ENGINEERING TOMORROW

# Discover Danfoss' Quick disconnect couplings for Agriculture and Mobile Hydraulics

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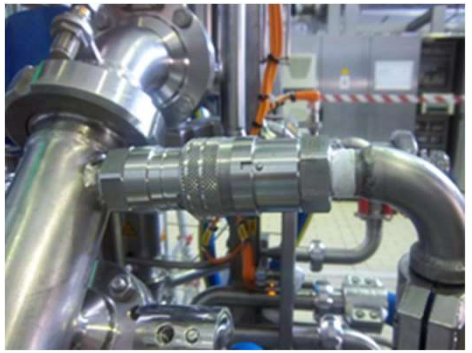
# Danfoss Quick Disconnect Training Overview

Available Application trainings.

- Agriculture and Mobile Hydraulics
  - ISO-A>H15000 and IA, W36000, FF and Multiplate couplings
- Liquid Cooling
  - ADB, FD83, MLDB, new developments
- Oil &Gas
  - FD85, 5100, W6000, HKFR (BOP) series
- Industrial Applications
  - ISO-B>HK, ST, H5000, W6000 series



# Overview couplings for Agriculture and Mobile hydraulics

For this market we discuss 3 series

1. ISO-A (H15000 and IA)
2. W36000 screw to connect
3. FF series

- ISO-A and W36000 are commodity products, **only discussing price!**
- FF series has competitive advantages, **sales needs to explain technical excellence!**

# Danfoss ISO-7241-1A Portfolio

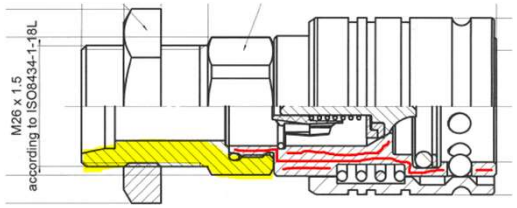
## Complete Portfolio

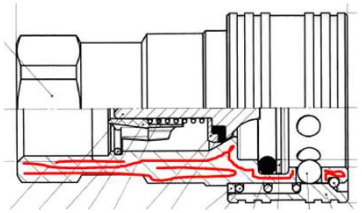
- Danfoss' ISO-A portfolio includes standard Products as Push Pull versions also. A wide range of end-connections are available.
- European manufactured product
- Performance exceeds market demands

**IA Series**

**H15000 Series**

| | | |
|---|---|---|
| Serie | | H15000/IA |
| Profile | | ISO 7241-1A |
| Size | | 1/4" till 1" |
| Available material | Steel | X |
| | Stainless | X (5600 series) |
| | Brass | |
| Flow rate (ΔP=1b) 1/2" | | 40 L/mn |
| Working Pressure (Bar) | | Up to 315 Bar |
| Previous Eaton Series | | 5600 (USA standard) |
| Benefits | | High Flow Rate,<br>1/2" series availablein Push pull,<br>IA: wide offer of end connections (male thread) |



# Danfoss ISO-7241-1A Portfolio

Only in ½" bodysize

## H15000 Series
## ISO 7241-1 A Interchange

The H15000 Series is a general purpose industrial interchange coupling that meets the ISO 7241-1 Series A standard. The H15000 Series features a rugged ball latch mechanism with self-sealing poppet valves.

### Product Features

- Meets the requirements of ISO 7241-1 Series A
- Designed and manufactured under Article 4.3 of the European Pressure Equipment Directive 2014/68/EU.
- ½" size available in push-pull version( double acting sleeve, bulkhead-mounted)
- Double shut off valves with ball locking
- Standard body material: Zinc trivalent plated steel
- Standard seal material: NBR

### Physical Characteristics

| ISO Size | Coupling Size | Nominal Flow Diameter | Max. Operating Pressure | | Rated Flow** | | Fluid Loss |
|---|---|---|---|---|---|---|---|
| | (in) | (mm) | (bar) | (psi) | (lpm) | (gpm) | ml max |
| 6.3 | ¼ | 5.3 | 315 | 4,565 | 10 | 2.6 | 0.35 |
| 10 | ⅜ | 7.3 | 315 | 4,565 | 20 | 5.3 | 1.5 |
| 12.5 | ½ | 10.2 | 250 | 3,625 | 40 | 10.6 | 2.6 |
| 20 | ¾ | 13 | 250 | 3,625 | 75 | 19.8 | 8.5 |
| 25 | 1 | 16.9 | 200 | 2,900 | 140 | 37 | 13 |

*The ISO size corresponds to the internal diameter of the hose or the external diameter of the rigid tube (as defined in ISO 4397 Standard).
**Indicated values refer to a 1 bar/14.5 psi pressure drop.

