TELEDATANET
EXPERIENCE INNOVATION

KLEIN TOOLS EST. 1857

CBS PRODUCTS
Leaders in Advanced Cable Installation Equipment

Fibre Cable Migration to underground - challenges and solutions

Factors Influencing Installation Process

- Local conditions
- Local climate
- Customer’s existing procedures
- Customer’s requirements

Pulling Method vs Blowing Method

Pulling Method:

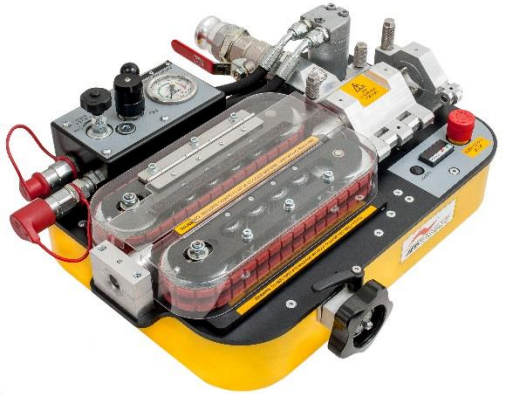
- Pulling rope pre-installed
- Equipment and man power at both sides
- High sidewall forces on cables and ducts may lead to cable damaged
- Manual pulling or machine pulling via a winch depending on installation situation
- Mainly used for short duct lengths
- Used for short distance, few 100m installations

Blowing Method:

- No pulling rope to install
- Equipment and man power at one side
- Forces on cable and duct can be monitored and controlled for minimal chance of cable damage
- Pushing force and Air Volume will depend on installation situation
- Preferred method for duct route with multiple bends and undulations

Preferred Method: Blowing

- Savings in man power
- Faster installation times
- Improved installation efficiency – particularly in long ducts with multiple bends
- Reduced force on the cable

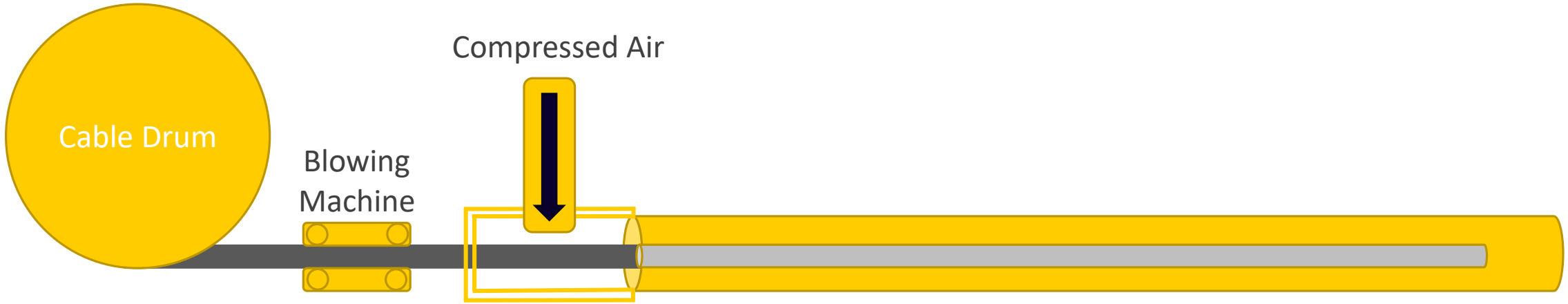


Blowing Method

- Installs cables by using high speed air flow combined with additional mechanical pushing force
- Compressed air is injected into the duct inlet after a few hundred metres of cable is pushed in
- Compressed air flows through the duct and along the cable
- Viscous drag enables the cable to flow along the duct to the required installation point
- Minimal force is applied to the cable during installation
- Can be used to install: Standard optical fibre cables, micro-duct cables, and micro-ducts
- Possible to install continuous lengths of more than 1000m

