Mole Impulse Digital DD Pro
Operation manual
QUICK START

THRESHOLD - between “0” and “4” (in case there is no noise it shall be set on “0”; then the device is set on its most sensitive mode, i.e. the maximum depth detection). In the event of noise it shall be moved with one level up to “4” until the noise disappears. During search of large objects it must be set on “6” to “10 in order not to hear smaller objects which, to a certain extent, reduce the detection depth. The position of THRESHOLD shall be bigger than the position after FIX.

For instance: In case FIX5 is set on „2”, the THRESHOLD potentiometer shall be set on “3”. This means that all signals higher than “3” will produce tones.

LEVEL – during work with large coils, LEVEL must be always set on „0“. During work with small coils and when a quick movement is needed, LEVEL shall be set on „0“ to „10“ until the tone is no longer heard in the speaker. In case the work with the smaller coil is slower, LEVEL shall be set on „0“.

DISC – from „0“ to „10“, normally „5“. By using the DISC potentiometer, the operator can control the device and set it to detect a metal either as a ferrous or as a nonferrous one.

FUNCTION –this button/potentiometer changes the work mode as well as MOV and FIX modes by moving it leftwards or rightwards. Mode change is made by two consecutive presses of the FUNCTION button. The arrow „>“ shall be moved upwards to Prof. The turn of the FUNCTION button changes Prof from „1“ to „4“. In case the mode needs to be changed, press the FUNCTION button downwards. Upon the first press the mode’s subsettings begin to appear consecutively, which in sequential order are: POW, ADC, STat, Disp and mDly, and which values change upon turning the FUNCTION button leftwards or rightwards.

Note: There are 22 functions more available which are service settings and are to be changed only in special occasions. They cannot be entered into or changed by accident as it is to be made by pressing combination of buttons.
Example:

Prof1:

POW: 1-2 (normally 2)
ADC: 1-3 (normally 2)
Stat: 2
Disp: 7

mDly - in coils of 23x36 cm or 50 cm it is between 4 and 6
in coils of 110x110 cm it is between 3 and 5
in coils of 200x200 cm it is between 2 and 4

smp1: 51
smp2: 49
0_c1: 15
0_c2: 11
cEFE: 0-10
rejF: 0
mode: 0-1 (for Europe and other countries with frequencies of 50 Hz) or
2-3 (for the USA, Japan, China and other countries with frequencies of
60Hz)
ofsB: 116
sclB: 100
ofsT: 33
sclT: 38
maxT: 40
chgi: 40
ofsl: 9
scll: 64
sclU: 105
maxU: 182
capB: 40
cf-l: 57
mneg: 6+
freq: 10-63 (61)
intM: 5-50 (on 5 – a short tone / on 50 – more continuous tone)
DISC/ ALL METAL button

Best to work is the ALL METAL mode which also provides discrimination. On the left from the centre section zeros shall be visible, i.e. ferrous metal detected, and on the right – bells, i.e. nonferrous metal detected.

When in ALL METAL mode, regardless of the discrimination, the device will produce one and the same tone for ferrous and nonferrous metals, but it will be visible on the display whether it is ferrous or nonferrous.

When a tone is produced while in ALL METAL mode, the operator must leave the detected object’s area and switch to DISC mode by pressing the DISC/ALL METAL button, and after that he must press the FAST ZERO button and again walk over the signal’s area. In case the metal detected is nonferrous, the produced tone will be loud and there are bells visible on the right from the centre’s display. If the metal detected is ferrous, there are circles visible on the left from the centre and the tone produced will be low.

When the operator completes his work over the object detected, he must leave its area and go to plain land and again press the FAST ZERO button in order to continue searching.

By only pressing the FUNCTION button the operator will reach the main menu where only the main parameters can be changed, namely: POWER (POW), ADC, STATISTIC (STAT), DISPLAY, mDly, without seeing the service ones.

How to enter the service settings menu?

Press and hold down the FAST ZERO button with your right hand. Press and hold down the FUNCTION button with your left hand and turn leftwards 1-2 positions. Then release both FAST ZERO and FUNCTION buttons. Press again the FUNCTION button until the desired function is displayed in order to change the settings.