## IA Series
## ISO 7241-1 A Interchange

The IA Series meets ISO 7241-1 A Standard requirements and has a push-pull design, which allows the socket to be bulk-head-mounted. This configuration provides automatic connection or disconnection via a simple push or pull of the plug. Our IA Series is available in ½", with female or male end connections such as tube fittings, NPT, metric or SAE threads. It is widely used in agriculture and forestry applications.

### Product Features

- ISO size: 12.5 mm (1/2")
- Standard body material: Zinc trivalent plated steel
- Wide offering of end connections, among which metric threads designed in accordance with ISO Standard 8434/1
- Standard seal material: NBR
- Optional PVC dust caps and plugs
- Designed and manufactured in accordance with Article 3.3 of the European Pressure Equipment Directive (PED 2014/68/EU)
- Meets dimensional requirements of ISO Standard 7241/1 Series A
- Push-to-connect: the push-pull sleeve on the bulkhead-mounted socket provides automatic connection or disconnection via a simple push or pull of the plug. In the event of pull on the hose, the double-action sleeve gives immediate and automatic disconnection

### Physical Characteristics

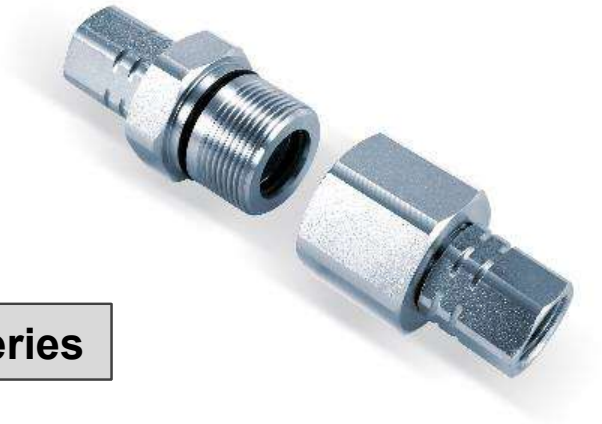
| Body Size | ISO Size* | Nominal Flow Diameter | Max. Operating Pressure | | Rated Flow** | | Fluid Loss |
|---|---|---|---|---|---|---|---|
| (in) | (mm) | (mm) | bar | (psi) | L/min | (gpm) | ml cc. |
| ½ | 12.5 | 6<br>9<br>10<br>10.5 | 250 | 3,625 | 65 | 17.2 | 2.6 |

* The ISO size corresponds to the internal diameter of the hose or the external diameter of the rigid tube (as defined in ISO 4397 Standard).
** Indicated values refer to a 1 bar/14.5 psi pressure drop.

# Danfoss Screw to connect Portfolio

## Screw to connect Portfolio

- Danfoss W36000 screw to connect product range includes all end connections for EMEA market.
- Including Hammer Proof versions.
- Mainly for forestry, construction and snow groomers



**W36000 Series**

| | | |
|---|---|---|
| **Serie** | | W36000 |
| **Profile** | | "German" / ISO 14541 |
| **Size** | | 1/4" - 1" 1/4 |
| **Available material** | Steel | x |
| | Stainless | |
| | Brass | |
| **Flow rate (ΔP = 1b) 3/4"** | | 74 L/min |
| **Working Pressure (Bar)** | | Up to 450 Bar |
| **Previous Eaton Series** | | |
| **Benefits** | | High Pressure in connected and disconnected position. Sealing area is protected when disconnected. Connectable under 50 Bar. O-ring indication allows check of complete connection. |

# Danfoss Screw to connect Portfolio

## W36000 Series
## Thread-to-Connect

Eaton's W36000 Series is a screw-to-connect quick disconnect coupling. Due to its design and the materials used, the W36000 Series quick disconnect coupling has excellent resistance to mechanical and hydraulic applications where vibration is present. The inner components of sizes ¾", 1" & 1"¼ have a robust construction to withstand the harsh application needs. Additionally, the plug sleeve ensures protection of the sealing area upon disconnection.

