Appendix I Rev. 1

Spinning and Winding Machine

Equipment List
(Total Scope of Supply)

project name:	Filamentos Industriales, Peru
engineer:	Werner Beeck

Basic Layout Data

scope:	1 SPINNING AND WINDING MACHINE				
machine type:	9E10/30D SP87 DIO EVO quenching WINGS40T-1500/10 Wings electric				
polymer:	PET	process:	textile	yarn type:	POY
no. of machines:	1	no. of spinning positions per machine:	4	no. of winding positions per machine:	4
		no. of yarn ends per spinning pos.:	10 (20 via DIO)	no. of yarn ends per winding pos.:	20
spacing:	1490 mm	bobbin volume:	16,8 dm^3	at max. outer diameter of:	440 mm

Titer Program / Capacities

product type (cross section)	titer / fineness (in case of POY: final - DTY- titer)	approximate process winding speed *	residual draw ratio * (in case of POY)	spinning /winding technique
	[den / f]	[m/min]	[1]	[ends]
POY (rd)	75 / f72	2900	1,7	20/20
POY (rd)	150 / f144 / f96	2850	1,68	20/20
POY (rd)	100 / f72 / f96	2950	1,7	20/20

As per design conference the min. throughput is 8 positions with 75den. The max throughput is 4 positions with 75den and 4 positions with 150den.

* data as basis for the layout of all components which are depending on the polymer throughput.

EQUIPMENT LIST

We reserve the right to carry out at any time technical modifications which may be necessary to achieve continuous process improvement and optimal plant operation.

NOTE

concerning abbreviations:

CB = CONTRACTOR's Barmag scope of supply
P = PURCHASER's scope of supply
PC = PURCHASER's scope of supply according to CONTRACTOR's specification
PE = PURCHASER's existing equipment
O = Optional supply
* to be delivered under a separate local contract

