr	50 kg/hr
Net weight	248 kg	700 kg	1,000 kg
Dimensions metres length x height x depth	1.60 x 1.60 x 0.57	2.14 x 1.8 x 0.73	2.68 x 1.80 x 0.73

Hopper feeder data	Twin screw version	Single screw version
Motor power	0.37 kW	0. 37 kW
Screw diameter	2 x 13 mm	27 mm (22 mm)
Screw RPM	0 to 250	0 to 250
Approximate capacity	100 kg/hour of powder	50 kg/hr of pelletized resin

Side feeder data	20 mm twin screw side feeder	26 mm twin screw side feeder
Motor power	0.37 kW	0. 37 kW
Screw diameter	2 x 20	2 x 26
Screw RPM	0 to 200	0 to 200
Approximate capacity	20 kg/hour of powder	100 kg/hr of pelletized resin