

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders



Please See Separate Catalogue
For Our 36 mm Versions

Labtech Engineering

TECHLABSYSTEMS

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

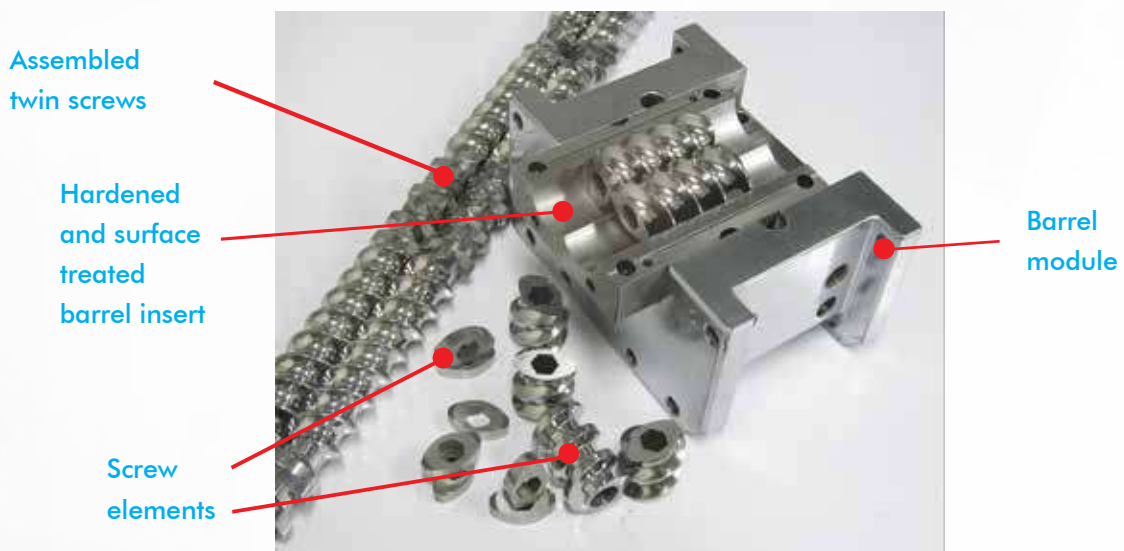
Clam Shell Barrel Type for Easy Cleaning and for Visualization of Melt Process on Screws

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 be supplied in a fully closed version.

The whole clamshell barrel assembly is split in the center and can be easily swung open after removing all 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 4D lengths. Each module is equipped with our new unique wear resistant insert system that enables easy and very economic replacements.

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.

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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.

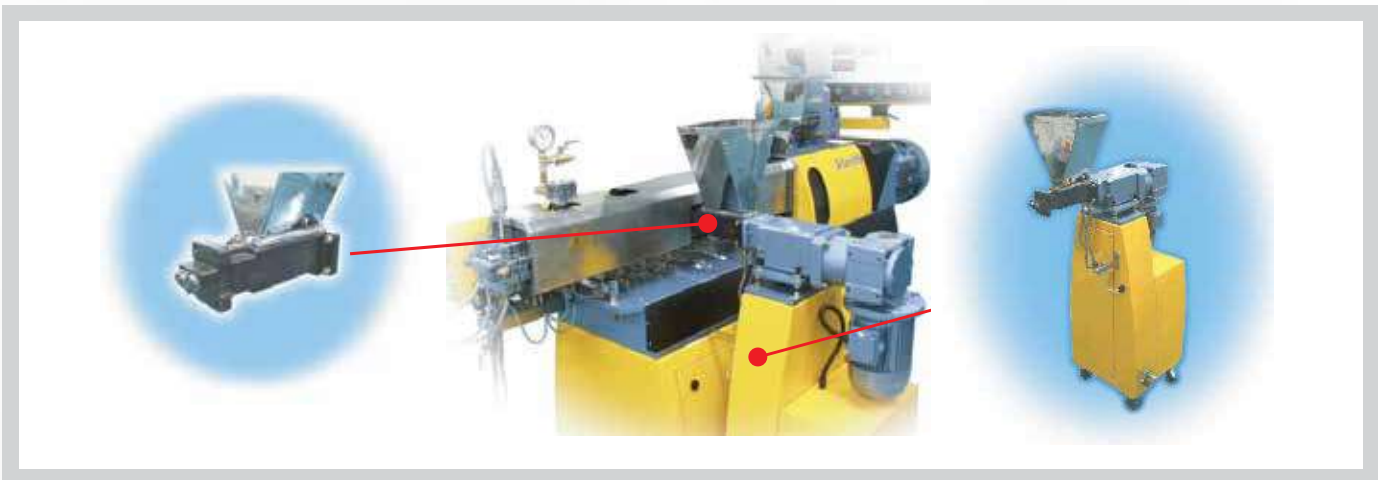
Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