NOTE

concerning itemizing system
i.e.

```
M  22  01  A  001
|  |   |  |  |
|  |   |  |  +-- consecutive no.
|  |   |  +------- line identification
|  |   +---------- part no.1 in plant section 22
|  +-------------- plant section 22, extrusion
+----------------- type of apparatus
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22			**EXTRUSION**	
22 05 0			**Spinning extruder (e-save)**	
			consisting of	
M 22 05 0 001	CB	1 pcs	**Horizontal spinning extruder basis**	
			type	9E10
			diameter	90 mm
			effective length of screw	30 x D
			granulate feeding housing	water cooled
			sealing for nitrogen pressure of max.	90 mm water column
			gear torque	6500 Nm
			rated cylinder heating capacity in total (at 400 V)	41,5 kW at 5 zones
			rated capacity for cylinder cooling (fan) in total (at 50 cps)	0,50 kW
			no. of heating zone(s) to be cooled	2 pc(s)
			extruder drive is comprising:	- motor fixation plate inside the frame - motor pulley - gear box pulley - V-belts - V-belt cover
			mechanical layout	max. 380 kg/hr
M 22 05 0 004	CB	1 pcs	**Extruder screw**	
			diameter	90 mm
			length	30 x D
			screw design	3 or 5 zone
			screw surface	nitrated
			mixer design	LTM - spiral barrier mixer
			polymer	PET
			dust content of chips (max.)	100 ppm equally distrib.
			polymer throughput min.	80 kg/hr
			polymer throughput max.	320 kg/hr (filter flowing included)
			shear viscosity	180 - 250 Pas (290°C)
M 22 05 0 007 M	CB	1 pcs	**Extruder AC main-drive motor**	
			rated capacity	78 kW
			motor type	asynchronous
			motor protection	IP54
			overheat protection	ptc-sensor for switch off provided
			motor location	integrated in the frame
			mechanical overload	not provided, overload function is realised via electrical torque limitation
			inverter	not included in the extruder drive, it is part of the control panel
22 10 0			**Measuring head and manifold**	
			consisting of	
A 22 10 0 001	CB	1 pcs	**Extruder measuring head basis**	
			to be flanged at extruder with diameter	90 mm
			heating principle / heating medium	vapour heated / heat transfer medium
A 22 10 0 004	P	1 pcs	**Extruder measuring head - Insulation**	
			to be insulated after installation at purchaser's site. Please refer to recommendations in our operation manual (supplied with the equipment).	
			design	metal sheet covered insulation
			insulation material	rock wool

A 22 10 0 007	CB	1 pcs	**Melt pressure sensor**	
			location	at measuring head
			pressure	min. 0 bar max. 350 bar
			output signal	min. 4 mA max. 20 mA
			pressure accuracy	± 1% of max. value
A 22 10 0 010	CB	1 pcs	**Melt temperature sensor**	
			location	at measuring head
			temperature accuracy	± 0,75°C at 300°C
			temperature	min. 0 °C max. 350 °C
A 22 10 0 013	CB	1 pcs	**HTM temperature sensor**	
			location	at HTM pipe
			temperature accuracy	± 0.75°C at 300°C
			temperature	min. 0°C max. 350°C
A 22 10 0 016	CB	1 pcs	**Manifold**	
			design	stainless steel for melt contacting parts, carbon steel for HTM jacket, layout according to Pressure Equipment Directive 97/23/EG or GB, final decision through contractor
			total number of outlets	2
			heating principle / heating medium	vapour heated / heat transfer medium
			operating temperature	319 °C
			operating pressure heating jacket	max. overpressure 2,5 bar
			polymer valve	1 per arm. welded in the manifold
			type	freezing
			freezing medium	6 bar compressed air
A 22 10 0 019	P	1 pcs	**Manifold - insulation**	
			to be insulated after installation at purchaser's site. Please refer to recommendations in our operation manual (supplied with the equipment).	
			design	metal sheet covered insulation
			insulation material	rock wool
A 22 10 0 022	CB	1 set	**Polymer mixer**	
			type	static
			location	before each split
22 15 0			**<u>Continuous polymer filter</u>**	
			consisting of	
F 22 15 0 001	CB	1 pcs	**Continuous polymer filter basis**	
			polymer throughput	60 - 300 kg/h
F 22 15 0 004	CB	1 pcs	**Filter - housing**	
F 22 15 0 007	CB	1 pcs	**Filter - insulation**	
F 22 15 0 010	CB	3 pcs	**Filter - insert**	

F 22 15 0 013	CB	1 pcs	**Filter - Melt pressure sensor**
F 22 15 0 016	CB	1 pcs	**Local indicator box** - indicator for extruder screw rpm
22 20 0			**Filter cartridge** consisting of
F 22 20 0 001	CB	3 sets	**Filter cartridge**

23			**SPINNING**	
23 05 0			**Spinning head**	
			consisting of	
A 23 05 0 001	CB	2 pcs	**Spinning head basis (e-save)**	
			type	SP87D (DIO)
			connection to manifold	welded
			positions per module	2 pcs
			spin packs per position	10 pcs (provided separately)
			spacing per position	1490 mm
			spinneret diameter	104 mm
			heating principle / heating medium	vapour heated / heat transfer medium
			operating temperature	max. 319 °C
			operating pressure heating jacket	max. 2,5 bar overpressure
			design	- layout according to Pressure Equipment Directive 97/23/EG or GB, final decision through contractor - for adapting of spinning pumps - for vertical spinning pump drives - for bottom loading of spin packs
A 23 05 0 004	CB	2 set	**Spinning head - insulation**	
			design	metal sheet covered insulation
			insulation material	rock wool
A 23 05 0 007	CB	2 pcs	**Spinning head - polymer mixer**	
			type	static
			location	welded in the melt inlet
A 23 05 0 010	CB	2 pcs	**Spinning head - melt pressure sensor**	
			location	before spinning pump, at first spinning position, counted from left hand side of machine