### Product Features

- Designed and manufactured in accordance with Article 4.3 of the European Pressure Equipment Directive PED 2014/68/EU
- Proprietary profile
- Thread to connect with double shut-off valving
- Can be connected against 50 bar (725 psi) residual pressure
- Optional dust caps and plugs (PVC or aluminum)
- An alternative version can be offered with a safety feature which minimizes the risk of unscrewing in conditions of heavy vibration
- O-ring indication allows checking that connection is complete thus guaranteeing full flow!
- Standard body material: Zinc trivalent plated steel
- Standard seal material: NBR

### Physical Characteristics

| Body Size | Nominal Flow Diameter | Max. Operating Pressure | | Max. Residual Pressure during Connection | | Rated Flow* | |
|---|---|---|---|---|---|---|---|
| (in) | (mm) | bar | (psi) | bar | (psi) | L/min | (gpm) |
| ¾ | 19 | 420 | 6526 | 50 | 725 | 57 | 15.07 |
| ¾ | 19 | 420 | 6526 | 50 | 725 | 21 | 5.55 |
| 1 | 25 | 420**/350*** | 6526**/5076*** | 50 | 725 | 43 | 11.36 |
| 1¼ | 32 | 420 | 6526 | 50 | 725 | 77 | 20.34 |
| 1½ | 38 | 350 | 4060 | 50 | 725 | 120 | 31.70 |
| 1¼ | 42 | 350 | 4060 | 50 | 725 | 300 | 79.25 |

* Indicated values refer to a 1 bar / 14.5 psi pressure drop.
** Operating pressures apply to ISO 6149 and SAE threads.
*** For ISO 8434-1 and connections.

# Danfoss ISO-7241-1A and W36000 cost out

Cost out ISO-A and W36000 ongoing and updated prices will be communicated

- H15000 and W36000 in general
- IA series in ½"

# Danfoss Flat Face Portfolio

## Broad FF Portfolio

- Danfoss invests to extend our Flat Face product range in order to be able to serve a wide range of different applications with our best-in-class Flat Face coupling.

**FF (ISO 16028)**

**MLFF**

**FFCUP**

**Multi FF**

# Danfoss Advanced Flat Face (FF) Coupling

| | |
|---|---|
| **Market** | **Agriculture, Construction, Truck, Bus, Railway, On and Offshore, Military, etc.** |
| **Application** | All kind of hydraulic fluid connections for power transmission |
| **Description** | The Flat Face coupling series is a full range of coupling for mid pressure applications (up to 400 bar) which allow no loss of fluid during disconnection, and no air entrance during connection.<br>It is offered with a wide variety of end connections and several options such as :<br>- Connect Under Pressure plugs (FFCUP)<br>- Color coding rings |
| **Sizes** | ¼" till 2" covers the whole range. |
| **Materials** | Zinc plated carbon steel, and 316L Stainless Steel |
| **Specs** | FF series meets and exceed ISO 16028 standard requirements |

# Advanced FF Coupling features and benefits

## Higher working pressure!

- Danfoss' FF couplings new design has a top performing pressure rating of 400 bar (+60% compared to ISO 16028 standard)
- 400 bar for static, steady or non-pulsed applications and 350 bar for ISO pressure rating / Dynamic application with moderate hydraulic shocks
- This provide a unique solution on the market with such high working pressure and high safety factor.

## Higher flow rates!

- New advanced Flat Face coupling offers top performing flow rates in the market.
- With up to 74% higher flow rate than ISO 16028 standard, this newly design FF coupling reduces fuel / energy consumption significantly.