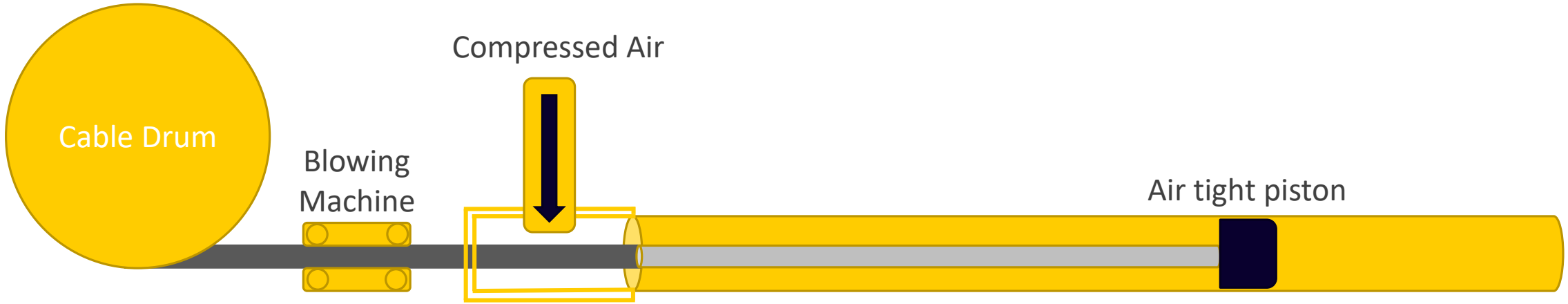
Method 1: High Air Speed Blowing

- Requires pushing the cable with machine for a few hundred metres
- Pressure and volume will depend on the duct and fibre sizes
- Air creates Viscous drag, keeping the cable in a floating condition
- Reduces friction between cable and the duct bore by reducing the contact area



Method 2: Push/Pull (Piston) Blowing

- Piston is attached to the front of the cable
- Air pushes the piston, and the piston pulls the cable
- Pulling force exists in the piston blowing and should not exceed maximum cable tension
- Preferred for larger size ducts – 32/40mm and 42/50mm
- Straight ducts achieve longer cable blowing distance



Blowing Method Key Parameters

- Duct Fill Ration – cable to duct size ratio
- Coefficient of friction – between cable outer surface and duct inner wall
- Cable stiffness – related to cable flexibility and undulations in duct route

Duct Fill Ration (DFR) Calculation Methods

a) Using the ratio between cross section area of the cable, and the inner bore of the duct/pipe:

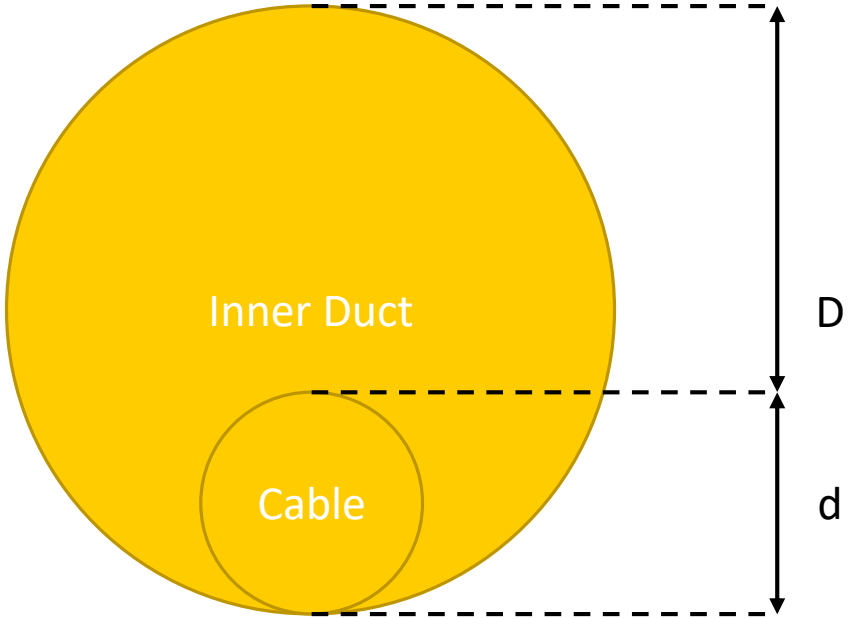
$$DRF = \frac{d^2}{D^2} \times 100$$

Where d = cable diameter, and D = duct/pipe bore

b) Ratio between cable diameter and duct inner diameter:

$$DRF = \frac{d}{D} \times 100$$

Where d = cable diameter, and D = duct/pipe bore



Optimal DFR for Blowing Performance

For optimum blowing performance keep DFR between 30% and 80%:

- Conventional cable of diameter 1-9mm: 30-50%
- Micro cable of diameter 1-9mm: 30-80%

Advantages of Higher DFR:

- Achieve longer blowing distances with straight routes
- Prevents cable buckling effect

Disadvantages of Higher DFR:

- Shorter blowing distance in routes with multiple bends

Coefficient of Friction

Termed as the drag force generated during cable blowing caused by the contact between cable and duct inner wall

CoF mainly depends on:

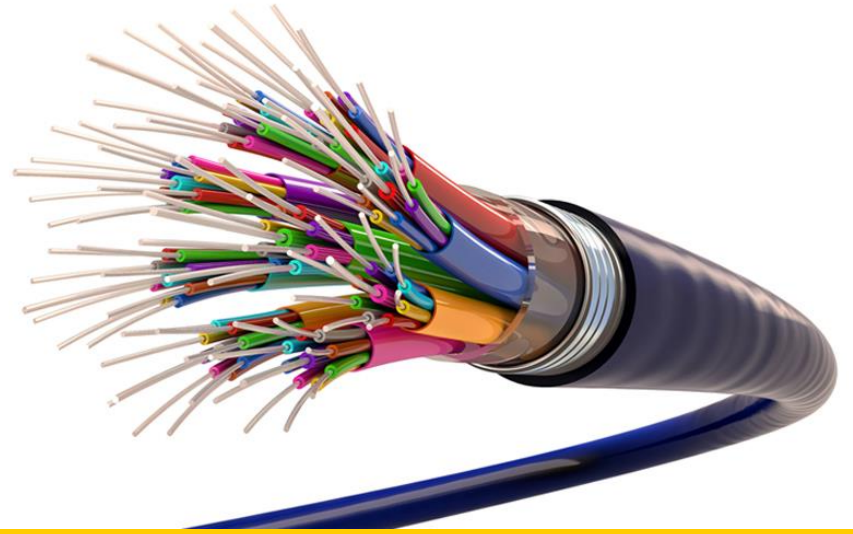
- Elevation
- Bending in duct route
- Undulations in duct
- Properties of cable outer jacket material, and Duct bored finish and material
- Generally stiffer materials provide better blowing results

Methods to Reduce CoF

Component	Parameter/Characteristics	Method to Reduce CoF
Cable	Weight, stiffness, and construction	Use of material with low stiffness
Duct	Material, construction, and design	Use high quality duct, inner surface – smooth or ribbed, use low friction lining pre-lubed
Duct Route	Straightness, number of bends, bend radii, elevations, and cleanliness	Straight laying of duct with no deformations or kinks, maintain minimum bend diameter >30x outer cable diameter – or as specified
Blowing Equipment	Temperature of compressed air, and presence of moisture in air	Use aftercooler and water separator in warm and humid conditions
Lubricant	Quality and quantity, Method of application	Should not react with cable outer sheath, apply right quantity by sponge. Do not use soap, water, oil etc.

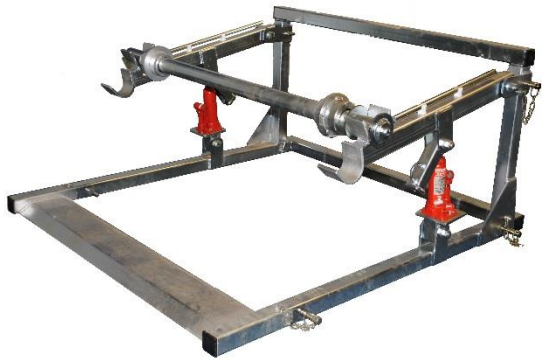
Cable Stiffness or Flexibility

- Stiffness depends on cable construction, i.e. metallic or non-metallic
- Stiffer cable can achieve more blowing distance in straight ducts
- Flexible cable can achieve more blowing distance in difficult trajectory or routes with multiple bends
- Stiffer cable is preferred due to fast blowing through undulations, and avoids buckling of the cable inside ducts



Cable Drum Pay Off

- Highly important to ensure cable is smoothly pushed inside the duct
- Always recommended to use cable reel pay off during cable installation
- Cable drum should be kept level to avoid the cable rubbing against the flange of drum
- Cable pay out should be from top of drum to avoid contact with the ground