			pressure	min. 0 bar max. 200 bar
			output signal	min. 4 mA max. 20 mA
			pressure accuracy	± 1% of max. value
A 23 05 0 013	CB	1 pcs	**Combined melt pressure temperature sensor**	
			location	between spinning pump and spin pack, at first spinning position, counted from left hand side of machine
			temperature accuracy	± 0,75 °C at 300 °C
			pressure	min. 0 bar max. 500 bar
			pressure accuracy	± 1% of max. value
			temperature	min. 0 °C max. 350 °C
			output signal	min. 4 mA max. 20 mA
A 23 05 0 016	CB	2 pcs	**Spinning head HTM temperature sensor**	
			type	Pt 100 / in 3-wires system
			location	in HTM jacket
			temperature accuracy	± 0,75 °C at 300 °C
			temperature	min. 0 °C max. 350 °C

A 23 05 0 019	CB	9 pcs	**Spinning pump drive - gear motor**	
			type	synchronous
			design	vertical drive
A 23 05 0 022	CB	9 pcs	**Spinning pump drive - drive shaft**	
			design	shaft with cardan coupling
			location	between gear motor and spinning pump
A 23 05 0 025	P	9 set	**Spinning pump drive - support frame for pump drives**	
			design	steel construction
A 23 05 0 028	CB	8 set	**Spinning pump drive - mounting plate for pump drives**	
			design	steel construction
23 10 0			**Spin pack**	
			consisting of	
A 23 10 0 001	CB	80 pcs	**Spin pack**	
			design	round shaped
			filtration	sand filtration with cup
			outer diameter of spinneret	104 mm
			melt pressure	min. 80 bar
				max. 300 bar
23 15 0			**Spinning pump**	
			consisting of	
P 23 15 0 001	CB	10 pcs	**Spinning pump**	
			type	GH30XK
			design	planetary gear pump
			rated capacity	3,0 cm^3/rev
			no of outlets	10
			no of levels	2
			discharge pressure	max. 350 bar
			differential pressure	max. 300 bar
			recommended rpm	min. 8 rpm
			recommended rpm	max. 30 rpm
			operation rpm	to be defined during design conference
			pump diameter	120 mm
23 20 0			**EvoQuench radial inflow quenching system (e-save)**	
			consisting of	
A 23 20 0 001	P	4 pcs	**Common air supply duct**	
			function	air supply to air ducts of quench air chambers
			location	behind the machine
A 23 20 0 004	CB	4 pcs	**Interfloor duct**	
			location	between EvoQuench chamber and take-up machine

A 23 20 0 007	CB	4 pcs	**EvoQuench radial inflow quenching chamber**	
			design: radial inflow quenching chamber consisting of: - support frame with side walls - air supply channel with throttle valve - flexible low resistance hoses to be connected to the throttle valve - EvoQuench lifting device - air pressure pipe for lifting device - EvoQuench box - EvoQuench screen cylinders	
A 23 20 0 013	CB	4 set	**Spare screen cylinder for EvoQuench radial inflow quenching system**	
A 23 20 0 010	CB	9 set	**Spin-finish nozzles and thread guides**	
23 25 0			**Spin finish supply** consisting of	
L 23 25 0 001	CB	1 set	**Spin finish piping**	
			type	for single inline oiling spin finish device
			common feeding pipe	stainless steel, welded, avoiding dead spots
			connection	flexible plastic hoses from feeding pipe to supply units - piping pre assembled as far as possible - hoses as coils for adaptation of length at customers site
			waste collection	provided
B 23 25 0 004	CB	1 pcs	**Spin-finish tank**	
			design	filter unit at tank inlet and mechanical ball valve provided
			storage tank volume	50l
				resonance switch provided
23 30 0			**Spin-finish pump** consisting of	
P 23 35 0 001	CB	10 pcs	**Spin-finish pump**	
			type	GFD1XA-50
			design	planetary spin-finish gear pump incl. stainless steel quick connectors at pump inlet and outlets
			rated capacity	0,12 cm³/rev
			no. of outlets	10 pcs
			recommended rpm	min. 15 rpm max. 60 rpm
			operation rpm	to be defined during design conference
P 23 35 0 004 M	CB	9 pcs	**Spin-finish pump drive unit**	
			design	individual drive per spin-finish pump by - AC gear motor - tooth coupling between gear motor and pump
			location	behind quenching chamber

23 35 0			**Heat transfer installation**	
			design	- for heating of spinning head, measuring head and manifold - vapour heater - layout according to Pressure Equipment Directive 97/23/EG or GB, final decision through contractor
			heating principle / heating medium	vapour heated / organic heat transfer oil (eutectic mixture consisting of 25% diphenyl and 75% diphenyl ether)
			operating temperature	max. 319 °C
			operating pressure	max. 2,5 bar excess pressure
			consisting of	
W 23 30 0 007	CB	1 pcs	**Vaporisation vessel**	
			design	horizontal vessel, heating flange in direct contact to heat transfer medium
			safety devices	- thermostat electric heaters high temperature alarm heat transfer medium low level alarm - manometer adjustable min. and max. signals - safety valve with condenser - level control for switching off at too low liquid level
			installed heating capacity	59,28 kW
W 23 35 0 001	CB	3 pcs	**Temperature sensor for heat transfer installation**	
			type	PT100 / in 3-wires system
			temperature accuracy	± 0,75 °C at 300 °C
			location	at the boiler: 1 for vapour area 1 for liquid area at the venting unit: 1 for vapour area
			temperature	min. 0 °C max. 350 °C
23 40 0			**Piping for heat transfer installation**	
			consisting of	
L 23 40 0 001	CB	1 set	**Piping for heat transfer installation**	
			system	1 circuit
			material	carbon steel
			location	fixed at rear side of machine behind spinning head