# Advanced FF Coupling features and benefits

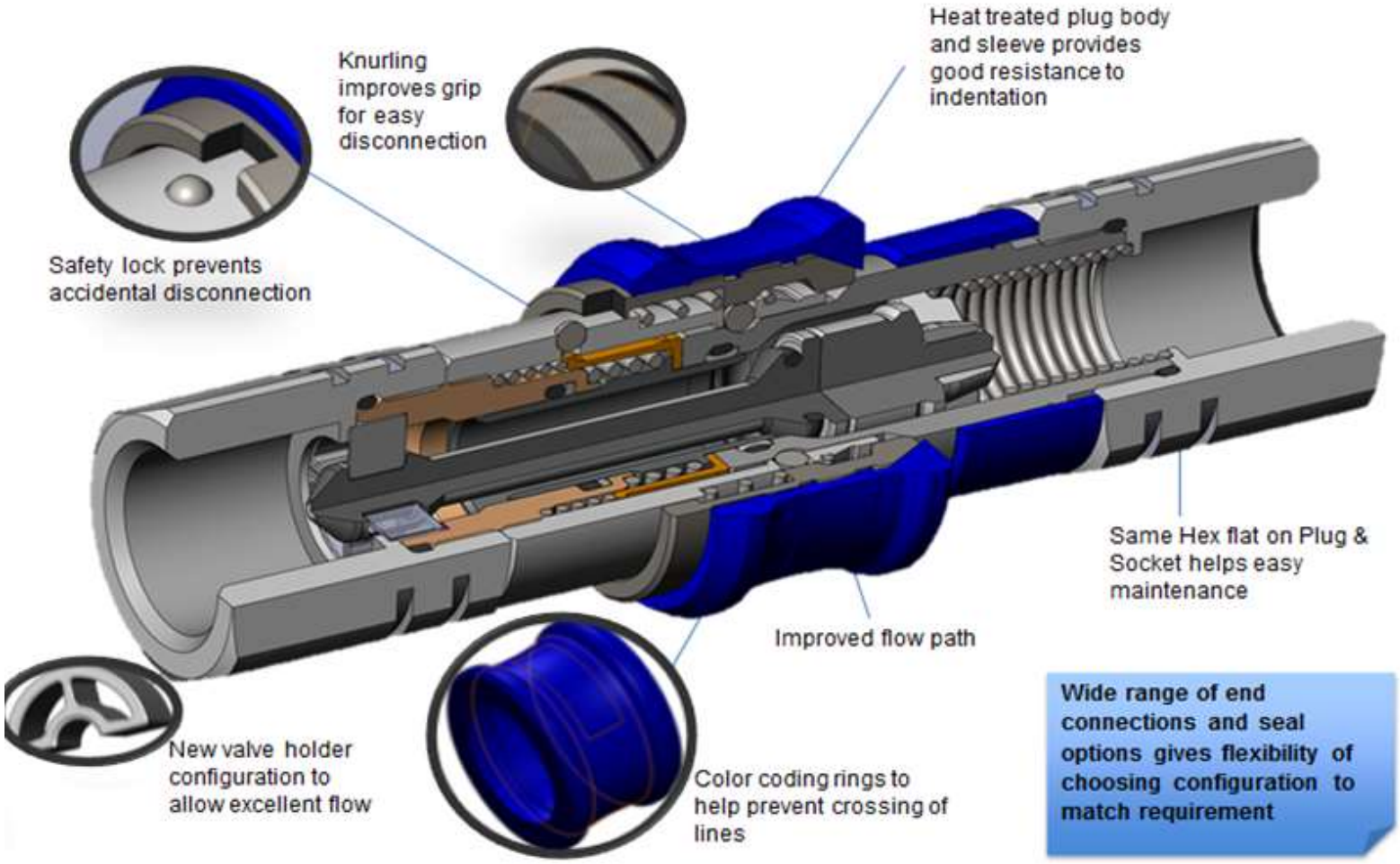
## Connect under pressure up to 350 bars

- Danfoss' Flat Face alternative design plug coupling connects under pressure (CUP) till 350 Bar
- No de-pressuring is needed with tools, Danfoss's patented relief valve releases residual pressure
- Low residual application? Connect under pressure up to 50 bar with standard FF coupling!

## A whole new level of corrosion resistance

- Up to 3x more protection compared to previous generations of zinc plating
- Is proven to protect against red corrosion up to 1000 hours.
- An environmentally friendly "Greener" plating solution:
- Nickel-free
- Solvent-free
- Meets Global RoHS, ELV and REACH requirements

# Unique coupling design enables a whole new level of possibilities



# Key benefits of Advanced FF coupling

- Exceeds ISO 16028 with higher operating pressure up to 400 bar
- Exhibits 74% higher flow rates than 16028 standard
- Up to 1000 hours corrosion resistant with environment friendly coating (nickel free)
- Connect under residual pressure up to 350 bar with CUP option
- Allows for an increase in design versatility, one series can be used in a variety of different applications
- The FF Series color coding feature for the male and female halves reduces the chance of line crossing and contamination
- The FF Series sleeve lock feature comes standard and decreases the chance of accidental disconnection
- The FF Series is laser marked with part number and date code
- Advanced Warranty
- FF series equipped with EPDM seals is 100% compatible for Ester phosphate Oils

# Exhibits higher flow rates

Problem:

High pressure drops creates energy loss and more fuel consumption.