If this short description is not enough to start detecting, please read the whole user’s manual carefully.
Switching on

After pressing the **POWER** button the internal speaker produces a sound and the display shows:

```
LOADING
Please wait...
```

The automatic adaptation to the coil starts, resetting the device which normally continues 2…4 sec.

```
START. | bat: 78%
| :651
-------- | :160
| :150
```

At the end of the coil initialization a second sound is produced and the display shows **Clear** – the device is reset.

```
Clear. | bat: 78%
| :680
-------- | :180
| :155
```

At the end, the device switches to the selected work mode - **ALL METALS** or **DISC (AUTO DISC)**.

```
ALL METALS | bat: 78%
. | Prof: 1
-------- | TRSH: 5
. | >fix5: 0
```
**All Metals Mode**

In **ALL METALS** mode the following parameters are displayed:

- **Battery meter** as a percentage of the maximum voltage (0..100% shows empty / full battery);
- **Prof work mode** 1/2/3/4 (for large searching coil - 1/2 or for small searching coil – 3/4);
- **Sound threshold** TRSH from 0 to 11. Only sound with strength higher than the threshold will be accompanied by a sound.
- **Signal strength** from an object as a number from 0…500…. OVERFLOW (signal error).
- **Graphic indicator of signal changes**. It can have either positive or negative values moving right and respectively left from the dividing zero point in the middle.
  - In **fix** mode this indicator is the same as the indicator of the general sound strength of 4th row
  - In **mov** mode it shows only the increasing values above the average sound strength;
- **Graphic indicator of the general signal strength**. It is similar to the indicator of signal changes.

Normally, both indicators show positive values when an object is detected and upon its disappearance they are zero (or tend to vary around fix5: -2 -1...0.. + 1 + 2).

**Values of level indicators in fix mode**

When there is an object within the range of the coil, the object causes a signal, which is displayed on the two level indicators as a number. If this signal **exceeds the chosen threshold TRSH**, a sound is produced. The frequency of this sound depends on the signal strength – higher frequency for higher signals.

The **signal type** is displayed on the **dividing line** as symbols – circles or stars (bells). The circles show slowly fading signal, and the stars – quickly fading signal.

Note: 1. If the device is reset with the **FAST ZERO** button while there is an object detected within the range of the coil, the level will become „0”. When the object disappears the signal will become negative (e.g. -35 and a sound warning for negative level will appear.
If the general signal increases and becomes bigger than 120 units, the level indicators show higher level as >>>>>> (overflow), but the value as a number continues to monitor the growth, and the sound frequency also continues to change.

If the level of overflowing is reached, the sound changes to a very high signal tone and the following appears on the 4th row of the display: OVERFLOW (signal error).

### Values of level indicators in mov mode

The mov mode is chosen after several turns of the FUNCTION knob, it can be mov 0..5. The difference between these submodes is in the time it takes to automatically reset the signals found. The device constantly adjusts to the average strength of the signal; however, the transitory changes are shown as a signal from an object signal disappears slower in mov5, i.e. in this case the movement is slowest and on the contrary, in mov0 the movement must be quicker.

On the 4th row of the display the level indicator and the numerical index show the general signal and on the 2nd row the level indicator mov shows the transitory diversion from the average signal.

Note: If the transitory signal fades below the level of the average signal and the difference became negative, the average signal is quickly leveled with the transitory one, i.e. the negative values in this mode are momentary so that the device can quickly pick up new signal intensifications.

The sound signal appears when the growth above the average signal (not the general signal) is equal or bigger than the threshold TRSH. Again, the bigger increase causes higher frequency sound.
Changing the working profile (capacity)

The device can function in four different profiles for adjusting the searching coil (Prof 1/2/3/4). Switching on different profiles happens when the “FUNCTION” button is pressed twice, the arrow is moved upwards, first in front of TRSH, after that in front of >Prof. With turning the knob leftwards or rightwards Prof 1,2,3 or 4 is chosen, after that the „FUNCTION” button is pressed downwards and the device is reset.

Note: The presence of four working profiles allows the device to tune in, in advance, to circular searching coils or a large frame. The described parameters below, POW, ADC, mDly, vary for each profile.

Change of the main delay of sampling

The parameter mDly (Main delay) determines on what level the procedure for automatic adjustment of the coil will end, after turning the device on. On this parameter depends where exactly will be situated the point of detection after the end of the impulse, upon acceptance of the reflected signals. This can greatly affect the sensitivity towards certain signals. For example, the early detection increases sensitivity towards quickly fading signals, on the opposite – the late detection suppresses the signals as the sensitivity towards slowly fading signals stays the same.

The practical application is the following – if ignorance of small objects is desired, as well as ground signal fading and only large and deeply buried objects, are searched (as in the case of working with a frame) – then mDly must be 3(4), which means delayed detection.

When working with circular coils mDly can be (5)6, this means earlier detection and provides maximum sensitivity.
Example for working in ALL METALS mode

Mode fix (0..5) (ALL METALS)

This mode can be chosen either for working in motion or being static. When the coil is held above the object, the signal does not fade gradually as it happens in mode mov. The signal stays, which is very comfortable for the precise location of the object.

Example:
Mode fix5 is chosen. The coil is held in the air and the device must be reset using FAST ZERO.