			design	separate pipes each for - heat transfer medium vapour - heat transfer medium condensate up from boiler to first heat transfer medium consumer - layout according to Pressure Equipment Directive 97/23/EG or GB, final decision through contractor
			connection to polymer filter is provided	

A 23 40 0 004	P	1 set	**Insulation**	
			To be insulated after installation at purchaser's site. Please refer to recommendations in our operation manual (supplied with the equipment).	
			design	metal sheet covered insulation
			insulation material	rock wool
A 23 40 0 007	CB	1 set	**Venting unit**	
			design	1 vent valve 1 vent vessel 1 vent condenser

24			**TAKE UP**	
24 05 0			**High speed winding machine - general**	
			machine type	WINGS POY
			winding unit arrangement	one deck
			installation of winding units	self supported on the floor
			layout winding speed	3.200 m/min
M 24 05 0 001	CB	1 set	**Fixing parts for winding units**	
L 24 05 0 004	CB	1 set	**Supply equipment for piping P1 for winding units**	
			location	behind the machine
			max. operating pressure	6 bar ± 0,5 bar overpressure
			filter unit	2 pcs, with bypass
			pressure reducer unit	1 pcs
			quantity	1 set per 4 positions
L 24 05 0 007	CB	1 set	**Piping P1 compressed air for winding units**	
			piping	1 pcs per 8 pos
			air hoses inside position	between piping and winding unit
L 24 05 0 010	CB	1 set	**Supply equipment for piping P20 for yarn gathering**	
			location	behind the machine
			max. operating pressure	approx. 6 bar + 2 bar overpressure
			filter unit	1 pcs, without bypass
			pressure reducer unit	not provided
			quantity	1 set per 4 positions
L 24 05 0 013	CB	1 set	**Piping P20 compressed air for yarn gathering**	
			piping	1 pcs. per 4 pos.
			air hoses inside position	between solenoid valves and yarn feeding device
L 24 05 0 016	CB	1 set	**Supply equipment for piping P50 for main intermingling**	
			location	behind the machine
			max. operating pressure	approx. 6 bar + 2 bar overpressure
			filter unit	2 pcs, with bypass
			pressure reducer unit	1 pcs
			quantity	1 set per position
L 24 05 0 019	CB	1 set	**Piping P50 compressed air for main intermingling**	
			piping	1 set per 4 pos.
			air hoses inside position	between solenoid valves and main intermingling jet
L 24 05 0 022	CB	1 set	**Yarn waste pipe**	
			design	standard length straight pipes are supplied. The length of the pipe is calculated for leading directly behind the machine. Adaptation at site
			usage	for suction nozzle only
L 24 05 0 025	P	1 set	**Fume suction piping**	
			location	inside the machine and at rear frame
			material	PVC
			connected	to covering of intermingling

24 10 0			**Winding unit**	
			consisting of	
M 24 10 0 001	CB	9 pcs	**Winding unit basis**	
			type	WINGS40T-1500/10
			bobbin change	automatic
			cast iron housing with turret	adapting 2 bobbin chucks
			electronic control unit	WINGS inverter system
			electric and pneumatic	plug in type
			data exchange	Ethernet system between winding unit and GUIDE system
			lubrications of bearings	grease
			mechanical speed range	2.500 - 4.000 m/min
M 24 10 0 004	CB	9 set	**Yarn gathering device**	
			design	1 yarn suction jet 1 yarn cutter 1 pneumatic holder with yarn guides
A 24 10 0 007	CB	9 set	**Main intermingling**	
			type	ceramic jet, including holder for intermingling jets and spray protection
			location	between the godets
A 24 10 0 010	CB	9 pcs	**Cold godet GR1**	
			type	GI33
			arrangement	S-formation
			mounting	fixed angle
			lubrication	grease
			coating	plasma coated
			cooling system	not required
			electrical connection	plug in type
			speed	max. 4000 m/min
			surface geometry	cylindrical
			outside diameter	85 mm
			length	45 mm
A 24 10 0 013	CB	9 pcs	**Cold godet GR2**	
			type	GI33
			arrangement	S-formation
			mounting	fixed angle
			lubrication	grease
			coating	plasma coated
			cooling system	not required
			electrical connection	plug in type
			speed	max. 4000 m/min
			surface geometry	cylindrical
			outside diameter	85 mm
			length	45 mm
A 24 10 0 016	CB	9 pcs	**Yarn break detector unit**	
			type	optical (contactless)
			location	mounted at the winding unit

M 24 10 0 019	CB	9 pcs	**Traverse motion system**	
			traverse type	birotor
			transfer tail	yes
			location of transfer tail	front
			traverse control	Helicont + RFR + SPW + wobbling
			contact pressure	adjustment via software
M 24 10 0 022	CB	9 pcs	**Bailer roll**	
			length	identical with bobbin chuck length
			surface of bailer roll	hard-chromium plated
			drive	electrically driven
			diameter	85 mm
M 24 10 0 025	CB	18 pcs	**Bobbin chuck**	
			electrical drive motor	1 per bobbin chuck
			brake	electrical
			design of tension elements	self tightening by means of spring and centrifugal force
			means of release	pneumatically
			tension elements	aluminium
			length	1500 mm
			diameter	110 mm
			mechanical package diameter	max. 440 mm
			nominal winding stroke	120 mm
			package volume	16,8 dm^3 at 440 mm mechanical package diameter and max. outer tube diameter
M 24 10 0 028	PC		**Paper tube**	
			design	according to Barmag drawing no. SP-0-1315
M 24 10 0 031	CB	9 pcs	**Initial string-up device**	
			function	automatic
M 24 10 0 034	CB	9 pcs	**Protection device for new bobbins**	
			location	automatically driven between the bobbin chucks during change-over
			function	avoids that loose yarn ends of the full bobbins are wound into the new bobbins
M 24 10 0 037	CB	9 pcs	**WINGS inverter system**	