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

Large fine mesh stainless steel filter



High capacity vane type vacuum pump

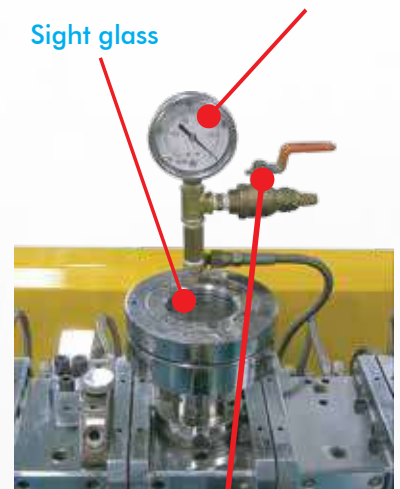
Extruder sub cabinet

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 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.

Vacuum pressure gauge

Sight glass



Relief valve (for adjusting the vacuum level)

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

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
- Control buttons 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
- Clamshell not fully closed
- Hopper feeder not fully assembled



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



Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

Extruder Controls - Computerized Version

Optionally, all extruder sizes can be supplied with fully computerized controls based on a high capacity PLC and large 10.5 inch LCD touch screen from B&R, Austria who also has custom developed the software with us. The main screen shown to the right is designed for clear visualization of the most important running parameters and allows for instant control of screw and feeder speeds as well as downstream equipments such as pelletizer, etc.

The computerized versions have briefly the following features:

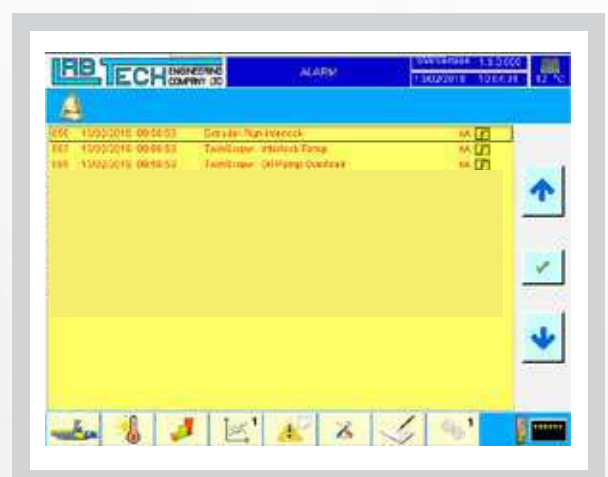
Process Controls

- Temperature controls and graphic set and readout illustrations of all barrel zones, die and auxiliary components as well as melt temperatures in barrel zones and die.
- Motor speed with torque and graphic illustrations
- Speed of main hopper feeder and auxiliary feeders such as additional hopper feeders, side feeders and liquid dosing units. The feeders can be either volumetric or gravimetric or a combination of both.
- Pressure control from transducer with graphic illustrations of pressure variations.
- On/Off functions of barrel vacuum pump, closed-loop cooling system and if applicable of water bath, pelletizer and any other downstream equipment.
- Speed of auxiliary equipment such as pelletizer etc.

All process controls setting and running parameters can be stored on board as well as downloaded via Ethernet 10/100 and RS232 ports. This can be used for analysis and reporting of all running parameters. The system can also be supplied with SCADA software.

Alarm Functions

Extensive alarm functions are included which covers all components such as main motor overload, torque limiter trip, overload or malfunctions of feeders, low cooling water pressure, barrel over pressure, safety switches not engaged, low temperature on any zone, overload on auxiliary equipments etc.



Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders

The Maximum output rate was achieved with our standard screw configuration, same as we supply for the past couple of years to most customer. However the compression screws at the screw end were with our new low pitch version which has proven to increase the output at a reduced screw torque. The test were made with large amount of resins where we gradually increased the screw speed, followed by increased feed rate from the hopper feeder.

All tests were made with Virgin Resins and it is expected that output rates will even be higher when producing compounds with higher density then the various polymers mentioned. However the output rate may be lower when running with light fluffy powders since these have a larger volume and may fill up the in feed screws more then pelletized resins.

Maximum Production Output with our Co-Rotating 20 mm twin screws extruder type LTE20-40, with 40 L/D length equipped with 5.5 kW motor drive and 800 screw RPM

POLYMER TYPE (Regular pellets)	Melt flow Index (g/10 min)	Maximum Output		% of Maximum Motor Power	Screw (rpm)	Barrel temperature rang°C (starting from in feed zone)
		lb/hr	kg/hr			
LDPE	20	46	21	83	800	150-180
HDPE	15	59	27	84	800	180-200
PET*	-	46	21	84	800	280-300
NYLON*	-	33	15	84	800	260-280
ABS*	18	59	27	85	800	220-240
GPPS	8	70	32	71	800	220-240
HIPS	8	72	33	74	800	210-230
PP	11	39	18	58	800	220-240
POM	9	66	30	83	800	220-240
PC*	19	39	18	85	800	270-290

*Materials were not dried before extruding.

Maximum Production Output with our **Scientific** Co-Rotating 26 mm twin screws extruder type LTE26-40, with 40 L/D length equipped with 15 kW motor drive

POLYMER TYPE (Regular pellets)	Melt flow Index (g/10 min)	Maximum Output		% of Maximum Motor Power	Screw (rpm)	Barrel temperature rang°C (starting from in feed zone)
		lb/hr	kg/hr			
LDPE	20	140	64	72	800	150-180
HDPE	15	143	65	84	700	180-200
PET*	-	156	71	92	700	260-280
NYLON*	-	110	50	82	600	280-300
ABS*	18	154	70	91	700	220-240
GPPS	8	171	78	82	800	220-240
HIPS	8	224	102	85	700	210-230
PP	11	189	86	87	700	220-240
POM	9	145	66	87	700	270-290
PC*	19	178	81	93	800	220-240

*Materials were not dried before extruding.

TABLE TOP MICRO SCIENTIFIC 16 MM TWIN-SCREW EXTRUDER



Standard Version



New Forced Air Cooled version Type FAC



Each barrel zone is equipped with electric cartridge heating on both top and bottom part of the barrel with exception of the in feed zone which has only water cooling. The high wattage heating enables fast temperature changes of each zone when changing processing conditions from one compound to another. The **FAC versions** with L/D up to 60+ have additional individual forced air cooling on each zone. The cooling is made with individual high force centrifugal fans where the air is directed over aluminum fins on top and bottom of the barrel. With this system, it is possible to obtain a very precise barrel temperature on each zone. The high efficiency of the cooling ensures that each barrel module will remain at the set temperature and will not increase in heat due to high shear forces from the screws. One or several barrel modules can optionally be equipped with opening for side feeder.

Table Top Micro Scientific 16 mm twin-screw extruder



Large in-feed 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 4D 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.



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.

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



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

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders



Side Feeder

Twin screw side feeder type LSF16 with screw length of 10 D and water cooled barrel. The screws used here are the same as the feed screw elements used in main twin extruder and they are mounted on same size hexagonal shaft. Complete with infinite variable speed AC drive, The side feeder is mounted on a practical swing arm for easy removal. The speed regulation will be controlled from extruder panel on a digital RPM instrument with scroll buttons or, if the extruder is equipped with computer controls, it will have all controls on the touch screen. Side feeder is supplied complete with barrel side opening and plug.

DOWNSTREAM EQUIPMENT FOR THE 16 AND 12 MM TWINS ONLY

Sub cabinet for the water bath and the pelletizer containing also the vacuum devise for the strand suction. The cabinet is made in same level as the twin screw extruder sub cabinet to form a convenient base for the whole pelletizing line. It is built on caster so that it can conveniently be separated from the extruder.

