

# EXTRUSION CROSS HEADS FOR CABLE'S INSULATION AND SHEATH



# CROSS HEADS FOR THE CABLE INDUSTRY

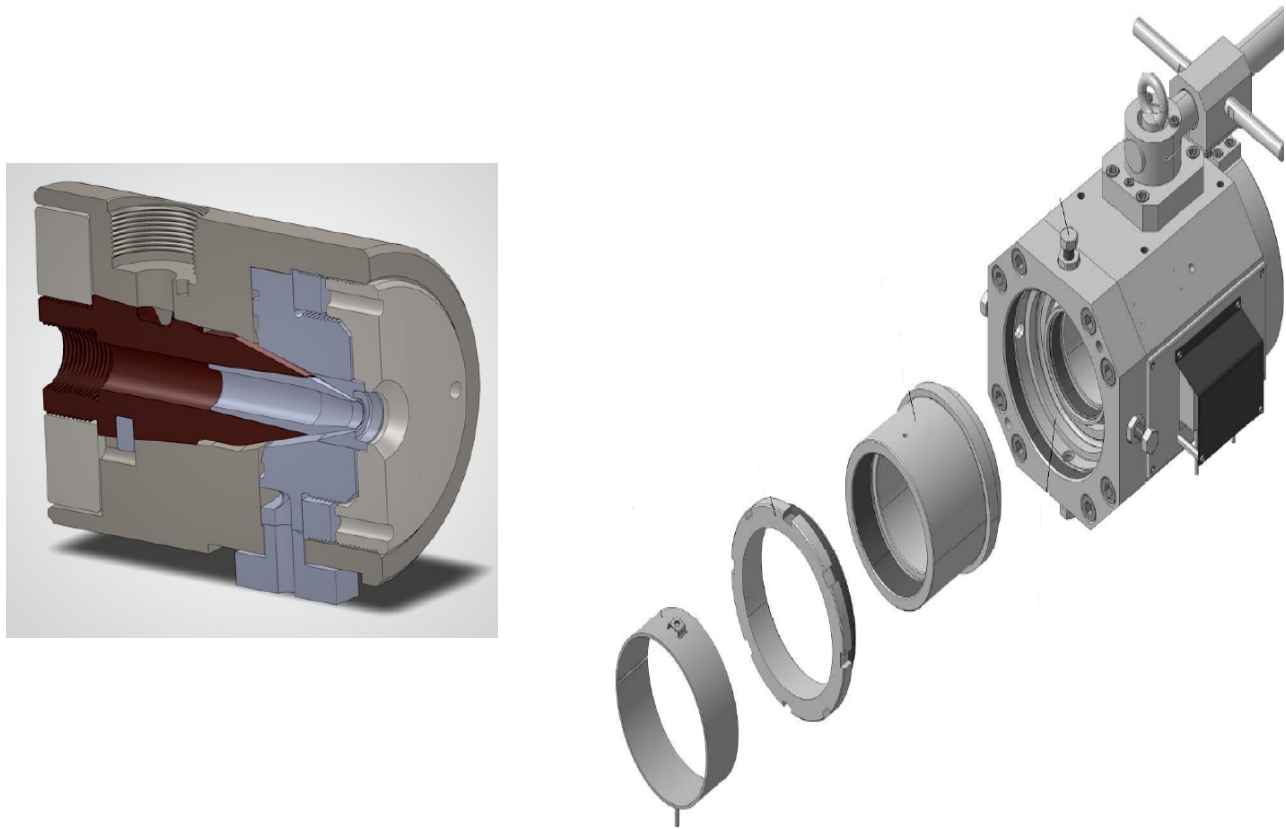
The extrusion head is the processing tool that shapes the extruded i.e. the tool that determines shape, properties, structures and dimensions of the extruded as well as mutual position of the elements in the extrusion process . We measure customer satisfaction by increased productivity.

The ALCHEMIX crosshead controls and defines every aspect of the quality of your product and can determine the output of your extrusion line.

Being aware of its responsibilities, ALCHEMIX is staffed by expert specialists whose experience and know-how are at the entire disposal of our customers.