			location	integrated at the rear of each winding unit
			inverter bobbin chuck	2 pcs each 18 A
			inverter chuck rotor	1 pcs 5 A
			inverter traverse motion	1 pcs 5 A
			inverter bailer roll	1 pcs 9 A
			inverter godets	2 pcs each 3 A
			kinetic buffering system	max. 500 msec (ramp down system)
			ambient temperature	max. 35 °C
			control unit	1 pcs Siemens Simotion/Sinamics®

26			**ELECTRIC**	
26 05 0			**Electric extruder**	
			consisting of	
E 26 05 0 001	CB	1 pcs	**Extruder control panel E10**	
			rpm / pressure control of AC-main	BELTRO-CONT®
			extruder cylinder temperature control	BELTRO-HEAT®
			heating actuator	solid state relay with heat sink
			inverter for extruder AC-main drive	make Siemens
			torque limitation	by electrical solution
			printer	for installation beside the panel or in a separate room
			recording function	provided via software, indication via GUIDE-PC
			interface for WinPCMS	not provided
			arrangement	recommended to be placed in air conditioned area
			cable inlet	from bottom
			air conditioning	via - filter in the door -air blower in the top of cabinet
			electric for filter	integrated
E 26 05 0 004	CB	1 pcs	**Control for dowtherm boiler**	
			location	integrated into the extruder control panel
			capacity	59,28 kW
E 26 05 0 007	PC	1 set	**Cabling**	
			layout	all cables in the extrusion area excluding data cabling (ProfiBus) according to barmag proposal
E 26 05 0 010	CB	1 pcs	**Buffering system for control voltage**	
			supply	24V control voltage out of battery rack
			location	extruder panel
			buffering time	max. 500 msec
E 26 05 0 013	CB	1 pcs	**Buffering system for drives**	
			type	kinetic buffering system
			principle	feeding to the inverter by means of the kinetic energy of the main drive
			system	controlled DC-bus voltage
			buffering time	max. 500 msec.

E 26 05 0 016	CB	1 func.	**Graphical machine control**	
			layout	visualisation of setpoints, current values and error messages as well as settings of machine parameters via GUIDE-PC. Maximum flexibility is achieved.
			type	BELTRO-GUIDE for extrusion (Graphical User Interface and Data Evaluation)
			operation	via colour screen menus in Windows environment
			indication	values are displayed in extruder and component graphics. Wording in english characters
			service	Barmag support by telediagnostic service via modem is possible
			improved disturbance diagnostics	an improved diagnostic system contributes to a better evaluation and faster localisation of disturbances, leading a reduction of maintenance times
26 10 0			**Machine control type WINGS machine electric**	
			consisting of	
E 26 10 0 001	CB	1 pcs	**GUIDE-PC**	
			type	GUIDE (Graphical User Interface and Data Evaluation)
			arrangement	to be placed in a separate room
			printer	included
E 26 10 0 004	CB	1 func.	**Graphical machine control**	
			layout	visualisation of setpoints, actual values and error messages as well as settings of machine parameters via GUIDE-PC. Maximum flexibility is achieved.
			type	GUIDE for extrusion, spinning and take-up machine (Graphical User Interface and Data Evaluation)
			operation	via colour screen menus in Windows environment
			indication	values are displayed in and component graphics. Wording in characters
			improved disturbance diagnostics	an improved diagnostic system contributes to a better evaluation and faster localisation of disturbances, leading a reduction of maintenance times
E 26 10 0 007	CB	1 func.	**GUIDE functions statistics and reports**	
			design	software functions - yarn break statistics - position efficiency - package size statistics - production report
			operation	via GUIDE

E 26 10 0 010	CB	1 set	**Electrical control panels with DC-bus**	
			content	- main switch - central control unit - I/O remotes - relays - chopper - line reactor - DC-supply - DC-DC converters - fuses
			type of control unit	- Siemens Simotion/Sinamics® - control and computer system with a special program (not subject to modifications by purchaser)
			cable inlet	from bottom
			location	next to the machine
E 26 10 0 013	CB	1 pcs	**Compressed air supervision box**	
			location	next to the machine
			content	- manometers for main pressure - manometers for operation pressure - all instruments with supervision contacts
			cable inlet	from bottom
E 26 10 0 016	CB	1 pcs	**Buffering system for control voltage**	
			supply	kinetic energy out of a. m. buffering system DC-DC converters are generating the 24 V control voltage
			location	DC-DC converters are part of each DC bus panel
			buffering time (max.)	500 msec.
E 26 10 0 019	CB	1 pcs	**Buffering system for drives**	
			type	kinetic buffering system
			principle	feeding by means of the kinetic energy of all drives, distribution via the common DC-bus
			system	ramp down system
			layout	common supply, all drives of are buffered
			buffering time	max. 500 msec.
E 26 10 0 022	CB	4 pcs	**Terminal boxes for data and power cabling**	
			location	next to the winding unit
E 26 10 0 025	CB	1 pcs	**EVO control box**	
			location	on quenching area
			ambient temperature	max. 40 °C
E 26 10 0 028	CB	1 set	**Inverter cabinet for spinning pump drives**	
			type of inverter	single inverter operation via GUIDE
			arrangement	mounted in cabinet
			ambient temperature	max. 35 °C
E 26 10 0 031	PC	1 set	**Cabling power supply**	
			according to Barmag proposal	to the feeding point of the machine

E 26 10 0 034	CB	1 set	**Cabling**	