After the coil is lowered to its working distance above the ground (6..10 cm for small coil and 30..40 cm for large coil), a ground signal appears fix5=3..5. Again push FAST ZERO.

Example: If the value of fix5 is 3 the sound threshold is adjusted to TRSH=4 with the THRESHOLD knob, the sound fades and appears only after the signal reaches levels beyond 4.

As the coil is moved around a certain area increase of the signal is discovered. 5..10..15..20..15..10..5 – a sound which monitors the amplitude is produced. Some slow movements, left and right, are made and the coil is stopped at the point where the signal is maximum (the frequency is the highest). After that, the coil is moved back and forth so that the device can determine the point of higher frequency and maximum sound. Thus, the place where the accepted signal is the strongest is found. The possible positioning of the object is in the ground, below the focus (the center) of the coil.

The difference between the submodes FIX0,1,2,3,4,5 is in the maximum movement speed allowed.

fix0(1,2) are quick modes where the consumed electricity from the battery is higher. The quickest one is fix0. It is suitable for very quick movements of the coil. However, it is very sensitive to disturbances as local radio stations, etc..

Submodes fix3(4,5) are slow modes, as fix5 is the slowest one. In these modes the consumed electricity from the battery is lower which provides longer battery life and respectively more working time.

Normally, mode fix5 is most suitable for work.
**DISC mode**

Here as well, the **fix** mode is static, the signal does not fade, and **mov** mode is for working in motion, i.e. the signal disappears after continuous hold of the coil above the object.

**Work mode**

**Graphic indicator of signal changes**

- dividing line upon lack of signal
- symbols showing the signal type

**Balance indicator**

**Threshold for low / high**

**Sound threshold works**

**Signal from an object as a number**

**Graphic indicator of the general sound strength**

**Signal mode**

Work parameters for this mode are:
- **TRSH** - sound threshold from **0 to 11**;
  Only sound with strength higher than the threshold will be represented and will be accompanied by a sound.
- **DISC** – Sound changing threshold from lower to higher tone. This threshold determines which object will produce high and which objects will produce low tones.

- **Balance indicator** – shows whether the device is balanced when there is no signal. In order to check this, the operator must lift the searching coil in the air, so that there is no signal in its range. Then the indicator must have the same levels on both sides of the dash symbol “=”, and if the levels are not the same, the device must be reset. Otherwise, the readings of C1 and C2, would be invalid, especially for lower levels.

**Adjusting the sound threshold – TRSH parameter**
(minimum signal after which the discrimination begins and a sound is produced).

The minimal level for the sound is chosen with the **THRESHOLD knob**, and is normally 10.

This level is higher than the level of the threshold in **ALL METALS** mode as the signal cannot be analyzed if the levels are too low. The higher the level, the steadier the discrimination is in the beginning, just beyond the threshold. This requirement for minimal levels of the signal in **DISC** mode is the reason why the greatest sensitivity can be achieved in **ALL METALS** mode.
This is the value of the coefficient C1, which is followed by a high tone signal and preceded by a low tone signal.

The threshold for sound change is adjusted by the DISC knob, normally 5. When the device picks up a signal greater than the threshold from which the sound works TRSH, it is discriminated and the coefficients C1 and C2 show the type of the signal and according to C1 and the chosen threshold DISC, a low or high tone is produced.

**Allowing and forbidding the low tone in DISC mode**

For allowing or forbidding the low tone, press “FUNCTION” down continuously for 3..4 sec.

When both tones are allowed the device produces low or high tone when discovering all types of metals.
- high tone = nonferrous metals
- low tone = ferrous metals

When the low tone is forbidden, upon discovering objects which provoked longer signal, a sound is not produced, but the signal’s strength and type are displayed.
Example for working in DISC mode

**MODE fix (0..5) - NORMAL DISC**

This mode can be used either in motion or being static.

If the signal picked up by the coil is greater than the sound threshold $\text{TRSH}$, according to the calculated coefficient $C_1$, high or low tone is produced if both tones are allowed.

If the received signal is short $C_1$ has positive values.

If the signal is long, $C_1$ has low positive or negative values.

Depending on the adjusted environment of the discrimination scale (DISC), if $C_1$ is greater than DISC, a high tone is produced. And the opposite, if $C_1$ is smaller than DISC, a low tone is produced if it is not forbidden, and if it is, no sound is produced.

**Example:**
The device is reset before starting a search by lifting the coil in the air and pressing the FAST ZERO button.

Lower the coil (to 6..10cm for small coil and 30...40cm for large coil) above the ground and press again FAST ZERO. If the ground signal is fix5=4..8 the sound threshold TRSH=10 must be adjusted by using the THRESHOLD knob. The environment of the discrimination DISC=5 is adjusted using the DISC knob.