Our services are your advantage:

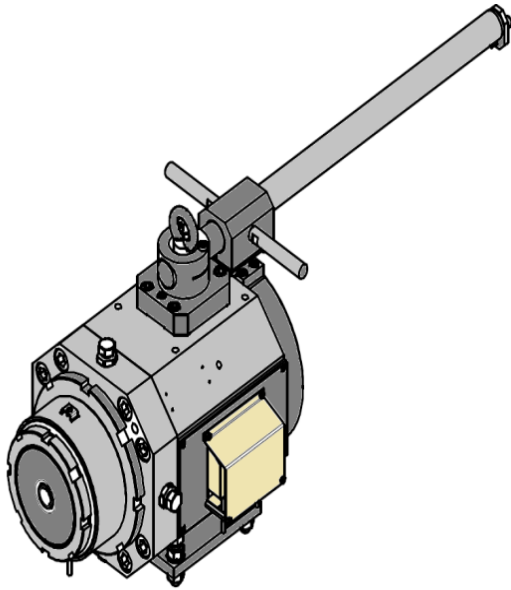
- Research & Development
- Analysis & Upgrading
- Close project follow-up
- Technical assistance & Commissioning
- Training



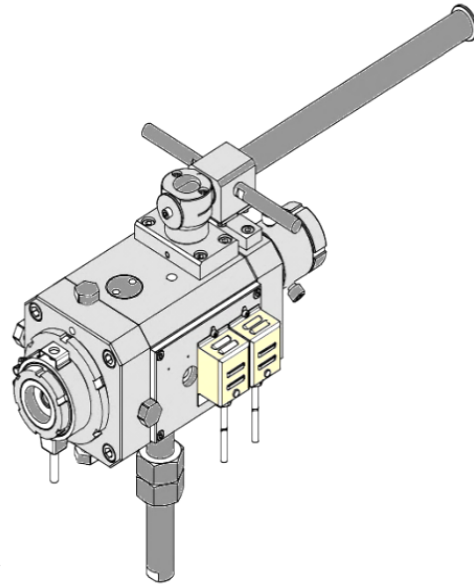
ALCHEMIX's Crosshead Series is designed to meet the needs and requirements for different types of cables and fits every Extrusion Line. The Series comprises of Crossheads for extruding cables from 1 mm core diameter to 120 mm core diameter.

The design of the Crosshead and the Distributor provides highest product quality with highest output. The verified design concept allows a homogeneous material flow and high centricity. Small Crosshead volume for quick and flexible product change. Ease in handling is guaranteed.

# MOST COMMON CROSS HEADS IN CABLE INDUSTRY



**SINGLE LAYER**  
HEAD(K-SL-XX)



**DOUBLE LAYER**  
CROSSHEAD(K-DLS-XX)



**SINGLE LAYER**  
**CROSSHEAD(K-SL-XX)**

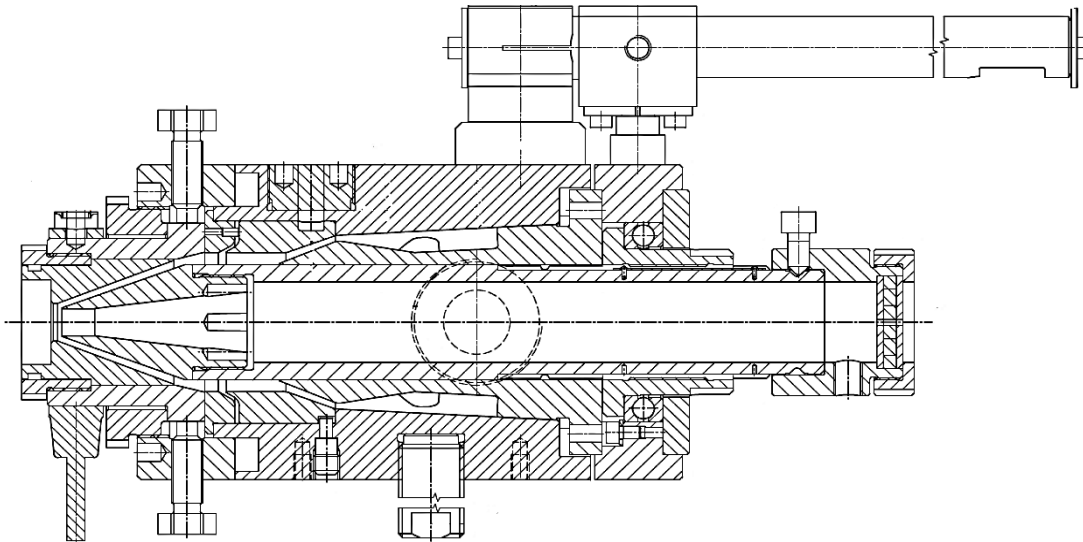
Model	Min inlet Dia (mm)	Max inlet Dia (mm)
K-SL-60	1	12
K-SL-90	4	40
K-SL-120	5	55
K-SL-150	10	120