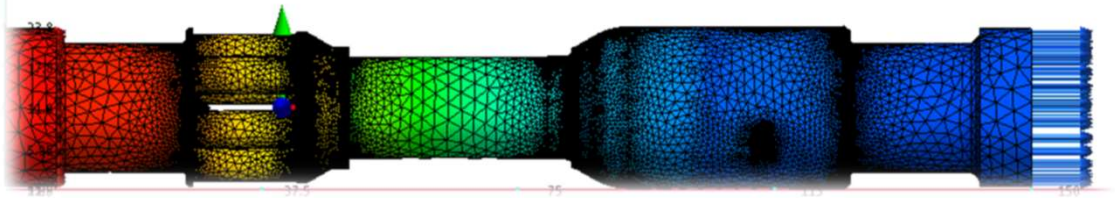
Excessive pressure drop are also heating up the oil impacting material lifetime and equipment efficiency

Multi-FF Solution:

Danfoss's Multi-FF coupling uses Danfoss Flat Face coupling with best-in-class flow rates

By FEA & CFD analysis geometry shapes were optimized to further improve the flow rate.

Result is up to 74% higher flow rate than ISO 16028 standard



# Connect under residual pressure

Problem:

Typical connection problem in the field is when residual pressure is preventing operator to connect. For example, when the sun heats up the oil and raise the pressure in the hydraulic line.

The result could be that operator uses a screwdriver, hammer or other tool to actuate the valve and release pressure which can damage the coupling and also cause safety issue.

FF enhanced Solution :

For low residual pressure (see datasheet by size), the standard design allow the operator to connect under pressure without damaging the seals.

For higher residual pressure up to 350 bar, the optional plug FFCUP allows easy manual connection without effort.

# Danfoss Flat Face Portfolio

- *Competitor Comparison – FF Series*

## Selling Features:

- Industry leading pressure and flow performance
- Connect Under Pressure Plug up to 350 bar
- Up to 1,000 hours of corrosion resistance
- Competitive quantity-based pricing options

| ISO 16028 Size (3/8”) - Steel | Danfoss | Faster | Stucchi | Stauff | DNP | Parker |
|---|---|---|---|---|---|---|
| Product Series | FF Series | FFH Series | A Premier Series | FH Series | PLT4 Series | FEM Series |
| Operating Pressure (bar) | 400 ✓ | 350 | 350 | 350 | 350 | 250 |
| Flow* (lpm) | 40 ✓ | 35 | 29 | 27 | 28 | 32 |
| Burst Pressure (psi) | 1,400 | 1,700 | 1,000 | 1,500 | 1,600 | 1,000 |

*Flow @ 1 bar of pressure drop

# Danfoss Flat Face Portfolio

- *Stainless Steel MLFF Series*

## Selling Features:

- High resistance to aggressive environments and corrosion
- Available in complete range from ¼” up to 2”
- Wide range of seal materials available (FKM, EPDM, NRB)
- Utilize FF Series dust caps and shock resistant color-coding rings