Above certain areas the signal increases fix5=15..25..30..15, and $C_1=7..8$, which is greater than the chosen DISC=5 and that is why a high sound is produced, signaling that a metal provoking quickly fading signals is detected. On the row between the level indicators a graphic symbol is displayed «**+»», corresponding to $C_1=7..8$.

Above another area a signal is picked up fix5=15..30..40..30..15, and $C_1=-2..-4$ and is lower than DISC=5, that is why a low tone is produced (if the low tone is forbidden there is no sound). This means that a metal provoking slowly fading signal is discovered. On the row between the level indicators a graphic signal is displayed «-O», corresponding to $C_1=-3$.

The symbol display of the discrimination result (the calculated coefficient for the signal $C_1$) allows its quicker and easier understanding – it is in a way "visual discrimination". The negative values of $C_1$ are shown on the left from the dividing point in the middle as circles, and the positive values are displayed as stars on the right side from this point.
Quickly fading signal

Slowly fading signal

**mov 0..5 (AUTO DISC) MODE**

In order to pick up signals in this mode, the coil must be in motion. After stopping, even if a signal is picked up, it gradually fades.

When the coil passes an area in which the signal is greater than the background and the difference is greater than the chosen sound threshold (TRSH with the THRESHOLD knob), this difference is discriminated, coefficient \( C_1 \) is calculated and a low or high tone is produced depending on \( C_1 \) and the chosen environment for discrimination DISC with the DISC knob.

Example:

With turning the FUNCTION button anticlockwise submode mov3 is selected. The coil is raised in the air and the device is reset.

Lower the coil above the ground (6..10cm for small coil and 30..40cm for large coil) and press again FAST ZERO. If the ground signal is mov3=5..6, which little by little fades to 0..1, the coil moves left and right and the signals received are mov3=8..10 due to the movement and the small changes in the ground signal. The sound threshold TRSH=10 and the environment of the discrimination DISC=5 are adjusted using the THRESHOLD and DISC knobs respectively.

When moving the coil above certain areas the signal goes stronger and the device shows mov3=15..25..15. \( C_1=12 \), which is greater than DISC=5, and that why a high tone is produced. This means that there is a metal object in the ground causing quickly fading signal – nonferrous metal.
The charging of the built-in accumulative battery is carried out when the **POWER button is off** and outside voltage charge 12V to 24V is provided. Recommended 20V.

The following is displayed on the screen:

- **Current maximum voltage reached**
- **Current temperature of accumulators**
- **Current voltage of accumulators**
- If the current voltage drops down below this value in charge mode the charging is stopped.
- **Current charged output**
- **Current charging electricity**

The charging of the batteries begins which continues to the reaching of the following measures:

- Normally, when charging the battery the voltage of accumulator gradually increases. At the end of the charging, when full capacity is reached, the batteries start slowly to warm up which causes certain, even though minimal, drop of the voltage regardless of the ongoing charging. This is standard indication that the battery is full, so the charging stops;

During charging the voltage of the battery has reached maximum value of 17.4V, greater than the final voltage 17.2V

The temperature has risen but has not exceeded 40 degrees.

Voltage before the stopping of the charge: there is a drop of 0.2V from the previously reached level of 17.4V – a reason for the charging to stop!

Expected final voltage of 17.2V, calculated from the reached level of 17.4V during charging

Charged output in the accumulator during charging

Charging electricity before charging termination

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- If, for some reason, the expected drop of voltage does not happen, the batteries will continue to warm up. After exceeding a certain temperature level the charging will stop.

During charging the voltage of the battery has reached the maximum value of 17.3V

Umax/Uend 17.3/17.1V
T=40.2°C cap=1350mAh
U=17.3V I=0.20A
Full!

The temperature has risen and has reached the maximum values allowed – a reason for the charging to stop!

The voltage before the end of charging is equal to the maximum voltage, i.e. there is no voltage drop.

Expected final voltage 17.1V, calculated from the reached level of 17.3V during charging.

Charged output in the accumulator during charging

Charging electricity before the termination of charging

- If, for some reason, the expected drop of voltage does not happen in the end of charging, the batteries do not warm up to the maximum temperature allowed but the maximum level set for the voltage is reached, and the charging ends.

During charging the voltage of the battery has reached the maximum value of 17.6V

Umax/Uend 17.6/17.4V
T=26.5°C cap=1420mAh
U=17.6V I=0.20A
Full!

The temperature has risen but has not exceeded the maximum level allowed

The voltage before the end of charging has not dropped but it has reached the maximum level for the battery – a reason for the charging to stop!

Expected final voltage - 17.4V, calculated from the reached level of 17.6V during charging.

Charged output in the accumulator during charging

Charging electricity before the termination of charging

Good luck!