**DOUBLE LAYER**  
**CROSSHEAD(K-DLS-XX)**

Model	Min inlet Dia (mm)	Max inlet Dia (mm)
K-DSL-60	0.5	10
K-DSL-90	2	25
K-DSL-120	4	36
K-DSL-150	6	50

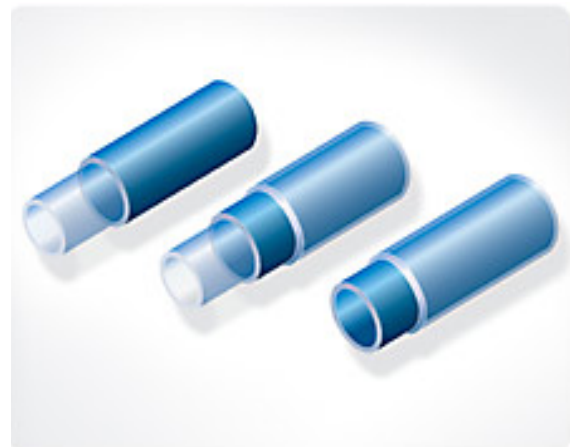
All of above models are capable of extrusion of PVC, PE, XLPE materials. For extrusion of HFFR, it is possible just to provide special cartridge. Other similar types and sizes could be manufactured by customer special order.

# CROSS HEAD FOR SKIN EXTRUSION OF DOUBLE LAYER



## Advantages of Skin application In extrusion of Insulation

1. \* Saving both in time and wasted material in extrusion process due to change of colored material inside the extruder barrel.
2. \* Saving in using masterbatch (about 90%) by using it just in Skin layer and therefore increasing insulation resistance due to more natural insulation.
3. \* Saving energy in extrusion line due to changing the material's color and Line Setup.





## CARTRIDGE AND OTHER TOOLS REQUIRED FOR EXTRUSION



We manufacture all types of cartridges  
for PVC, PE, XLPE, HFFR,



Breaker Plates

**In all requested sizes (for both skin and strip extrusion)**



# DIE AND WIRE-GUIDE REQUIRED TOOLS FOR EXTRUSION

**ALCHEMIX extrusion dies** are made from:

Hardened steel, Tungsten carbide.

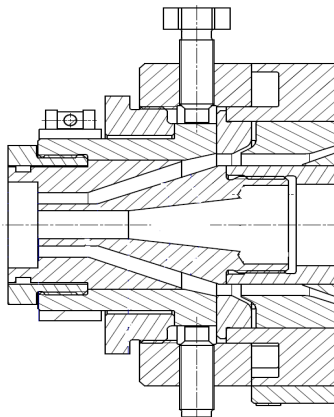
These are manufactured to fit any type of crosshead used in the wire and cable industry. Their use guarantees a high quality of the insulated conductor.

The performance of our products is guaranteed by optimal tooling design, which always takes into account the insulating material being extruded. Being aware of high insulation quality required by our customers, we have the tightest tolerances and a mirror polished surface finish which is second to none.