			included	- from winding unit to terminal box - from winding unit to godet - all data cables
			not included	all other cables (Purchaser supply), list of needed cables will be handed over during design conference
E 26 10 0 037	CB	4 pcs	**Push button boxes quenching area**	
			usage	- start/stop of spinning and spin-finish pumps - signalling between take-up and quenching area
			location	on quenching area

27			**ACCESSORIES SPINNING / TAKE UP**	
27 41 0			**Set of special tools and accessories extrusion**	
Y 27 41 0 001	CB	1 pcs	**Screw push out device**	
			for screw diameter 90 mm	provided
Y 27 42 0 001	CB	1 pcs	**Toolkit for filter**	
			comprising	- tools for cleaning - set of special tools
F 27 42 0 004	CB	1 pcs	**Bypass insert for polymer filter**	
			operation	to be installed in the filter instead of the filter insert for start up and operation without filtration
			melt flow	inside the filter insert through a pipe, without filtration
			material	stainless steel for melt contacting parts
27 43 0			**Set of special tools and accessories spinning**	
Y 27 43 0 001	CB	1 set	**Toolkit for spinning equipment**	
			consisting of	
			- flushing valves for spinning pumps - toolkit for spin pack as described above - standard toolkit car - toolkit for measuring points - wrench for spinning head filling pieces - hook wrench for shear pin coupling	
Y 27 43 0 004	CB	1 pcs	**Air pressure measuring instrument**	
			design	hand held measuring instrument with air hose
			usage	pressure drop test of screen cylinders
Y 27 43 0 007	CB	1 pcs	**Screen cylinder test stand**	
			design	testing device for screen cylinders with pressure reducer and flowmeter
			usage	pressure drop test and adjustment of screen cylinders
27 45 0			**Set of special tools and accessories take up**	
Y 27 45 0 001	CB	1 pcs	**Tool car**	
			usage	assembly/disassembly of take up machine
Y 27 46 0 001	CB	1 pcs	**Yarn suction gun**	
			suction gun type	CHS5
			supports for yarn suction gun	not provided
			compressed air hose	7 meters, connecting elements not provided
			waste hose	7 meters, connecting elements not provided
Y 27 46 0 004	CB	1 pcs	**Winding unit mounting car**	
			usage for	- fitting the winding unit into the machine - transport
			operation	manual

Y 27 47 0 001	CB	1 pcs	**Toolkit no.1 for WINGS winding unit**	
			disassembly/assembly tools for	birotor gear
			adjustment tools for	- thread guide system - yarn catching lock - birotor wings
			measuring devices for	contact pressure
Y 27 48 0 001	CB	1 func.	**WINGS winding unit inline test (software function)**	
			use for	test of WINGS winding unit functions at one position of the winding machine
			operation	via operating panel of winding unit
			winder test procedure	different test modes for interactive testing
			check of	- single functions of electrical drives - single functions of other actuators - teaching of rotor

28 **EXCHANGEABLE & CONSUMPTION MATERIAL**

Y 28 03 0 001	CB	60 pcs	**Spinnerets**	
			design	round shaped outer dimensions
			cross section of bore holes	round shaped profile
			no. of bore holes	144 (2 x 72)
			diameter	104 mm
Y 28 03 0 002	CB	15 pcs	**Spinnerets**	
			design	round shaped outer dimensions
			cross section of bore holes	round shaped profile
			no. of bore holes	216 (2 x 108)
			diameter	104 mm
Y 28 03 0 003	CB	15 pcs	**Spinnerets**	
			design	round shaped outer dimensions
			cross section of bore holes	round shaped profile
			no. of bore holes	288 (2 x 144)
			diameter	104 mm

Appendix II

Exclusions from Delivery and Services

05 Exclusions from delivery and services

In the following CONTRACTOR outlines some of supplies and corresponding services which are not included in the contractual scope of supplies and services as specified in Appendix I Rev. 1. This list is not exclusive and shall be understood as a list of mere examples. Only the scope of supplies and services as listed in Appendix I and II and therein not marked with CC, P, PC, PE or O is binding.

05 1 Engineering

PURCHASER shall design and engineer all plant and equipment not covered by CONTRACTOR's scope whether inside or outside battery limits, e.g.

- civil detail engineering
  civil statical calculation
- detailed design of "P" supplies
- design of energy plants such as recooling, raw water feeding, nitrogen supply
- design of furniture for laboratories
- detail engineering of steel structures including statical calculation
- design of elevators, cranes, hoisting equipment
- design of floors, pits, ducts, cable ducts, pipe trenches, drains on the floors including cover plates, grating, etc.
- design of sewerage and drains, floor drainage, feed and drainage of potable water
- fire fighting and extinguishing systems
- sanitary installations and equipment
- workshops
- room heating or venting, air conditioning of offices
- protective coating and finish painting
- offices and staff rooms, furniture
- design of indoor and outdoor lighting systems
  design of earthing and lightning protection systems
- design of intercommunication-, alarm- and signalling systems
- design of all electrical HV and LV feeding and distribution equipment(including all feeding and control cables) down to the incoming terminals of motor control centres and other LV subdistribution boards
- design of emergency power supply and distribution

05 2 Equipment

05 2 1 Civil engineering and building works

