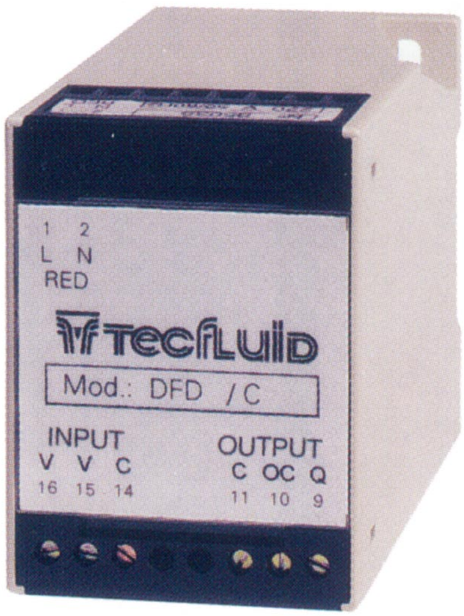
Digital Frequency Divider

INSTRUCTION MANUAL



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1 WORKING PRINCIPLE

The DFD has been designed to generate a series of output pulses mathematically equivalent to the input pulses. The relationship between the output and input pulses is:

$$I_o = I_i \times K$$

I_o = Number of output pulses
I_i = Number of input pulses
K = Correlation factor

The value of **K** is selected by means of BCD switches inside the instrument. Division factors of 1, 10, 100 and 1000 are selected by means of a jumper.

1.1 Operating Limits

The output frequency is always less than the input frequency, that is to say **K < 1**.

1.2 Applications

a) The correction or rationalization of the number of pulses of measuring transducers, for example a flow meter which gives 5 pulses per litre and we wish to batch in litres, or a length measuring equipment which gives 10 pulses per inch and we want to work in meters.

b) Batching: Logically if we can give one output pulse for every n input pulses we can use the DFD for batching.

2 INSTALLATION

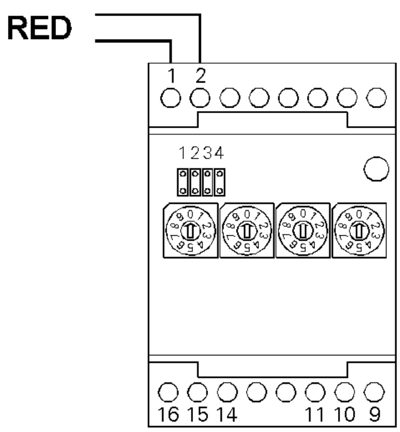
The DFD is housed in an IP40 plastic case for mounting inside an electric control panel. The plastic case has two holes for mounting with screws to DIN 46 121 and DIN 43 660. It also has a snap fastener for fitting to DIN 46 277 and DIN EN 50 022 assembly rails. Screw terminals are provided for external wiring. The terminals are protected against accidental contact in accordance with VDE 0100 Part 750, VDE 0160 Part 100 and VBG 4.

IMPORTANT: In order to comply with the electrical safety requirements as per IEC 1010-1, the installation of the equipment must take into account the following:

- The equipment must be installed inside an electrical mounting cabinet to prevent the possibility of an operator touching a connection terminal.
- A mains switch must be provided to disconnect the equipment. This switch must be marked as the disconnecting device for the equipment and be within easy reach of the operator.

2.1 Mains connection

The mains supply voltage is connected to terminals 1 and 2. The mains voltage is indicated on the label at the side of terminals 1 & 2.



2.2 Input connection

The DFD is designed to be able to work with two types of inputs. The different types of inputs are selected by means of jumpers inside the instrument.

2.2.1 Magnetic Pick-up Input

For the input from turbine type flowmeters which use magnetic inductive pick-ups to detect the movement of the turbine blades, the wiring must be made as following:

DFD Terminal Nº	Pick-up Terminal Nº
14 shield	1 shield
15 live	2 live
16 live	3 live

"live" means the two ends of the pick-up coil.

The input cables must not be installed close to mains cables as these can induce errors due to electrical interferences.

2.2.2 Electrical Contact Input

For connecting inputs from reed switches etc., as one can find for example in COVOL flowmeters, the wiring must be made as following:

DFD Terminal Nº	COVOL Terminal Nº
14 shield	1 shield
15 no connection	
16 live	2 live

The shield is connected to one end of the reed switch and the live to the other end.

A pulse generator with an open collector output (NPN transistor) can be connected to this input mode. In this case the emitter (or common) must be connected to terminal 14 and the collector to terminal 16.

2.3 Output connection

There are two types of pulse output for connecting to different types of equipment.

2.3.1 Open collector output

Terminal 11 is the common of the output and is connected internally directly to the emitter of an NPN transistor. Terminal 10 is the collector of this transistor. This open collector output can be used to drive electromagnetic counters or relays. There are no protective devices on this output, such as current or over-voltage limiting and these must be provided externally when needed. The standard pulse-width of the output is 0.5 millisecond; in the event that the output must drive an electromagnetic element this pulse-width will be too short. On order longer pulse widths can be supplied; the maximum output frequency must be specified in the order.

2.3.2 TTL Output

For the TTL (0 to 5 volts) output, terminal 11 is the common and terminal 9 is the live output.