| ISO Size* | Coupling Size | Maximum Operating Pressure | | | | | | Minimum Burst Pressure | | | | | | Rated Flow** | | Fluid Loss | Air Inclusion | Force to Connect | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Connected | | Plug/ Male Half | | Socket/ Female Half | | Connected | | Plug/ Male Half | | Socket/ Female Half | | | | | | | |
| (mm) | (in) | (bar) | (psi) | (bar) | (psi) | (bar) | (psi) | (bar) | (psi) | (bar) | (psi) | (bar) | (psi) | (lpm) | (gpm) | ml-cc. | ml-cc. | N | Lbs |
| 6.3 | ¼ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 2,335 | 33,858 | 1,640 | 23,780 | 1,330 | 19,285 | 17 | 4.49 | 0.004 | 0.007 | 80 | 18.0 |
| 10 | ⅜ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 1,672 | 24,244 | 1,664 | 24,128 | 845 | 12,253 | 29 | 7.66 | 0.006 | 0.010 | 140 | 31.5 |
| 12 | ½ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 1,679 | 24,346 | 997 | 14,457 | 993 | 14,399 | 55 | 14.53 | 0.012 | 0.013 | 195 | 43.8 |
| 16 | ⅝ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 1,190 | 17,255 | 950 | 13,775 | 880 | 12,760 | 67 | 17.70 | 0.016 | 0.030 | 205 | 46.1 |
| 19 | ¾ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 1,370 | 19,865 | 882 | 12,789 | 845 | 12,253 | 105 | 27.74 | 0.034 | 0.015 | 215 | 48.3 |
| 25 | 1 | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 1,690 | 24,505 | 1,000 | 14,500 | 850 | 12,325 | 177 | 46.76 | 0.032 | 0.033 | 260 | 58.5 |
| - | 1"½ | 250 | 3,625 | 250 | 3,625 | 250 | 3,625 | 750 | 10,875 | 750 | 10,875 | 750 | 10,875 | 450 | 118.9 | 0.265 | 0.445 | 385 | 86.6 |
| - | 2" | 175 | 2,535 | 175 | 2,535 | 175 | 2,535 | 525 | 7,610 | 525 | 7,610 | 525 | 7,610 | 700 | 184.9 | 0.390 | 0.260 | 375 | 84.3 |