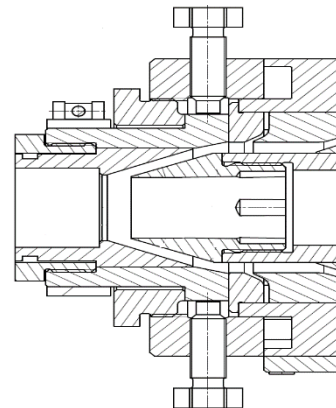
**ALCHEMIX wire-guides** are made from:

Hardened steel, Tungsten carbide,

Hardened steel body with tungsten carbide insert or Hardened steel body with diamond insert. These have been developed to meet the highest demands of the wire and cable industry. Our wire-guides with tungsten carbide or synthetic inserts are provided with a hardened steel body into which the inserts are solidly fixed. A special centering process guarantees to keep the stone in position under the most difficult circumstances and results in a long life of our products.



**TUBING  
TYPE**



**PRESSURE  
TYPE**



## Different Die and Nipple (For both skin and strip extrusion)

PREV



## VERTICAL / HORIZONTAL CO-EXTRUDERS FOR SKIN APPLICATION

We can manufacture (or provide) small extruders for co-extrusion of skin layer, compatible with provided cross-head (in sizes 30, 45, 60 by order) in vertical or horizontal types ...



# CROSS-HEAD QUESTIONNAIRE

## COMPANY DATA

- Your REF. : -----
- Company name: -----
- Mrs./Mr.: -----
- Phone : ----- Fax: ----- mail: -----

## Product details

- Conductor Ø: min: -----mm max: -----mm
- Conductor type: ☐ solid ☐ stranded
- Insulation o.Ø: min: -----mm max : -----mm
- Intended production speed: min: -----m/min max:-----m/min

## Production details

- ☐ fixed centered ☐ manually centered
- Single extrusion :
  - distance between extruder adaptor&wire center -----mm
- Co- extrusion :
  - skin extrusion ☐
  - foam skin ☐
  - special skin ☐
  - Layer thickness : -----mm
  - stripe extrusion ☐
  - No. of stripes -----
  - Width of each stripes -----%
- working direction ☐ left →right ☐ right →left
- tooling type ☐ compression ☐ tubing
- extruder specification:
  - main extruder screw Ø -----output -----kg/h
  - secondary extruder screw Ø -----output -----kg/h

## CROSS-HEAD: STANDARD OF DELIVERY

**For a Cross-head, we normally include following items as standard:**

1 Head body with two independent heating zones: head body / die

1 Distributor mono flow PE/XLPE/PVC

1 Sealing collet for mono-extrusion

1 Collet for skin 100%

1 Manual centering adjustment

1 Vacuum plug

1 Assembling/dismantling/cleaning tooling set

1 Operating instructions

1 Head support

1 Connecting heated flange for main extruder

1 Connecting heated flange for auxiliary extruder

1 Set of tubing tools in hardened steel

### **Option (by customer selection and Order):**

Manual bypass module with extractor

Semi-compression Wire-guide in hardened steel

Semi-compression Die in hardened steel

Commissioning: for 2 working days plus 2 days travelling, air flight tickets lodging and boarding to customer's account.

Wire-guide holder with gum space adjustment from the cross-head back

Distributor support for easy and quick dismantling

Distributor for HFFR, PA

Collet for 1 stripe --- Breaker plates on request -----

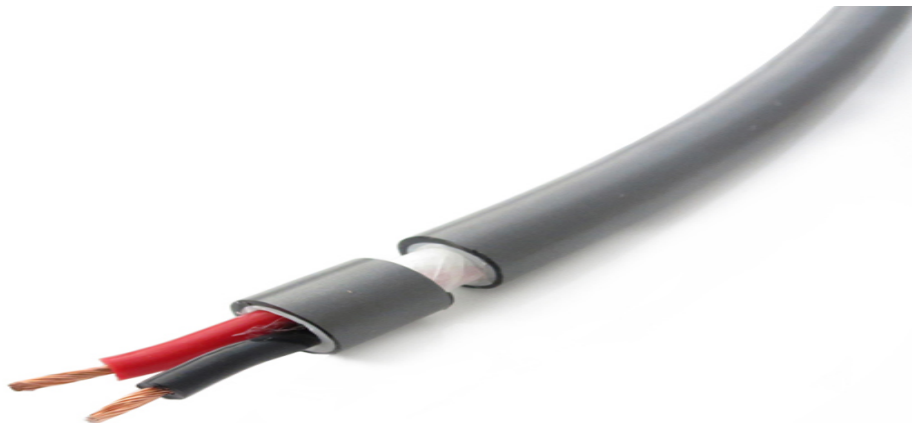
## COST SAVING OF SKIN EXTRUSION IN INSULATION OF CABLES

Here are our investigations about savings by using **Skin** extrusion comparing to whole colored insulation.