3 SETTING UP

Once the instrument is installed the only thing that has to be done is setting the multiplication factor which must de applied to the input frequency to obtain the output frequency. For example, if we have a turbine flowmeter which gives 752.22 pulses per litre and we want to totalize litres with a counter the relationship between the output and input frequencies will be 1/752.22; thus the factor (K) to be introduced will be 0.001329398. Given that we only have four significant digits this factor will be rounded off to 0.001329.

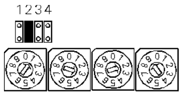
$$K = \frac{\text{output pulses}}{\text{input pulses}} = \frac{1}{752.22} = 0.001329$$

To introduce this conversion factor we have four BCD coded switches and a jumper with four positions. With the four BCD coded switches we select the four significant digits and with the jumper we select the number of zeros between the decimal point and the first significant digit. To get to the switches, a screwdriver can be used to lever out the top cover, which is just clipped in its place.

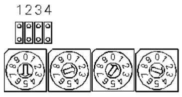
In the examples given, the jumper is shown as a black filling.

In the four examples given, one can see the way to select the multiplication factor (K). The first example would be the selection of the factor in the case of the turbine flowmeter given above, in which the four significant digits have been selected with the BCD switches and the jumper has been put in the second position for the two zeros between the decimal point and the first significant digit.

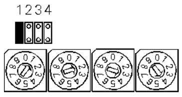
Changes of the multiplication factor must be made when the instrument is switched off (no mains voltage), because this factor is read only when the instrument starts up (when the mains voltage is switched on).



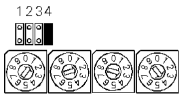
Factor = 0,001329



Factor = 0,5213



Factor = 0,01234



Factor = 0,00001234

4 TECHNICAL DATA

4.1 Working conditions

The case is IP 40 and the terminals are IP 20. The working temperature limits are 0 to 50^{o}C

4.2 Mains supply

The standard mains voltage is 220 VAC 50/60 Hz. AC Mains voltages of 240 V, 110 V & 24 V 50/60 Hz. and 24 V DC supply voltage are available on order. The power consumption is less than 1W. The instrument is not supplied with a mains filter and in the exceptional cases that, due to high levels of mains interference, a mains filter is needed, this must be installed externally. Due to the low power consumption, almost any small mains filter will be adequate.

4.3 Outputs

The standard output pulse-width is 0.5 millisecond. This pulse-width is the same for the open collector and the TTL outputs.

1. The TTL output comes directly from the output of an operational amplifier. The minimum recommended load is of 1000 ohms.

2. The open collector output has a maximum voltage of 40 Volts DC and a maximum current of 100 mA

4.4 Pulse inputs

1. The input called "COVOL" is designed to work with an electrical contact which closes the circuit between terminals 1 and 2 of the COVOL flowmeter. Given that this type of input is generally slow and to avoid contact bounce this input is limited to about 200 pulses per second.

2. The pick-up input is designed to work with an inductive pick-up using a coil. The input frequency in this case is limited to about 2000 pulses per second.

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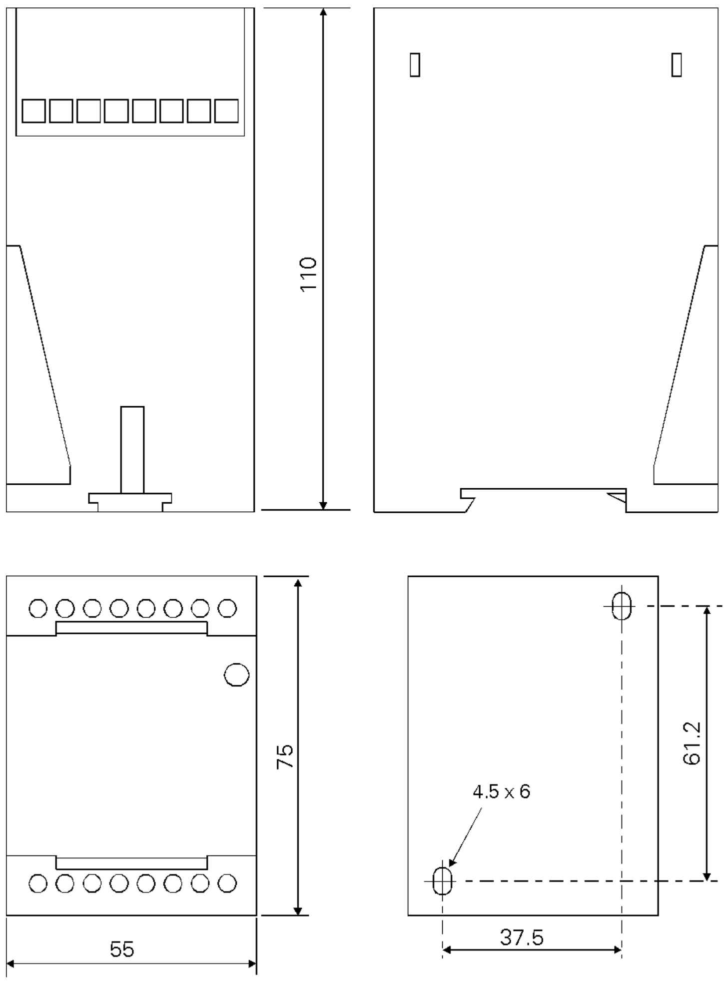
4.5 Dimensions

In the following drawings the outside dimensions and the layout of the fastening holes for screws are given. The layout of the fastening holes is given looking at the top of the instrument.

The weight of the instrument is approximately 300 g.



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