# Danfoss Flat Face Portfolio

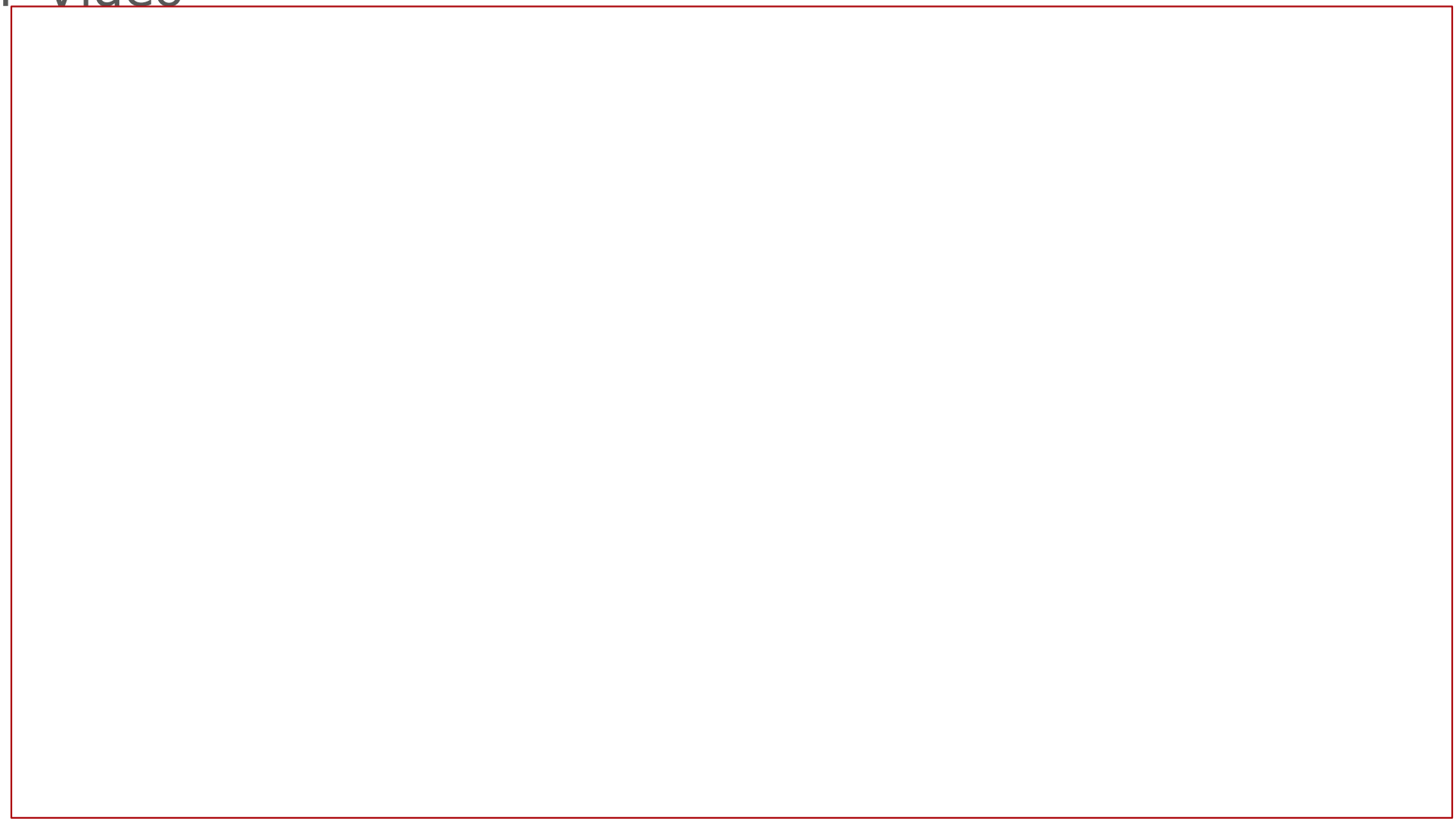
- *FFCUP connect-under-pressure plug*

## Selling Features:

- Flat Face plug that can be connected at 350 bar residual pressure
- Fulfills all requirements according to ISO 16028
- Available in 3/8” and ½”
- ¾” will be added to portfolio in 2020

| Body Size | ISO Size* | Nominal Flow Diameter | Max. Operating Pressure | | Min. Burst Pressure | | Rated Flow** | | Air Inclusion | Fluid Loss | Force to Connect | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (in) | (mm) | (mm) | (bar) | (psi) | (bar) | (psi) | (lpm) | (gpm) | ml-cc. | ml-cc. | N | lbf |
| 3/8 | 10 | 8.6 | 350 | 5,075 | 1,400 | 20,300 | 29.4 | 7.76 | 0.010 | 0.006 | 350 | 79 |
| 1/2 | 12.5 | 11 | 350 | 5,075 | 1,400 | 20,300 | 46.8 | 12.36 | 0.013 | 0.012 | 270 | 60.7 |

# FF Video



# Danfoss Multi-FF Coupling

| | |
|---|---|
| **Market** | **Agriculture, Construction, Commercial Vehicles** |
| **Application** | All kind of multiple hydraulic fluid connections for power transmission |
| **Description** | The Future Multi QDC series will provide a customer friendly solution to connect multiple performant Flat Face couplings for working pressures up to 350 bar, and including as an option electrical connection. To meet specific requirements, Multi-FF can also be provided with DB series QDC in Aluminum or SS materials. |
| **Sizes** | For 6, 10, 12 and 19FF coupling size |
| **Materials** | Zinc plated carbon steel, and 316L Stainless Steel for couplings, Aluminum for plates |
| **Specs** | Non applicable, exceeds performance of ISO 16028 |

# Multi-FF features and benefits

## Smaller package size and light weight design

- Danfoss Multi-FF coupling solution offers very compact package size
- Customers have a higher flexibility in designing their equipment and can reduce overall size of their machinery
- The up to 16% lower weight of the Danfoss Multi-FF coupling solution reducing effort for operators to make connections

## Easy to handle with increased operator comfort

- The Danfoss Multi-FF offers a short 130° for connection with distinctive start and end locations of the handle.
- A push button offers an easy opening of the two plates at the end of connection.
- The optimum Force to connect makes it even easier for operator. For example, it requires just 50N force to connect 4x10FF configuration

# Multi-FF features and benefits

## Higher flow rates

- Multi-FF uses Danfoss Flat Face couplings offering top performing flow rates in the market.
- With up to 74% higher flow rate than ISO 16028 standard, the Multi-FF coupling reduces fuel / energy consumption significantly.

## A whole new level of corrosion resistance

- Up to 3x more protection compared to previous generations of zinc plating
- Is proven to protect against red corrosion up to 1000 hours.
- For all aluminium components anodization is used for surface protection.