The major Savings are concentrated on:

- 1) Reduction of used color masterbatch.
  - 2) Reduction of waste material due to color exchange.
  - 3) Reduction of electricity consumption on color change.
  - 4) (hidden advantage) Reduction of over consumption by using more precise extrusion toolings.
- Note: the line speed does not change either by using mono head or dual head.

For comparison purposes only medium to big size conductors (bigger than 10 mm<sup>2</sup>), extruder (size 120) with skin extruder (size 30) are used.





There are following assumptions used in the calculations too:

- 1) The skin thickness (in proposed tooling) is about 0.1 to 0.2 mm (I considered worst case ; 0.2 mm)
- 2) Masterbatch consumption according to catalogues is 1 to 3 % (I have considered 1.5 %)
- 3) Masterbatch price depends on color (the cheapest is black and most expensive orange ; (average that makes 4.5 USD/kg)
- 4) For XLPE (used in LV cables) IEC 60502-1 is used as a standard of reference. Conductors are all class 2 and from 35 mm<sup>2</sup> and above are compressed.
- 5) XLPE price 2.35 USD/kg.
- 6) Electricity cost is 0.1 USD/KWH.
- 7) The 120 extruder has power consumption on its main motor and heaters (that should work continuously during normal operation and color changing time) is 150 KW and volume of inside barrel excluding screw is 30 kg and required time for color exchange is 1 hour comparing to vertical skin extruder size 30 that is 15 kW , 2.5 kg and 10 minutes respectively.

\* Normally for power cables we use 4 different colors (old BSI standard or new EN/IEC/BSI standard). So for a normal Production we will have 2 times of color exchange for each individual product (like 3x150/70 or 4x35 or ....).

- 8) Waste of insulation material and number of color changing in working shifts and days of operations highly is dependent to skills and art of production planning department of the factory and order length of cables vs various type and size of cables (the lower various types and higher production length gives lower waste in general).

A real example is a cable factory receiving different orders, (Kavian cable) which gives real measures of production and waste materials.

Following table is based on IEC 60502-1 (most common international standard for LV cables) and one year of Kavian Cable factory for production of LV insulated cables (in all manners , round core , sector shaped , ....)

Conductor Cross section Area	Insulation Total Thickness mm	(According to Kavian Cable Records)		Master-batch saving on Skin
		Production over half a year (meter)	Number of Productions	
mm <sup>2</sup>	(IEC 60502- 1)	meter	Numbers	kg/kM
<b>16</b>	0.7	447,767	135	0.19
<b>25</b>	0.9	231,593	118	0.22
<b>35</b>	0.9	160,583	100	0.24
<b>50</b>	1.0	146,151	145	0.32
<b>70</b>	1.1	100,940	110	0.43
<b>95</b>	1.1	71,391	84	0.49
<b>120</b>	1.2	99,937	81	0.62
<b>150</b>	1.4	61,742	50	0.83
<b>185</b>	1.6	55,115	38	1.08
<b>240</b>	1.7	62,162	49	1.32
<b>300</b>	1.8	89,968	46	1.56
<b>400</b>	2.0	3,797	4	1.97
<b>500</b>	2.2	400	1	2.48

## CONCLUSION

So, in the above table summary of 6 month operation of extruder 120 for insulation of XLPE cables from 16 mm<sup>2</sup> to 500 mm<sup>2</sup> (it makes 1,531,546 meter insulated wires) results are as following:

- A) Saved master batch 1400 Kg/year making 6300 USD/year.
- B) Saved XLPE due to color change in smaller extruder about 10 tone/year, making 24,000 USD/year.
- C) Saved electrical energy in quicker way and in smaller extruder 22000 KWH/year making 4300 USD/year.
- D) Precise tooling = Precise sizing. No extra material cost (hidden and not included in this calculation).