- excavation and civil engineering works, e.g. foundation, sewage system, rail and road construction
- buildings such as production rooms, rooms for auxiliary plants, repair workshops, staff rooms and offices, all social and sanitary facilities
- air conditioning equipment for offices and social rooms
- ventilation and exhaust systems
- room heating equipment

05 2 2 Auxiliary plants

- laboratories
- balancing equipment
- sewage and waste treatment
- workshops and workshop equipment
- office furniture
- furniture including sinks, fittings and pipes for chemical and textile laboratory

05 2 3 Energy and utility plants

production and / or cleaning of energies and utilities, i.e.:

- water recooling and / or supply of city water
- waste water draining and treatment facilities
- chilled water system
- steam boiler
- nitrogen generation / purification
- electrical power supply
- discharge and waste storage and disposal
- complete air conditioning system and air supplies with ducts, pipes etc.
- complete compressed air system and piping to the connecting points
- all engineering services for the above-mentioned items

05 2 4 General equipment

- spin finish system at the winding machine
- bending of the yarn waste tubes, our scope of contract comprises standard length straight pipes and a pipe bending device
- waste boxes
- maintenance equipment and workshop for maintenance and repair, except special tools, gauges and devices particularly mentioned in this contract

  tables, balances, etc. (unless specified in Appendix I Rev. 1)
- winder and godet test stand
- balancing machine incl. necessary guides and brackets
- all laboratory equipment
- all transport and lifting equipment (unless specified in Appendix I Rev. 1)
- set of original parts as spare parts
- equipment for sorting, packing and weighing of semi-finished and finished products, i.g. sorting cars for transportation of intermediate products
- consumables, such as paper tubes, etc.
- operating mediums, such as lubrication oil, lubrication grease, spin-finish oil, etc.

05 2 5 Steel structures

- steel structures, i.e. operating platforms, stairways, ladders, railings and protection devices, supporting frames for machinery
- all rails in the winding floor
- pipe holders and pipe bridge material

- cable tray material for main power supply

05 2 6 Piping and fittings

- pipes, fittings and armatures outside battery limit
- pipe supports and pipe holders inside and outside battery limit, pipe bridges
- pipes, fittings, armatures, pipe supports and pipe holders in connection with sanitary installation, room heating equipment and fire fighting

05 2 7 Electrical equipment

- electrical energy generation, high voltage switchboards, low voltage main switchboards, power transformers, power factor compensation equipment, feeder to main distribution boards, power cables to the motor control centres
- lighting and emergency lighting equipment
- communication equipment, telephone-, loudspeaker-, electric clock-installations
- lightning protection and grounding equipment
- cables outside the machines, as far as necessary, as well as cable trays
- cable trays for spinning electric
- holder for cable trays
- base plates for central control panel and DC energy supply panels
- power supply and main power distribution to the machines
- pre transformer in case of supply voltages other than 3-phase, 380 - 415 V
- electric buffering systems
- spinning signal equipment
- single wire coding
- emergency power equipment

05 2 8 Instrumentation and control equipment

- all measuring devices (e.g. supply meters) for energies and utilities as well as the subsequent treatment of corresponding signals
- process control system and all interfaces and software for the adaptation of such a system
- label printing
- yarn break statistics

05 2 9 Auxiliary, starting and operating materials

- auxiliary and operating materials and first fillings such as chips, spin finish, heat transfer medium, solvents, greasing agents, etc., unless specified in Appendix I Rev. 1
- chemicals and glassware for laboratories
- all packing materials

05 2 10 Insulation materials and protective painting

- insulation materials, paint finish, unless specified in Appendix I Rev. 1

05 2 11 Protective equipment

- safety equipment, fire alarm system, fire extinguishing and fire fighting equipment

05 2 12 Erection, start-up and training

- training at customers site - on request a separate quotation can be forwarded

Appendix III

General Technical Basis

GENERAL TECHNICAL BASIS

Specification of utilities (for PET products)

Electric power supply

Rated voltage:	3 x 380 [400, 415] V; AC - PE and loadable neutral line
Voltage variation:	max. ±10%
Control voltage:	24 V DC
Frequency:	50 [60] cps
Frequency variation:	± 1%; short term ± 2%

Deviating supply voltages and power tolerances require a pre transformer. The equipment is not tropic-proofed and is designed for operation below 1.000 m above sea level. Higher altitudes lead to load reductions.

Air conditions (for PET products)

	temperature	rel. humidity	Filtration quality	Exhaust temp.
Quenching air	**20 - 23**[1] ± 0,5°C	**70 - 90**[1] ± 3,0% r.h.	F9 (DIN EN779)	
Air for take-up	**20 - 24**[1] ± 1,0°C	**50 - 75**[1] ± 3,0% r.h.	F7 (DIN EN779)	≤ 32°C

[1] **a fixed setting out of the given ranges needs to be selected**