# Key benefits of Danfoss Multi-FF coupling

- Exceeds ISO 16028 with higher operating pressure up to 350 bar
- Connect under residual pressure up to 350 bar with CUP option
- Integrated couplings exhibits up to 74% higher flow rates than 16028 standard
- Up to 1000 hours corrosion resistant with environment friendly coating
- Long lifetime through patented internal mechanism and linear connection
- Easy handling also for untrained operators with optimum force-to-connect
- Integrated contamination protection through sealing band and dust caps
- Improved serviceability through easy to replace couplings, dust cap and safety pin mechanism.
- Modular design that allows customized solution with electrical connectors or specialized couplings

# Multiplate standard configurations

| MultiFF Part number | No. of coupling ports | Coupling type | Coupling body size | Pattern | Operating pressure | Seal | No. of Electrical port | No. of contacts in electrical connector | End connection for couplings ## |
|---|---|---|---|---|---|---|---|---|---|
| 4MFC-10CUP15LS11 | 4 | FFCUP** | ISO 10 | DLM122 | 250 bar | NBR | 0 | 3 # | 15L as per ISO 8434-1 |
| 4MFCE1-12CUP15L | 4 | FFCUP | ISO 12 | Generic | 350 bar | NBR | 1 | 3 | 15L as per ISO 8434-1 |
| 4MFC-12CUP15L | 4 | FFCUP | ISO 12 | Generic | 250 bar | NBR | 0 | 3 | 15L as per ISO 8434-1 |
| 4MFC-1015L | 4 | FF* | ISO 10 | Generic | 350 bar | NBR | 0 | 3 | 15L as per ISO 8434-1 |
| 4MFCE1-1015L | 4 | FF | ISO 10 | Generic | 350 bar | NBR | 1 | 3 | 15L as per ISO 8434-1 |
| 6MFC-1015L | 6 | FF | ISO 10 | Generic | 350 bar | NBR | 0 | 3 | 15L as per ISO 8434-1 |

* FF is ISO 16028 interchange flat face series coupling
** FFCUP is ISO 16028 interchange flat face series coupling with connect under residual pressure capability on plug side
# No. of contacts in each connector is configurable and connector can be provided with 3 to 12 number of contacts as per requirement
## Other end connection styles and sizes are available. See next page for list of end connection available for configuration. Contact Eaton CSR for more information.

**Note:** This limited list of configurations are indicative only. Eaton's Multi-FF solution is highly configurable and optimum solution can be provided to meet application requirements. Please contact Eaton CSR for more information.

# Multiplate standard configurations

**Complete MultiFF part number** **4 MF C E1-12 ML 50BS 192 S11**

**Number of QDC**
This digit specifies number of QDC's in a Multi-FF set.
MF is family name for Eaton's Multiplate solution

**Type of assembly**
C: Complete set of MultiFF system
P: Movable plate sub-assembly (attachment side)
S: Fixed plate sub-assembly (equipment side)

**Electrical connector**
This position indicates number of electrical connectors in particular MultiFF system
(no code) = No electrical connector
E1 = 1 electrical connector
E2 = 2 electrical connectors
Etc.

**QDC Body size**
ISO size of QDC's used.
6 = ¼" 10 = 3/8" 12 = ½"
16 = 5/8" 19 = ¾" 25 = 1

Eaton internal code for special QDC pattern or configuration

**Seal code**
(no code) = NBR **507** = HNBR
**143** = FKM **242** = Kalrez® 6375
**192** = EPDM **503** = FFKM

**End connection size and code**
**PT** = NPT **MET** = Metric
**BS** = BSPP **UN** = UNF
**L** = ISO 8434-1 Light Duty
**S** = ISO 8434-1 Heavy Duty

**End connection thread size**
- For BSPP, NPT, UN, UNF threads:
  Fraction in inch x 100
  1/4 = 25; 3/8 = 37; 1/2 = 50;
  5/8 = 62 ; 3/4 = 75 ; 1" = 100
- For Metric threads:
  2 character nominal thread size
  e.g. M5=05; M10=10; M22=22
- For ISO 8434-1 terminal end:
  2 digits tube size per ISO 8434-1

**Product series code**
This position is to define type of QDC being used in Multi-FF solution

- (no code) = Flat Face ISO 16028
- CUP = Flat Face Connect under Pressure ISO 16028
- ML = SS version of ISO 16028 coupling
- MDB = SS version of Dry break coupling (water transfer etc.)
- ADB = Dry break coupling in Aluminum (for cooling line etc)
- G600 = Pneumatic application coupling

# Key Takeways

- Cost out for W36000 and ISO-A is ready to quote new price levels with improved competiveness
- FF is competitive in price and offers wide range of technical advantages
- Multiplate launch in September to complete the portfolio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