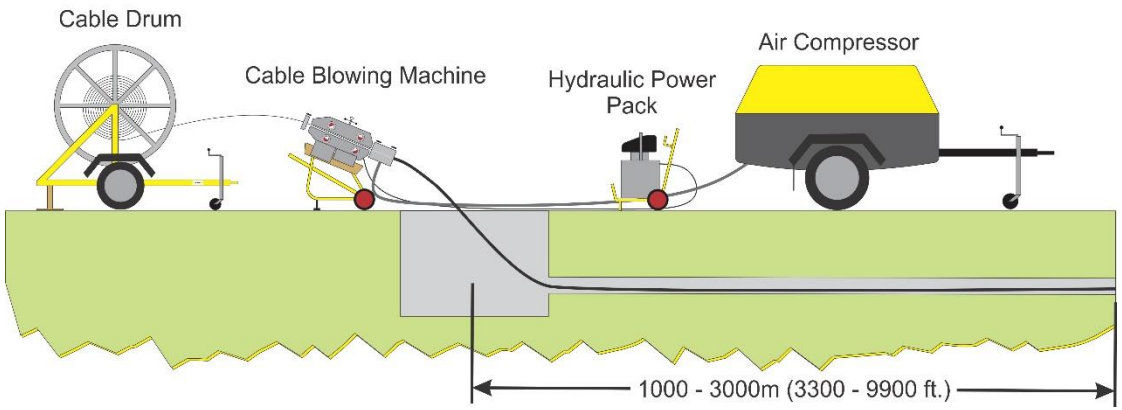


Tornado Plus

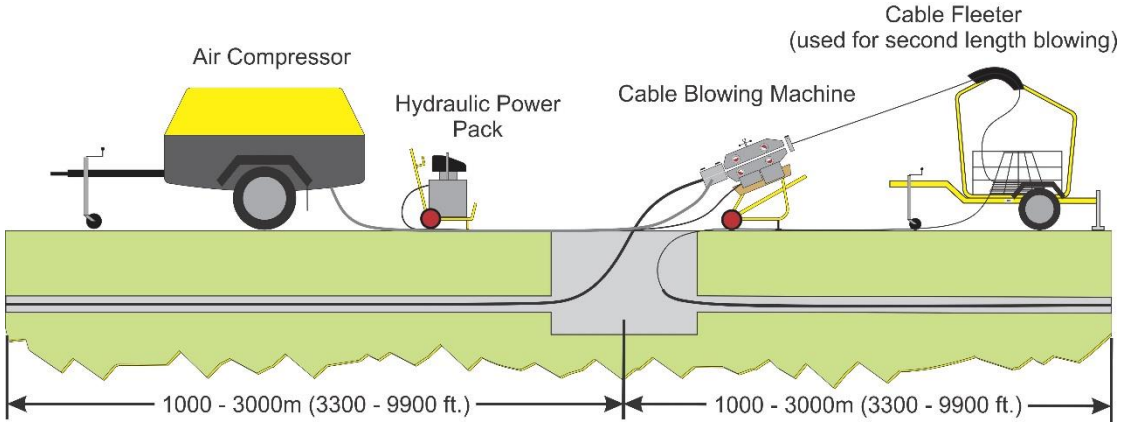
- 25-63mm duct range
- 6-32mm cable range
- Capable of speeds up to 90m/minute
- Operates on the viscous drag principle
- Compressed air and hydraulically controlled
- Monitoring system provides read outs of speed and distance

Tornado in Action

Single Length Cable Blowing



Mid-Point Cable Blowing with Fleeter



Micro Cable Fleeting Machine

- Enables longer lengths of cable to be laid from a single drum
- Fits cable diameters between 5mm and 6mm
- Max cable length of 2000m

Airstream

- 5-18mm duct range
- 2.5-11mm cable range
- Maximises micro cable protection
- Compliant double drive concept
- Precise control of torque and speed
- Simple to use ergonomic controls
- Low maintenance requirements and high reliability
- Adjustable to suit cables from 3mm to 11mm

Cable Blowing Compressor

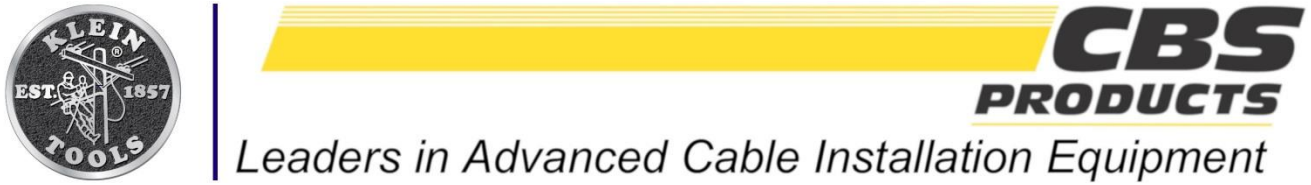
- Specifically for use with the Breeze and Airstream
- Fitted with aftercooler and water separator
- Mounted on dual wheel trolley
- Powered by 21.5hp Honda engine

AccelAir 2

- 3-10mm duct range
- 0.8-3mm cable range
- Simple and reliable fibre blowing
- Fits 1-3mm diameter cables
- Full automation and fibre management
- Only requires a single 24V D.C electrical supply and compressed air
- Custom set for your fibre

Cable Drum Trailers

- Compact and manoeuvrable
- Suitable for a variety of drum sizes
- Ease of drum lifting via hydraulic rams
- Rams can be operated together or individually
- Suitable for use on uneven ground
- Drum locked in top position during transportation



End of Presentation

Thank you for your time

Questions?