Ambient temperature for static inverters and operator stations have to be stable and a max. of 35°C must not be exceeded. Depending on the equipment and the rate of utilisation this value has to be slightly corrected. For the BELTRO WIS system the max. ambient temperature is +25°C when the winders are equipped with motor drivon idler rolls and when running speeds above 4.500 m/min.The relative humidity must be less than 75%, reference temperature <= 40°C. For dowtherm boilers the max. ambient temperature is limited to 40°C.

Compressed air for hand held aspirator

Pressure for hand held aspirator (at aspirator, valve opened):

• FDY	≥ 12 bar mandatory
• POY ≤ 300 den	≥ 9 bar ≤ 14 bar depending on product
• POY > 300 den	> 14 bar mandatory
Dew point	≤ + 14°C
Temperature	ambient ≥ 16°C / ≤ 30°C

Compressed air for intermingling, winder, pneumatic controls and stationary aspirator

Pressure gauge (at using point)	≥ 6 ≤ 8 bar
Dew point	≤ + 4°C
Temperature	ambient ≥ 16°C / ≤ 30°C
Conditions	free of oil (< 1 mg/m³) and solid particles (≤ 20 mg/m³, particle size < 40 µm)

The equipment is generally designed for **compressed air connection** at a constant operating pressure of 6 bar. If the limit value of 8 bar pressure is exceeded in Purchaser's plant, reduction valves have to be provided by Purchaser.

Cooling water / industrial water (for cooling of extruder feeding mouth / extruder gear box)

(Temperature figures do not apply for E11 type extruders. Refer to E11 instructions!)

Pressure gauge (at floor 0,0 m)	≥ 0,5 < 9,0 bar
Temperature (supply)	≥ 2°C ≤ 30°C
Temperature (return)	not higher than supply temperature + 5°C or ≤ 38°C
Total hardness	within 8 - 14°DCH (German carbonat hardness); particle free

Nitrogen for use at extruder feeding mouth (if applied)

Purity	≥ 99.999%
Pressure	≤ 100 mm water column
Quantity	refer to extruder manual

To avoid corrosion, slime and deposit problems caused by micro biological growth the cooling water system should be treated with corrosion inhibitors and microbiocides

The before mentioned values shall be taken as an indication. The values have to be defined exactly during design conference.

Standards

The equipment, including the pressure devices, has been **designed, manufactured and tested** according to applicable standards (VDE, EN, IEC, PED (Pressure Equipment Directive) 97/23/EG or GB). This also applies to all flange connections of pipe work. Welding seams at melt guiding pipes have to be carried out according to WN 1456-1.

The PURCHASER shall accept the sole responsibility for the defect-free nature including the testing of the permanent material connections of the components to be delivered by CONTRACTOR and produced by the PURCHASER itself or produced on behalf of the PURCHASER. The connecting of the pressure equipment (in terms of the EG Pressure Equipment Directive) shall be undertaken by the PURCHASER or its agent in accordance with the national or local regulations applicable at the place of assembly or operation. The PURCHASER shall itself be responsible for compliance with such regulations. The same shall also apply to requirements in relation to welding and testing control and the qualification of the welders as well as the testers of the permanent material connections to be produced by the PURCHASER.

Protection class for control cabinet and operator stations is as a minimum IP54 according to VDE 0470-part 1 (= EN 60529 = IEC 529), which means that the components are protected against solid particles of 1,0 mm diameter as well as against shower water.

Protection class of motors is minimum IP44 according to VDE0530-part 5 (= EN60034-part 5 = IEC34-part 5). This covers protection against solid particles of 1,0 mm diameter as well as against shower water.

Protection class of motors in winders is IP44, which means that the motors are protected against solid particles of 1,0 mm diameter as well as against shower water.

The **electronics** are **designed** in accordance with the European standard EN60721-3-3/ climatic environmental conditions class 3K3. This means particularly that no moisture is allowed on the electronic components during operation. This requirement also applies to the shutdown and start-up conditions of the air conditioning system.

Documentation

The Barmag scope of supply is comprising the following documentation, 1 set as printed paper and 2 CD-ROM:

--> main dimension plans of complete machines

--> operation instructions with safety instructions

--> service books with information for

a) restart / adjustment b) operation

c) operation disturbances d) machine service

--> original parts catalogue with user guide system

The entire documentation is forwarded bilingual, i.e. in German and English language.

Yarn production know how

For the yarn production with the above mentioned machinery, a certain know-how and technology are necessary. Neither is supplied by Barmag.

Miscellaneous

Components of non-CONTRACTOR origin and components produced in CONTRACTOR's global net work correspond to Barmag quality standards.

Unless otherwise stipulated in the contract, any performance data given in the quotation, in the order confirmation, in the correspondence or any other document refer to the specific component and not to the process. By giving these data, the CONTRACTOR does not guarantee, that these data can be achieved in a process for the product.