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.



Downstream Equipment for The 16 and 12 mm Twins only



Water bath type LWB-40

Bench top type made of stainless steel with two strand rolls equipped with quick locks mounted on one side of the water bath so that the rolls can be placed in numerous positions for optimum cooling efficiency. The water bath is equipped with vacuum suction for efficient removal of all water on the strands. The vacuum device is built into the lower sub cabinet.

Co-Rotating Modular Laboratory and Pilot Plant Twin Screw Extruders



**Bench Top Pelletizer
Type LZ-80 HP**

Bench Top Pelletizer type LZ-80 with variable speed up to 1400 RPM and with 6 bladed rotary cutting knife made of high grade carbon steel. Speed regulation with programmable inverter. With polycarbonate swing open door with double security safety locks which instantly stops the rotary knife when opened.

The lower driven in feed roller is made of grooved hardened steel and the upper following roll is made of Polyurethane and spring loaded to lower roll. Picture to the left shows the pelletizer with manual controls. The two digital instruments control the knife speed as well as the pellet length in mm with the optional variable in feed speed described.



Optional variable speed strand feeding device

driven by a separate AC gear motor with programmable frequency inverter. The in feed speed is controlled with a digital instrument, showing the pellet length in mm. With this option, it is possible to vary the pellet length from 5 mm down to micro pellet size of only 1 mm length.

Maximum Production Output with our MicroScientific Table top Co-rotating 16 mm twin screw extruder type LTE16-40, with 40 L/D length equipped with 2.2 kW motor drive and 800 screw RPM

POLYMER TYPE (Regular pellets)	Melt flow Index (g/10 min)	Maximum Output		% of Maximum Motor Power	Screw (rpm)	Barrel temperature rang°C (starting from in feed zone)
		lb/hr	kg/hr			
LDPE	20	11.9	5.4	56	800	150-180
HDPE	15	18.5	8.4	61	800	180-200
PET*	-	15.8	7.2	90	600	280-300
NYLON*	-	28.4	12.9	80	800	260-280
ABS*	18	17.4	7.9	61	800	220-240
GPPS	8	20.9	9.5	52	800	220-240
HIPS	8	22.4	7.7	51	800	210-230
PP	11	18.9	4.3	48	800	220-240
POM	8.6	14.5	10.3	54	800	220-240
PC*	9.5	17.8	6.7	88	800	270-290

*Materials were not dried before extruding.



Micro Compounder 12 Mm Twin-screw Extruder

Suitable for highly efficient compounding of very small batch sizes down to 20 gram or even less.

The Clam Shell Barrel is equipped with exchangeable barrel lining inserts for optimum economy and ease of replacement. These standard inserts are made from a very high grade tool steel which is through hardened to over 60 RC and which can withstand high processing temperatures of up to 400 °C. This unique barrel insert system was designed by us in 2003 and has proven during the years to be a very good feature.

Available both in manual as well as fully computerized version with LCD touch screen controls

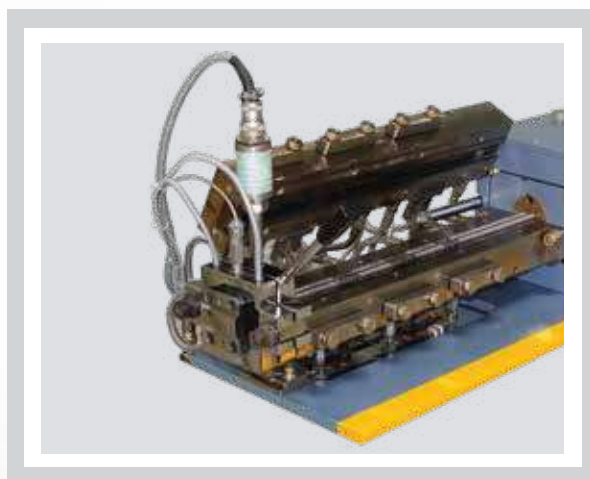
Micro Compounder 12 mm twin-screw extruder



Twin Screw Extruders type LTE12-36
with segmented screws and screw speeds up to 800 RPM

The New MicroCompounder 12 mm co-rotating twin screw extruders is made with a complete modular build up of the clam shell barrel, where each barrel section have a length of 9D or 108 mm. The length is available with 36 L/D and with drive power of 2.2 KW.

This twin is designed to be used with polymers in powder or micro pellets form with an approximate maximum granule diameter of 1.5 mm. It is suitable for processing of minute polymer quantities for research applications but it can also produce larger quantities having a maximum output of around 4 kg/hr. The amount of resin remaining in the screws is only around 10 grams so if the batch size is for instance 50 gram, the amount of polymer which is compounded and exits through the die is 40 gram.



TECHNICAL DATA

Description	12 mm Twin Screw Extruder	16 mm Twin Screw Extruder	20 mm Twin Screw Extruder	20 mm Twin Screw Extruder Maxi Compounder	26 mm Twin Screw Extruder	26 mm Twin Screw Extruder Maxi Compounder
	36 L/D	32 to 52+L/D	32 to 56+L/D	32 to 56+L/D	32 to 60 +L/D	32 to 60 +L/D
Screw Speed (RPM)	0 to 800	0 to 800	0 to 800	0 to 1200	0 to 800	0 to 1200
Motor power (kW)	2.2 kW	2.2 kW	5.5 kW	11 kW	15 kW	22 kW
Max. extrusion output pressure	200 bar	200 bar	300 bar	300 bar	300 bar	300 bar
Max. dynamic thrust bearing load	3.2 kN	3.2 kN	30 kN	30 kN	62 kN	62 kN
Maximum torque at 600 RPM	2 x 12 Nm	2 x 18 Nm	2 x 31 Nm	2 x 47 Nm	2 x 90 Nm	2 x 90 Nm
Specific Torque Nm/cm ³	12	9.22	10.35	10.35	9.8	9.8
Outer and inner screw diameter ratio (D/d)	1.5	1.73	1.71	1.71	1.63	1.63
Max barrel temp. (Standard)	400 °C	400 °C	400 °C	400 °C	400 °C	400 °C
Heating power per barrel section (4 L/D)	1.6 kW	0.8 kW	2.0 kW	2.0 kW	2.0 kW	2.0 kW
Heating power for strand die	0.8 kW	0.4 kW	0.8 kW	0.8 kW	1.0 kW	1.0 kW
Total max power for 40 L/D	9.9 kW (36 L/D)	11 kW	21.7 kW	28 kW	36.8 kW	42.5 kW
Minimum water pressure and water consumption	3 bar / 7 lt/min	3 bar / 7 lt/min	3 bar / 20 lt /min	3 bar / 20 lt /min	3 bar / 20 lt /min	3 bar / 20 lt /min
Water pump power for optional closed-looped cooling system	0.75 kW	0.75 kW	0.75 kW	0.75 kW	0.75 kW	0.75 kW
Approx. max. output (LDPE)	4 kg/hr	5.4 kg/hr	21 kg/hr	26 kg/hr	64 kg/hr	80 kg/hr
Minimum batch size (LDPE)	20-60 g	30-100 g	200-400 g	200 - 400 g	1000 - 1500 g	1000 - 1500 g
Resin remaining on screw (LDPE)	10.2 g	15 g	35.4 g	35.4 g	77 g	77 g
Net weight (for 40 L/D)	520 kg	650 kg	700 kg	820 kg	1,000 kg	1,190 kg
Dimensions (metres) length x height x depth (for 40 L/D)	1.56 x 1.70 x 0.78	1.60 x 1.60 x 0.57	1.94 x 1.66 x 0.63	2.56 x 1.66 x 0.63	2.68 x 1.80 x 0.73	2.85 x 1.85 x 1.05

Hopper feeder data	Twin screw version	Single screw version
Motor power	0.37 kW	0.37 kW
Screw diameter	2 x 18 mm	27 mm
Screw RPM	0 to 250	0 to 250
Approximate capacity	100 kg/hr of powder	100 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	0.75 kW
Screw diameter	2 x 20 mm	2 x 26 mm
Screw RPM	0 to 250	0 to 200
Approximate capacity	50 kg/hr of powder	100 kg/hr of pelletized resin